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Published online: September 30, 2018

## **8<sup>th</sup> Africa Nutrition Conference**

Addis Ababa, Ethiopia, October 1-5, 2018

### **Abstracts**

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Co-organized by:  
*The African Nutrition Society and  
The Food and Nutrition Society of Ethiopia*

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## Foreword

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The 8<sup>th</sup> Africa Nutrition Conference (ANEC 8) has continued its tradition of providing an opportunity for African and international nutrition scientists, researchers, field workers, practitioners and students to showcase their work in a collegiate environment. This year's conference attracted a very high number of abstracts in ten sub-thematic categories. The categories include: Multi-sectoral Actions in Nutrition and Scaling up Nutrition; Food and Nutrition Security; Food Industries, Biofortification and Nutrition; Maternal, Infant and Young Child Nutrition; Nutrition Education and Information; Nutrition and Non-communication Diseases (NCDs); Nutrition Policies, Politics, and Governance; Food Safety and Systems; Adolescent Health and Nutrition and other Nutrition-Related Research. Following peer review, 166 abstracts were accepted for short oral original communications and a further 223 abstracts for poster presentation. These are additional to over 25 invited plenary keynote presentations at this year's conference.

We are pleased with the number and quality of abstracts received. We are also pleased to see the range of good quality research being conducted in the fields of nutrition, food science and public health in Africa and in international nutrition domains. They provide a very rich resource and opportunities for networking amongst scientists, funding agencies, industry, non-governmental institutions and academia on African soil.

Whilst we celebrate the improving quality and numbers of abstracts received, we recognize the need to continue to encourage and support especially young African scientists to gain confidence and the necessary skills for disseminating the good work that they do. In that regard, this year we introduced an “**abstract mentoring system**” as part of our capacity building efforts to support students and researchers new to the scientific writing and review process. Over 76 percent of abstracts which went through the mentoring process were accepted for oral presentation and the feedback we have received from mentees indicate that they found the process most useful.

On behalf of the African Nutrition Society (ANS), the Food and Nutrition Society of Ethiopia (FONSE) and the International Scientific Committee (ISC) of ANEC 8, I wish to thank all those who submitted abstracts and to acknowledge the immense contribution of all our reviewers and editors without whose efforts and sacrifices we wouldn't have such a high quality end product. We hope that you will continue to support the ANS and ANEC in our efforts to grow the nutrition family in Africa, build intellectual and research capacity and provide a platform for dissemination, intellectual dialogue, continuing education and networking to support Africa's nutrition agenda.

Finally, it is our fervent hope that most authors of abstracts will develop full manuscripts for publication following this conference.

**Professor Paul Amuna**

*Chairperson, International Scientific Committee*

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The effort required to put on a scientific meeting of this kind is substantial, but the potential returns are considerable. Some have likened it to a market place for the exchange of experience, ideas and opportunities in order to be able to enhance the opportunities offered to those we serve. The application of research to identify better solutions to problems and improved training to put those solutions into practice underpin our drive to improve services. I expect vigorous debate and intellectual challenge within the collegiate atmosphere that best enables informative exchange, but most of all hope that the deliberations will be respectful, informative and enjoyable and each participant will leave a little wiser.

**Professor Alan Jackson**

*International Scientific Committee Co-chairperson*

## **ANS President's welcome message**

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Fellow members of the African Nutrition Society (ANS), Delegates of the 8<sup>th</sup> Africa Nutrition Conference (ANEC 8), Friends: greetings from the sunny and humid city of Accra, Ghana – where the ANS is headquartered. Established in 2008, the ANS, most of you recognize, is a leading continental professional society of scientists working in the fields of nutrition, food science, agriculture, health, and related disciplines. The society has the goal to promote harmonization of nutrition workforce training, and to strengthen human capacity needed for nutrition policy, programming, and implementation. Aside serving as a platform for dissemination of best practice, ANEC provides a unique platform for mentoring and capacity strengthening. Mentoring, which is a constant feature of ANEC, is ingrained in the DNA of ANS.

I therefore consider it an honor and privilege to welcome you – distinguished subject experts, distinguished conference delegates, industry stakeholders, ANEC8 partners including students to Africa, to Addis Ababa, where ANEC8 takes place. This year's ANEC is particularly special in many respects. It's taking place in Addis Ababa an African city known for its pan-Africanism. It is also special because, ANEC8 is taking place at the AUC, the headquarters of the executive/administrative branch or secretariat of the African Union. Can you think of a better location for a conference of a pan-African Society in ANS?

ANEC, has, is, and will continue to be the continent's biggest gathering of nutritionists in Africa. Our conferences have been known for delivering world-class speakers. This year's meeting will be no different. Rich with inspiration and insights from the best and brightest, you will find details in our scientific programme on the conference website, or in the conference packet.

Appropriately themed “Multi-stakeholder nutrition actions in Africa: translating evidence into policies, and programmes for impact”, our conference will address some of today's public health's most critical issues, including: scaling up nutrition, nutrition governance, food systems, food safety and value chain, biofortification, food security, food industries, nutrition transition, and nutrition-related NCDs etc. All of these are in line with the Society's strategic direction.

As a reminder, ANS exists to bring together all stakeholders involved in the business of elevating the field of nutrition – including but not limited to researchers, practitioners, donors, policy makers and students. We know that it is only by working collaboratively that we will be successful in our mission and realizing our visions.

At this point, I would like to acknowledge the innumerable individuals who have contributed in diverse ways to ANEC8 (I have not named you, but you know yourselves). My sincere thanks to you for your sincere and continued support of ANS and our shared goals.

Finally, there is no ANEC without ANEC delegates. We thank you all for your devotion, dedication, and enthusiasm toward ANEC. You make ANEC hold the record, as the biggest family in Africa. We hope that your time at the conference will be stimulating and rewarding.

If you are reading the African Nutrition Matters for the first time, or attending ANEC for the first time, and not yet a member of the ANS, please consider JOINING and help us advance the laudable missions of ANEC, and the ANS. Once again, please receive my wishes for a delightful, stimulating, and a productive ANEC8

**ENJOY ANEC8! ENJOY ADDIS ABABA! ENJOY AFRICA.**

**Amos Laar, Ph.D**

*President, African Nutrition Society*

## **Welcoming words from the President of FONSE**

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Nutritional epidemiology is an area of epidemiology that involves research to examine the role of nutrition in the etiology of disease and monitor the nutritional status of populations. The African Nutrition Society has been conducting Nutritional Epidemiology Conferences every two year for the last several years under different themes. This year, the 8<sup>th</sup> African Nutritional Epidemiology Conference will be held in Addis Ababa, Ethiopia, from October 1 to 5, 2018. The conference is co-organized with the African Nutrition Society(ANS), Food & Nutrition Society of Ethiopia (FONSE) and the Ethiopian Public Health Institute(EPHI). This year's conference theme is **"Multi-stakeholder nutrition actions in Africa: translating evidence into policies, and programmes for impact"**. Therefore, I welcome you all to this important and educative conference and to Ethiopia, the Land of the Human Origin.

**Kelbessa Urga**

*Associate Professor of Food Science & Nutrition*

*Editor-in-Chief, Ethiopian Journal of Public Health & Nutrition*

*President, Food & Nutrition Society of Ethiopia*

## **Disclaimer**

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All abstracts have been printed as received and formatted for uniformity and the Organizing and Scientific committees cannot be claimed responsible of the contents and future applications. All views expressed during the scientific sessions at this Congress are those of the individual authors and do not necessarily reflect the views of any of the Committees or any other individual member of these Committees or the views of any of the official organizing bodies.

## **Making Economic Case for Nutrition Investment in Africa: Why Ministers of Finance Should Put Nutrition High on Their To Do List**

**Professor Lawrence Haddad, PhD**

Executive Director, Global Alliance for Improved Nutrition (GAIN), Geneva, Switzerland

**Contact Address email:** lhaddad@gainhealth.org

Nutrition is seen as a health issue by too many leaders in government. In fact, nutrition "Nourishes the SDGs". The presentation provides arguments drawn from the evidence and from experience on why and how to make nutrition a top issue for Ministers of Finance and Planning

# **Plenary and keynote abstracts**

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## **The Why, When, Who and How to Engage with the Private Sector to Advance Nutrition in Africa**

**Professor Lawrence Haddad, PhD**

Executive Director, Global Alliance for Improved Nutrition (GAIN), Geneva, Switzerland

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The presentation argues that if we are going to get close to achieving the SDGs by 2030 governments cannot do it on their own. All stakeholders need to play their part. Businesses are the "last frontier" when it comes to understanding what this set of stakeholders can do positively for nutrition. This talk explains why businesses are important for SDG2, when they should be engaged, how and which companies to engage with.

## **FAO/WHO GIFT (Global Individual Food consumption data Tool) achievements and prospects**

**Catherine LECLERCQ<sup>1</sup>, Pauline ALLEMAND<sup>1</sup>, Agnieszka BALCERZAK<sup>1</sup>, Rita FERREIRA DE SOUSA<sup>1</sup>, Markus LIPP<sup>2</sup>, Victoria PADULA DE QUADROS<sup>1</sup>, Philippe VERGER<sup>3</sup>**

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The **FAO/WHO Global Individual Food consumption data Tool (FAO/WHO GIFT)** is an open-access online platform providing access to harmonized individual quantitative food consumption (IQFC) data, especially in low and middle-income countries (LMICs). This platform is hosted by FAO and supported by WHO.

Knowing who eats what, understanding the various eating habits of different population groups, according to the geographical area, is critical to develop evidence-based policies for nutrition and food safety.

The FAO/WHO GIFT platform provides an inventory of existing IQFC data collected worldwide. To date, it contains detailed information on 188 surveys (91 in Africa) conducted in 72 countries (29 in Africa). The platform is operational since 2017, and will serve as the global FAO/WHO hub to disseminate IQFC microdata. To facilitate the use of these data by policy makers, ready-to-use food-based indicators are provided for an overview of key summary data according to population segments and food groups. FAO/WHO GIFT is a growing database. Currently, datasets from Burkina Faso, Uganda, Bangladesh, the Philippines and Lao People's Democratic Republic are available for dissemination. An additional 50 datasets are planned to be disseminated within the next 4 years.

All datasets shared through the platform are harmonized with the food classification and description system FoodEx2, which was developed by the European Food Safety Authority (EFSA) and then upgraded for use at global level. The concurrent mapping with FoodEx2 of food hazard occurrence datasets will improve the consistency and reliability of dietary exposure assessments, a critical step in establishing suitably protective limits for microbiological or chemical agents in food. Similarly, the mapping of food composition datasets with FoodEx2 will enhance the quality of the assessment of nutrient intakes worldwide.

The FAO/WHO GIFT platform is developed in synergy with other global initiatives which are also aimed at increasing the quality, availability and use of IQFC data in LMICs to enable evidence-based decision-making and policy development for better nutrition and food safety.

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### **Current strategies for stunting reduction in the light of emerging evidence of causal complexity**

**Dr Habiba Hassan-Wassef, MD**

National Research Centre, Cairo Egypt

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**Background and objectives:** Evidence from scientific research has identified a number of factors that contribute to linear growth retardation in children. The responsibility for control of several of these emerging causative factors may lie with other sectors than health and are rarely addressed in strategic orientations of health sector programmes for stunting reduction. Overcoming stunting is regarded by economists as critical for *building Africa's grey matter infrastructure*; brain power being regarded as a basic requirement for accelerating economic growth and the realization of Africa's Agenda 2063.

**Methods:** The scientific evidence that identifies the various factors contributing to child stunting is presented. Evidence of impact of climate change and extreme weather on child stunting are also examined. The various approaches and strategies applied for stunting reduction are reviewed and probable reasons for noted differences in progress made in stunting reduction rates discussed. Special attention is given to environmental pollutants and food contaminants with focus on the group of mycotoxins recognized for their growth retardation and health damaging impact.



**Results:** Scientific evidence demonstrates the limitation of current stunting reduction strategies adopted by the health sector. The uptake by the health sector of scientific evidence incriminating environmental and food chain sources of some of the causative factors for stunting has not yet been translated into strategies.

**Conclusions:** Stunting reduction strategies of national nutrition plans in Africa and supportive nutrition sensitive interventions in plans of other concerned sectors will necessarily need to be revised to address all causes of stunting if the commitment for reducing stunting by 40 percent is to be achieved by 2025. Treatment protocols for stunting, preventive strategies and regulatory measures to address all causative factors will necessarily be also revised.

**KEYWORDS:** Child stunting, causative factors, revised strategies, trans-sectoral actions

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### **Developmental origins of adult diseases and the relevance to health in the African context**

**Professor Alan Jackson, CBE. MD; PhD; FRCP; FRCPHC; RNutr**

University of Southampton, United Kingdom

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It is now considered unremarkable that current health is built on past experience and that although genetic endowment marks the opportunity for biological function, cumulative experience and environmental interactions determine how this potential plays out. These relationships have been recognised throughout history but the underpinning biological mechanisms through which they are enabled is now the direct purpose of a body of scientific endeavour. It is clear that much of ill-health is

a consequence of imposed stresses which may often be biological in origin, as with infections. But with the epidemiological, demographic, economic and nutrition transitions the stresses are increasingly attributable to the poor quality of life experience, loss of social and cultural harmony and the nature of social interactions. The basis of developmental origins is the relationship between the capacity of an individual ability to cope, otherwise characterised as the magnitude of their resilience, against the sum total of the stresses imposed through life's experiences. The extent to which these general relationships can be quantified from one context to another determines the policy choices and options for both population and individual approaches to health and care. At every stage of life nutritional considerations determine the capacity to cope, often most easily marked as growth in size and shape. Nutritional considerations can also contribute as stressors, as with poor quality diets that fail to match the needs for physical activity and growth. Locally relevant research and context specific enquiry is needed to determine how best an appropriate balance can be achieved for any particular group, community or situation.

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### **Prevention of cancer through, diet, nutrition, and physical activity: the case of Africa.**

**Professor Alan Jackson, CBE. MD; PhD; FRCP; FRCPHC; RNutr**

University of Southampton, United Kingdom

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**Abstract:** Cancer is the most rapidly growing health problem across the world and particularly in low and middle income countries. In May, 2018 the World Cancer Research Fund International/American Institute for Cancer Research published

their 3<sup>rd</sup> report on the “Prevention of Cancer Through, Diet, Nutrition, and Physical Activity”. This extensive systematic enquiry into the relationship between a wide range of exposures and cancer risk at defined sites represents the largest analysis for any health related condition with careful and critical review of all the evidence against explicitly defined criteria to achieve consensus and come to considered advice that will form the basis of policy. Much of the policy informed advice is similar to that for health more widely and prevention of chronic non-communicable diseases but is built on a more secure evidence base. The recommendations are: to be a healthy weight; to be physically active; to eat a diet rich in whole grains, vegetables, fruit and beans; to limit processed foods, foods high in fat starch and sugars, to limit processed and red meat consumption, to limit sugar sweetened drinks, to limit alcohol; to encourage and enable breast feeding. Although the available data are limited for Africa, the advice applies to all populations there are important considerations that may apply particularly, for protect against the consumption of aflatoxins. TAs a series of general statement, the Recommendations comprise a comprehensive package of behaviours that promote a healthy pattern of diet and physical activity to reduce cancer risk. They are to be used by individuals, health professionals, communities and policymakers, as well as the media. WCRF, IUNS and UICC have together formed an international collaboration, supported by IARC and IAEA, to enable wider national engagement and action through which the nutrition community and cancer community come together to better organise activities to address this widespread and common problem.

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There are many models for the delivery of health care but those that most sustainable can be delivered at lowest cost, but require that people adopt and accept primary responsibility for their own health, where appropriate with the guidance and support of policy makers and health professionals. As with public health, effective and efficient delivery of all care requires the organised efforts of all society, acting collectively to achieve a common ambition. For the structures that are put in place to deliver quality requires that people of quality are able to recognise and address problems in context a timely way. The organized and structured approach to problem solving or learning from experience is what is often called research, but at times with pejorative overtones. Research should be seen as the structured approach to problem solving which enables greater efficiency of effort and distinguishes underlying principles from context specific experience. The so-called pipeline for research has for convenience been broken down into stage: discovery, efficacy, effectiveness; going to scale. Each step plays a role and each step has its own characteristics and skill base. Common to each stage of the process is the need to: inform and educate; set standards within a quality assurance management framework; understand how to, be able to show how and assure fidelity in practice. The formal development of Implementation Science as a formal structured approach to the application of what is known to routine practice offers a major development in enabling people to own responsibility for their own health when as a matter of course.

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### **Enabling People to Own their Health”**

**Professor Alan Jackson, CBE. MD; PhD; FRCP; FRCPHC; RNutr**

University of Southampton, United Kingdom

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**FOOD SECURITY AND MALNUTRITION – ARE THE ELDERLY AS VULNERABLE AS WOMEN AND CHILDREN? THE SITUATION IN SOUTH AFRICA**

**Wilna Oldewage-Theron PhD, RD (SA)**

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**Objective:** Specific indicators such as food insecurity, poverty and malnutrition prevalence among children, women and the elderly were investigated. To answer the question if the elderly is just as vulnerable as women and children, due to lack of data, a case study was undertaken in a group of Sharpeville elderly to determine the food security situation and the influence of socio-demographic factors on food security markers.

**Methods:** A literature review was undertaken for the background study and included national studies and review articles about food security in South Africa. The case study was undertaken in 146 free-living elderly, attending a care centre in Sharpeville. The **measuring** instruments included a socio-demographic-, 24-hour recall- and dietary diversity questionnaire and the validated household food insecurity access scale (HFIAS). Data were analysed on SPSS, version 23.0. A comparison was drawn between children women and the elderly.

**Results:** The prevalence of food security was 67.8% in the Sharpeville elderly, which compared more favorably to the national prevalence rate of 45.6% in women. A variety of coping strategies were used to cope with food insecurity. Poverty rates were much higher among women (55.5%) and children (66.8%) and elderly (44.0%) in South Africa. However, 100% of the Sharpeville elderly lived under \$2 per person per day.

**Conclusion and recommendations:** Due to a paucity of national data, a comparison to answer the research question could not be drawn. The Sharpeville study points to a problem of household food insecurity with poor dietary intakes among the elderly. National surveys should include the elderly as a

separate entity for data analyses to plan and implement interventions/programs/policies that would best fit the needs of senior citizens in South Africa.

**Key words:** children, elderly, food security, poverty, South Africa, women,

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**Breaking the vicious cycle of Health literacy and health outcome**

**Professor Mary Murimi, PhD**

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Health Literacy is the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate and personal health decisions. Health Literacy therefore implies having correct and clear information to make the right health decisions. However nearly one billion of the world's poorest people have not yet experienced the education age and majority of them reside in Africa south of Sahara and majority of them are women and girls. Evidence based studies show a consistent association between low health literacy and poor health status. The purpose of this session is to discuss the benefits of health literacy and evidence based strategies to narrow the gap health literacy gap.

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**Before the first 1000 days: the critical importance of the peri-conceptual nutrition of both parents**

**Professor Andrew M Prentice, PhD, FMedSci**

Director, Medical Research Council (MRC) Unit, The Gambia  
London School of Hygiene and Tropical Medicine (LSHTM))  
United Kingdom

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The 'first 1000 days' has become a mainstream concept in nutrition and has played a valuable role as an advocacy tool as we try to focus greater attention on the ills of malnutrition and how to solve them. However, if interpreted too literally, it has two shortcomings. The first is that it may wrongly imply that deficits present at age 24 months are irreparable. This is partly, but not entirely, true. More importantly it suggests that we need only concern ourselves with nutrition from conception onwards. Recent research shows that this is a critical error. Shortly after the fusion of the sperm and egg the new embryo's genome undergoes a rapid and highly complex process of epigenetic erasure and then re-establishment. Experiments in mice clearly show that these processes can be altered by changing the mother's diet before mating. We have recently revealed the first-in-human evidence to back this up. By exploiting a seasonal 'experiment of nature' in rural Gambia whereby conceptions randomly occur against a very different dietary background (mandated by seasonal changes in food types and availability) we have shown that a baby's season of conception has profound effects on the methylation levels of certain key genomic regions. There are already strong signals suggesting that some of these changes will affect susceptibility to obesity, viral diseases and certain cancers though biological validation of these phenotypic associations is still required. The fact that the epigenome might be alterable through nutrition interventions (whereas the genome is invariant) offers exciting possible prospects for next generation interventions to optimise fetal development and hence life-long health.

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**Disappointing results from WASH intervention trials: Why, and where next?**

**Professor Andrew M Prentice, PhD, FMedSci**

Director, Medical Research Council (MRC) Unit, The Gambia  
London School of Hygiene and Tropical Medicine (LSHTM))  
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Child growth is not simply a matter of good nutrition. Research in our field station in rural Gambia was among the first to link growth failure to persistent damage to the gastric mucosa involving villous atrophy, crypt hyperplasia and a persistent inflammatory state. This constellation of features (now frequently termed environmental enteric disease (EED)) causes malabsorption of key nutrients and nutrient wastage, especially energy. EED is widely viewed as a key driver of growth failure so a number of water, sanitation and hygiene (WASH) trials have attempted to clean up the child's environment in order to block the development and persistence of EED. The results of a series of large WASH interventions have been published this year; WASH Benefits from Bangladesh and Kenya, and the SHINE Trial from Zimbabwe. The results have caused widespread dismay and disappointment. Whilst the nutrition (promotion of IYCF) arms had a small benefit (averaging about 0.25 z-scores for length) the WASH arms had no benefit. Why is this the case? We have evidence from rural Gambia that the

intention was valid but that there is a very high threshold of hygiene that needs to be overcome before EED will be reduced, and that the WASH interventions were simply not sufficiently intense. The investigators are working with WHO to promote the concept of 'Transformative WASH' and, subject funding being available, there will no doubt be trials of more intensive interventions in the near future.

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### **Addressing the Problem of Childhood Obesity in the Arab Gulf: The Case of Qatar**

**P. Amuna<sup>1\*</sup>, H. Al Mujalli<sup>1</sup>, H. Qotba<sup>1</sup>, S.T. Veetil<sup>1</sup>, A. Terranegra<sup>2</sup>, P. Bergsten<sup>3</sup> and the Qatar ECHO Group.**

*Department of Clinical Affairs, Primary Health care Corporation, Qatar; <sup>2</sup>Division of Translational Medicine, Sidra Medical and Research Center, Qatar; <sup>3</sup>Biomedical Research Institute, University of Uppsala Medical Centre, Uppsala, Sweden*

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Although the underlying causes and risk factors for childhood obesity are well recognised, this has not translated into tangible gains in tackling and preventing its exponential growth worldwide and especially in developing countries where a 4-fold increase in prevalence has been reported in some countries over the last decade alone. In the Arab Gulf region, rapidly rising childhood obesity levels require urgent national and collective regional actions to avert a worsening public health crisis.

The components of risk are complex, involving intergenerational historical epigenetic and molecular risk-programming mechanisms which precede the post-natal life course social, environmental, cultural and behavioural determinants which

although thought to be modifiable, have nonetheless remained an elusive proposition.

An obesogenic environment plays a significant role especially in the Arab Gulf countries which have seen major demographic and epidemiological shifts as a direct result of rising gross national incomes, with a concomitant shift in unhealthy lifestyles, eating behaviours and sedentariness within the context of strong cultural values relating to gender, food and exercise.

Government policies and the political will exist as well as broad strategies to tackle childhood obesity yet their implementation remains a work in progress. Inter-sectoral collaborative actions though necessary, still need to be developed and strengthened. Health care professionals' training, knowledge, understanding, accurate measurement and their ability to recognize risks; as well as parental and care-givers' health and nutrition literacy and parental involvement in addressing the issue remain some of the challenges to be overcome.

The objective of this paper is to highlight childhood obesity as a major health issue in the Arab Gulf region and to explore efforts currently being made to address it with a focus on Qatar, including challenges and opportunities for the future.

**Key words:** child, obesity, Arab Gulf, public health, interventions, Qatar

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### **Double-duty actions for nutrition in Africa**

**Muhammad A Dhansay<sup>1,2,3</sup>**

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In the past, there was colonialism, the industrial revolutions, and world wars. The world now is still in tumult, as evidenced by the 2008 financial implosion; genocide; civil strife with internal displacements; xenophobia; rising (economic) nationalism; trade wars; climate extremes (drought and floods); cross-border disease outbreaks (cholera, Ebola); poor governance, cybersecurity issues (Fourth Industrial Revolution), intemperate politicians; interference (overt and covert) in countries' sovereignty; corruption ... the list is endless! Some might say the world, and Africa, have become inured to all the strife, conflict and changing social and health environments – this should not be allowed to happen. Against this backdrop, the world, and especially Africa, faces the spectre of malnutrition in all its forms (over-and undernutrition) and diet-related non-communicable diseases, today and for the foreseeable future. Nearly 151 million children under five years of age are still stunted. Other forms of malnutrition, such as adult obesity, continue to increase in countries, and many countries are coping with multiple forms of malnutrition at the same time. Coherent and cohesive responses are required and at multiple levels, with sound nutrition as a keystone. Several global compacts and initiatives are on the agenda, e.g., the UN Decade of Action on Nutrition; the WHA Global Nutrition Targets 2025; and the SDGs 2030. However, time is short, political commitment is lacking most times and resources stretched, especially in Africa. In light of this, the strategy to address multiple forms of malnutrition by considering implementing *double-duty nutrition actions* is urgent, more so in Africa with its fragile economies and huge disease burden. The approach is

rooted in contextualizing these actions, since the diversity that is both an outstanding feature of the continent is also its potential weak spot. Through case studies, potential double-duty nutrition actions are presented with a bias towards the South (African) context.

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### **Fatty acids: a role for Africa?**

#### ***Professor Jacques Delarue PhD***

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Among macronutrients, fatty acids have been the most controversial concerning health effects. This is mainly explained not only by the very different biological effects of their different major subclasses of fat: saturated monounsaturated and polyunsaturated (PUFA) but also because of the biological and health effects of specific fatty acids inside a subclass. In the whole, contrarily to a popular belief, total mortality is inversely associated to the amount of fatty acids consumed. In contrast, a positive relationship exists between consumption (expressed as quintiles in 126,233 Nurses) of Trans fatty acids or saturated fatty acids and total mortality and an inverse relationship between consumption of monounsaturated or polyunsaturated fatty acids and total mortality. Among PUFA, in spite of some controversy, long chain omega 3 PUFA has a protective effect in secondary cardio-vascular prevention at least in subgroup of

population and when including cohort studies. Concerning the consumption of fat there is a specificity of Africa as compared to other continents. Energy from saturated fat does not exceed 14% and highly depends on the country as well energy from n-6 PUFA, which does not exceed 8% (4). Energy from trans-fat is very low in Africa except in Egypt; dietary intake of marine omega 3 PUFA is very low in Africa inferior to 100 mg/day whereas international recommendations promote 250 to 500 mg/day. In contrast consumption of plant omega 3 PUFA (ALA) is highly variable depending on the country. Both fish and ALA availability are low in numerous African countries. In spite of these characteristics of fat consumption and availability prevalence of diabetes is the lowest and cardiovascular events are very low in Africa, partly explained by the fact that the whole dietary pattern is globally the best of all continents, even though there is a tendency to deterioration over the last decade. One objective of "fat for Africa" could be to increase as much as possible the amount of marine omega 3 PUFA consumed by promoting aquaculture, and to maintain as much as possible traditional dietary pattern by preventing a tendency to westernization, provided that the amount of energy and protein is sufficient to fight against wasting and stunting where it still exists.

organisms and to providing tolerance to non-threatening organisms, to food components and to self. The immune system works by providing an exclusion barrier, by identifying and eliminating pathogens and by identifying and tolerating non-threatening sources of antigens, and by maintaining a memory of immunological encounters. The immune system is complex involving many different cell types distributed throughout the body and many different chemical mediators some of which are involved directly in defence while others have a regulatory role. Babies are born with an immature immune system that fully develops in the first few years of life. Immune competence can decline with ageing. The sub-optimal immune competence that occurs early and late in life increases susceptibility to infection. Nutrition is very important in assuring appropriate immune function. Undernutrition decreases immune defences, making an individual more susceptible to infection. However, the immune response to an infection can itself impair nutritional status and alter body composition. Practically all forms of immunity are affected by protein–energy malnutrition, but non-specific defences and cell-mediated immunity are most severely affected. Micronutrient deficiencies impair immune function. Vitamins A and D, Zn, Fe and long chain omega-3 fatty acids will be considered here. Their effects on the immune system and the underlying mechanisms of action will be discussed.

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#### **Recent scientific developments and new insights in nutritional immunology: their relevance to Africa**

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#### **Generating evidence for diet-disease relationships and their further use in FBDGs**

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A well-functioning immune system is key to providing good defence against pathogenic



**Abstract:** During the past years, more and more clinical trials with human subjects were conducted and existing large scale prospective data collection have been analyzed regarding many research questions. This development made it more and more difficult to summarize dietary status by simply describing the studies and rather favoring a quantification approach pursued by meta-analysis. More recently, the quantification of effects or associations across different studies forms the basis of the data that are used by scientific panels to give advices and to formulate recommendations. Thus, in the food area and their translation into public health policy via food based dietary guidelines, meta-analytical approaches are also the choice. One example is the conduct of meta-analyses with an identical number of 12 foods for different endpoints, which also generated non-linear plots of the relationships. However, the single food-disease relationship needs further to be processed into a common relationship of a food with the various endpoints in order to obtain one non-linear relation per food, independent from any future disease because such events are not projectable for an individual. Such relationships need further to be translated into daily adjusted life years (DALYs) attributed to the food by using counterfactual food intake distributions often taken from real surveys. In this presentation, these issues will be explored with case examples from the scientific evidence.

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### **Changing food environments in African cities and implications for policy**

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Africa is currently experiencing rapid demographic change, partly driven by increasing migration of individuals to cities. As a consequence, people's food environments and dietary habits are also changing, with increasing marketing, availability and consumption of energy-dense, nutrient-poor foods and beverages. Such changes are associated with increasing levels of obesity and diet-related non-communicable diseases (NCDs), coexisting with persistent undernutrition, as for example, unhealthy diets are also associated with lower micronutrient intake. Therefore, improving food environments has the potential to prevent both diet-related NCDs and undernutrition. This double burden of malnutrition represents a pressing public health concern and integrated actions (interventions and policy) are required to improve food environments. This presentation will provide evidence for how food environments are changing and shed light on the factors driving this in Africa. It will summarise the role that people's physical environments play (e.g. access to outlets selling unhealthy food and food advertising. It will explore how food consumption habits are structured and organised in social environments, such as when/where unhealthy food and beverages are eaten, how quickly and with whom. The evidence for developing interventions and policies within Africa comes mainly from outside the continent. Whilst useful, it is important to account for the food environments that people live in, so that policies and interventions to promote healthier food consumption in African cities are context and culturally relevant and address all forms of malnutrition. Hence, by investigating the role of urban social and physical environments, emerging public policies and interventions are likely to positively impact on nutritional status, thereby enhancing social and economic development.



## **Maximizing benefits and minimizing adverse effects of micronutrient interventions**

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Micronutrient deficiencies affect a significant proportion of the world's population. Infants, young children, adolescent girls, and women of reproductive age are the most affected. The adverse effects of micronutrient deficiencies include poor cognitive performance, frequent infections, congenital abnormalities, and overall poor health to name a few. Food fortification and supplementation have been proven to be cost-effective in preventing micronutrient deficiencies and related health risks. Consequently, efforts to scale-up the reach of fortification and supplementation have been underway. However, little is known about usual intakes and the risk of excessive micronutrient intakes in low and middle-income countries (LMIC) and whether there is a reasonable additional risk with untargeted micronutrient interventions. In this review, evidence of the co-existence of excessive nutrient intake will be shown in a non-negligible proportion of the population living in resource-limited settings of LMIC, where inadequate intake is often seen as the only problem. Vitamin A, iron, iodine and folic acid are among the most common nutrients for which excessive intakes exist. Secondly the need for targeting interventions will be highlighted and the programmatic challenges associated with it discussed. Finally, current technological and program design advances that have the potential to maximize the benefits of micronutrient interventions while minimizing risks will be discussed.

## **Adding value to nutrition research for evidence-based policies in Africa**

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**Introduction/Background:** Ineffective use of resources for biomedical research is an important concern internationally, in particular in low- and middle income countries where needs are high and resources are constrained. Concerns regarding the quality of nutrition research were raised previously and call for concerted actions by the nutrition research community. To date, a comprehensive overview of strategies to add value to nutrition research is unavailable.

**Methods:** Narrative review of existing initiatives to enhance quality of nutrition research across the research cycle: from adequate formulation of research priorities and funding to better reporting of findings, sharing and re-use of data.

**Results:** Most research has focused on technical aspects related to the design, implementation and analysis of nutrition research. Efforts to (i) define and fund research priorities according to priorities by African researchers, (ii) better reporting of findings and (iii) data handling are unexplored and deserve attention. Examples of relevant tools, reporting guidelines, and data sharing practices will be discussed.

**Conclusions:** Fostering of evidence-based nutrition policies will require attention and curriculum development of courses to integrate different parts of the research cycle: from adequate priority setting to reporting of findings. Most of the tools developed however, require application, testing and engagement of nutrition researchers in low- and middle-income

countries to ensure adequate uptake into the best possible programs and policies.

**Keywords:** Evidence based policies, nutrition research, research waste, nutrition epidemiology

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## **The Need for Ethical Leadership Has Never Been Greater**

### **Mark Hollingsworth**

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The presentation examines the structure of ethical leadership. Leaders who put their personal interests first, who see leadership as power, are identified through links with corruption, nepotism, egoism, and abuse of power. They avoid the truth, do not take responsibility for their actions, often simply to cover their own tail, or to make themselves look good. Ethical leaders act in accord with their conscience, when called upon, risking their careers by pursuing a more expansive vision of the organizational, institution, national or local interest in opposition to internal and/or external popular opinion or pressure. Such leaders are naturally humble, trustworthy, honest, considerate, charismatic and fair. They set high standards through personal example, becoming the role model and champion for the importance of ethics. Ethical leaders are able to recognize ethical dilemmas, the trigger situations and 'inner voice' which alerts them to certain challenging situations. However, recognizing ethical dilemmas is one thing, deciding how to manage them is somewhat different. Ethical leaders have developed systems to assist them in dealing effectively with ethical dilemmas. In summary, to act ethically requires one key

trait: Courage. In practice this means to be a true ethical leader, to engender deep trust and loyalty, starts with telling the truth. Telling those being led not what they want to hear, but rather what they need to hear is ethical leadership in action

Anaemia in African children: Efficacy and Risks of Iron Supplementation  
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**Abstract:** Iron deficiency is the most common nutritional deficiency worldwide. Despite aggressive implementation of iron supplementation programs either alone or in combination with food-based supplementation, the prevalence of anaemia remains high in Sub Saharan Africa. The long-term consequences of anaemia are severe, yet it is, in theory, easily treatable – hence, the WHO recommends universal iron supplementation for young children. However, in 2006 a large interventional trial resulted in significant excess of serious adverse events in African children receiving iron and raised serious concerns about the safety of iron supplements. These concerns have been reinforced by subsequent studies that show a stimulatory effect of iron on potential bacterial and protozoal. A 2016 Cochrane review searched all available evidence and concluded that iron supplementation should not be withheld in malaria endemic areas where malaria management services are available. Unfortunately, they were unable to address the question of the safety of iron supplementation in young children in the absence of malaria prevention and treatment services. Our work has sought to understand the relationship between iron deficiency, iron supplementation, and malaria, using in vitro infection models and blood from iron deficient Gambian children. Our results show elevated rates of malaria susceptibility following

iron supplementation, which parallels increases in erythropoiesis. These results highlight the need for malaria prophylaxis during iron supplementation campaigns. We have also demonstrated that the inefficacy of iron supplementation in children is likely to be mediated, at least in part, by a hepcidin-mediated blockade of iron absorption. This is driven by chronic inflammation that in turn is caused by poor living conditions, and points to a need for multi-sectoral interventions in order to eliminate iron deficiency anaemia.

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## **ON-THE-GROUND COORDINATED MULTI-SECTOR ACTIVITIES ARE NEEDED TO IMPROVE CHILD NUTRITION**

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**Introduction/Background:** Endemic poverty, inadequate infrastructure, and limited government services contribute to the poor nutritional status of rural Ghanaian children. Interventions that integrate resources from diverse district sectors are needed to develop effective approaches to improve infant and young child (IYC) nutrition.

**Methods:** *Nutrition Links [NL]* was 5-year capacity-building and research program in the Upper Manya Krobo District of the Eastern Region of Ghana. The NL program provided training on nutrition and health, gender, data analysis, and evidence-based decision-making to government and private sector service providers in the health, education, agriculture, governance, and finance sectors of the district. In addition, three of six sub-districts were randomly selected for a cluster randomized controlled trial to test the effect of a 12-month agriculture-nutrition education intervention on child diet and

growth. Sixteen clusters with 500 households were randomly assigned to intervention (inputs and training for poultry farming and home gardening, and nutrition and health education) or control group. The study was registered at Clinicaltrials.gov (NCT01985243).

**Results:** Compared to children in the control group, children in the intervention group met minimum diet diversity (aOR=1.65; 95% CI: 1.02, 2.69) and had a higher LAZ ( $\beta$ =0.22; 95% CI: 0.09, 0.34) and WAZ ( $\beta$ =0.15, 95% CI: 0.00, 0.30). The components of the program that contributed to its success included: (1) training that strengthened the district-wide support of child nutrition in different sectors of government; (2) community-based training and development of community volunteers that improved local awareness and support of child nutrition; and (3) training, support of income-generation activities, and increase in accessibility of diverse foodstuffs that enhanced household opportunities to support child nutrition.

**Conclusions:** Interventions that address the multiple barriers that households face require the diverse expertise that is available in the different government sectors in a district. Integrated approaches that can increase access to high quality foods and nutrition education can improve child nutrition. **Key words (4 –5):** child nutrition, agriculture, income-generation activity, linear growth, diet diversity

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## **FOOD SECURITY AND MALNUTRITION – ARE THE ELDERLY AS VULNERABLE AS WOMEN AND CHILDREN? THE SITUATION IN SOUTH AFRICA**

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**Objective:**

Specific indicators such as food insecurity, poverty and malnutrition prevalence among children, women and the elderly were investigated. To answer the question if the elderly is just as vulnerable as women and children, due to lack of data, a case study was undertaken in a group of Sharpeville elderly to determine the food security situation and the influence of socio-demographic factors on food security markers.

**Methods:**

A literature review was undertaken for the background study and included national studies and review articles about food security in South Africa. The case study was undertaken in 146 free-living elderly, attending a care centre in Sharpeville. The measuring instruments included a socio-demographic-, 24-hour recall- and dietary diversity questionnaire and the validated household food insecurity access scale (HFIAS). Data were analysed on SPSS, version 23.0. A comparison was drawn between children women and the elderly.

**Results:**

The prevalence of food security was 67.8% in the Sharpeville elderly, which compared more favourably to the national prevalence rate of 45.6% in women. A variety of coping strategies were used to cope with food insecurity. Poverty rates were much higher among women (55.5%) and children (66.8%) and elderly (44.0%) in South Africa. However, 100% of the Sharpeville elderly lived under \$2 per person per day.

**Conclusion and recommendations:**

Due to a paucity of national data, a comparison to answer the research question, could not be drawn. The Sharpeville study points to a problem of household food insecurity with poor dietary intakes among the elderly. National surveys should include the elderly as a separate entity for data analyses to plan and implement interventions/programs/policies that would best fit the needs of senior citizens in South Africa.

**Key words:** children, elderly, food security, poverty, South Africa, women,

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**Importance of reliable & standardized food composition data generation towards solving Africa's nutrition problems: constraints and the role of FAO/INFOODS/AFROFOODS & other stakeholders in future initiatives**

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**BACKGROUND:** Despite the rich biodiversity of the African continent and the tremendous progress so far made in food production, African is still pledged with the problems of food insecurity, hunger and malnutrition. Malnutrition, in its various forms (under-nutrition, over-nutrition, micronutrient deficiencies and the emerging non-communicable diseases) has continued to be a serious public health problem in Africa. To combat these nutritional problems, the production and consumption of nutritious and safe foods need to be promotion. These cannot be achieved without accurate data on the quantity and quality of nutrients and other components (food composition data) provided through foods. Food composition data (FCD) are compiled in food composition tables (FCTs) or food composition databases (FCDBs) for use by several professionals for a variety of purposes, ranging from clinical practice, research, public health/education, food industry to planning and policy, as well as nutrition monitoring and surveillance, with the ultimate goal of improving the nutritional status and wellbeing of population. To perform these functions effectively, the importance of reliable and standardized FCTs/DBs cannot be overemphasized. Poor quality FCD has serious consequences on the health of the population, and provide wrong evidences for nutrition and health related policies.

**OBJECTIVES:** This paper will review the various methods of FCD generation, the importance of reliable and standardized FCD generation in assisting nutrition/dietetic professionals in solving Africa's nutrition problems; current status of FCD generation, compilation and dissemination in Africa, constraint to the use of FCD by professional and the role of FAO/INFOODS/AFROFOODS and other Stakeholders towards improvement and future initiatives.

**PROGRAMME IMPLICATION:** The information provided will create awareness on the importance of FCD and facilitate the identification of gaps and prioritization of future efforts in FCD generation, compilation and dissemination in Africa and subsequent strategies for the alleviation of the food and nutrition problems in Africa.

**Keywords:** Food composition data, generation, uses, current status and limitations, Africa's nutrition problems, INFOODS/AFROFOODS.

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## **SCALING UP NUTRITION IN AFRICA: A RECIPE FOR SUCCESS**

**Gerda Verburg**

UN Assistant-Secretary General and SUN Movement Coordinator

Given the State of the World's Food Security report from 2018, undernourishment and severe food insecurity appear to be increasing in almost all regions of this Continent. The time is now to focus on the what and how when it comes to scaling up nutrition, for impact and results at scale.

According to the SUN Movement's experience of improving nutrition in countries, three key ingredients constitute the 'recipe for success', which are: government ownership, multi-sectoral and multi-stakeholder collaboration for aligned implementation, and investment. The 2030 Agenda for Sustainable Development compels us to tackle food security, nutrition, agriculture and health

in unison. This will help unlock progress across all Sustainable Development Goals.

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**Innovations in Agriculture/food systems-nutrition research: Connecting disciplines and sectors, globally and locally**

**Dr. Suneetha Kadiyala**

Associate Professor in Nutrition-Sensitive Development, London School of Hygiene & Tropical Medicine (LSHTM); Principal Investigator of IMMANA & the Agriculture, Nutrition and Health (ANH) Academy

The talk will first highlight the developments in agriculture-nutrition research in the last decade and summarize the evidence of the impact of agriculture interventions outcomes along agriculture-nutrition pathways and key evidence gaps. The talk will then present some recent key innovations in interdisciplinary methods and metrics to fill these evidence gaps and conclude with presenting a way forward in bridging disciplines and communities of practice (with specific reference to the Agriculture, Nutrition and Health Academy) to accelerate the the development of a robust scientific evidence base needed to guide policy investments in agriculture-food systems for improved nutrition.

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**What role can leadership play in governance for nutrition policies, strategies and programmes in Africa?**

**Dr. Namukolo Covic**

Senior Research Coordinator in the Poverty Health and Nutrition Division at IFPRI, Addis Ababa, Ethiopia.

Leadership is a critical component of accelerating progress on nutrition on the African continent. Yet this is an area that has not received adequate attention. If we are to benefit from policies and programmes being implemented across the African continent, key leadership principles need attention across the whole multisectoral nutrition system. This must bring on board food systems dynamics. The complexity of multisectoral action calls for vision and purpose beyond self-interest as well as appropriate governance attitudes within existing structures to effectively deliver on stakeholder commitment and collaboration through effective coordination. Leadership can play a role in governance for nutrition in Africa by galvanising efforts in a positive direction and this leadership capacity needs to be developed in addition to technical capacity.

# ORAL ABSTRACTS

## OPTIMAL IODINE STATUS OF SCHOOL AGE CHILDREN AFTER UNIVERSAL SALT IODIZATION PROGRAM IN ETHIOPIA: A CROSS-SECTIONAL STUDY AT DABAT DISTRICT

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**BACKGROUND:** Iodine deficiency is a major nutritional problem and its control is a global public health triumph. Despite the country launching a universal salt iodization program, the existence of iodine deficiency disorders have been reported in Ethiopia. Our study aimed to assess the prevalence of iodine deficiency disorders among school age children aged 6-12 years in the Dabat district.

**METHODS:** A cross sectional survey was conducted among children in Dabat district in May 2016. MBI international Rapid Test Kit was used to determine iodine content of salt. Urinary iodine concentration (UIC) of was analyzed using the Sandell-Kolthoff reaction method. One-way ANOVA was used to compare mean of log transformed UIC values among different categories for independent variables.

**RESULTS:** A total of 358 school age children enrolled in the study with a mean age of 10.8(SD= 1.45) years; [M=56.7%; F=43.3%]. The median urinary iodine concentration was 234.99µg/l [IQR: 161.3, 320.2]. Nearly one-third of school-age children had excessive iodine intake. Thirty-four percent of the sample had goiter. The prevalence of grade 1 and grade 2 goiter was 26.5 and 7.5%, respectively. The coverage and adequacy of household iodised salt was 97.5% and 30.7%, respectively. Median urinary iodine concentration was correlated with place of residence and household iodine level (P<0.05).

**CONCLUSIONS AND RECOMMENDATIONS:** The study population of school-age children is currently iodine sufficient by median urinary iodine concentration but adequacy of household iodised salt was low and total goiter rate showed existence of severe iodine deficiency. Regular monitoring of household iodised salt and median urinary iodine concentration in children and other vulnerable groups is warranted.

**KEY WORDS:** Optimal iodine status, school age children, Dabat District, Ethiopia.

## ADHERENCE TO SELF-CARE RECOMMENDATIONS AND ASSOCIATED FACTORS AMONG ADULT HEART FAILURE PATIENTS AT GONDAR UNIVERSITY REFERRAL HOSPITAL, NORTHWEST ETHIOPIA

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**BACKGROUND:** Heart failure related morbidity and mortality is increasing globally. It affects younger age Africans more than Europeans and Americans. Though medication is available, low sodium diet, regular exercise, and weight monitoring are essential to control heart failure symptoms and its exacerbations. Poor adherence to treatment recommendations is contributing to an increase in hospitalization, morbidity, and mortality. The aim of this study was to assess adult heart failure patients' adherence to self-care recommendations and its associated factors.

**METHODS:** A hospital-based cross-sectional study was conducted among 310 adult heart failure patients selected by systematic random sampling at Gondar University Referral Hospital, from February to May, 2017. Data was collected through face to face interview and from patients' medical records. The collected data was analyzed using SPSS version 20. Binary logistic regression was used to check the effect of different factors on patients' level of adherence.

**RESULTS:** Of 310 study participants only 22.3 % (95% CI, 17.4%-26.8%) of patients reported good adherence to their self-care recommendations. Adherence to self-care was positively associated with being male in gender (AOR=2.34, 95% CI: 1.18-4.62), good level of heart failure knowledge (AOR =2.49, 95% CI: 1.276-4.856) and absence of chronic co-morbid diseases (AOR =2.57, 95% CI: 1.28-5.14).

**CONCLUSIONS AND RECOMMENDATIONS:** Overall, heart failure patients' adherence to self-care recommendations was poor and selective. Being male, absence of chronic comorbidity, and good level of heart failure knowledge were positively associated with adherence to self-care recommendations. It is important to plan strategically targeted measures for improving patients' knowledge about the signs, symptoms and its treatment to improve adherence.

**KEYWORDS:** Self-care, heart failure, adherence, Gondar, Ethiopia.

## INCIDENCE AND DETERMINANTS OF TIME TO DIABETIC RETINOPATHY OCCURRENCE AT TIKUR ANBESSA SPECIALIZED HOSPITAL IN ETHIOPIA

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**BACKGROUND:** Diabetic retinopathy is highly prevalent in the world. Recent studies showed a 2.6% prevalence of related blindness cases in the world and in Ethiopia between 21% to 38% of cases of retinopathy are attributable to diabetes. However, there is limited evidence about incidence and determinants of time to diabetic retinopathy in Ethiopia. The aim of this study was to estimate incidence and identify determinants of time to diabetic retinopathy at Tikur Anbessa Specialized Hospital, Addis Ababa.

**METHODS:** A retrospective follow up study was conducted from February 01 to June 30, 2017. A total of 377 diabetes mellitus (DM) patients were included in the study selected by simple random sampling. Data analysis included Kaplan Meier estimation and Log rank test. Weibull Proportional hazard modeling was done to identify determinant factors of time to diabetic retinopathy. Hazard ratio and its 95% confidence interval (CI) were used to declare statistical significance. All statistical analysis was done using STATA 12.

**RESULTS:** Out of the total DM patients, 70(18.6%) developed diabetic retinopathy. The mean and median follow up time were 70.4 and 74.4 months (with IQR=35.9) respectively. Male sex (HR=1.94, 95% CI = 1.10-3.39), type-II DM (HR=4, 95% CI= 1.34 - 12.00), creatinine (HR=2.59, 95% CI= 1.91-3.52), borderline high triglyceride (HR=2.87, 95% CI 1.33-6.21) and high (HR=2.59, 95% CI=1.31-4.97) triglyceride levels were significant factors of time to diabetic retinopathy occurrence.

**CONCLUSION AND RECOMMENDATIONS:** The incidence rate of diabetic retinopathy was relatively high and the average time to retinopathy occurrence was short. Diagnosing patients by considering type of DM and sex of patients, good control of triglyceride and creatinine level, will help to delay onset of retinopathy after diagnosis of DM.

**KEYWORDS:** Complications, diabetes mellitus, retinopathy, Incidence, Ethiopia.

## BETTER EDUCATED PREGNANT WOMEN COMPLY LESS WITH IRON-FOLIC ACID SUPPLEMENTATION IN SOUTHERN ETHIOPIA *CN Seifu and TG Hailemariam*

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**BACKGROUND AND OBJECTIVE:** Globally, half a billion women of reproductive age are affected by anemia, which is the most prevalent single nutrient deficiency in resource limited countries. Daily iron supplementation, with or without folic acid, is a proven public health intervention. Though maintaining compliance is crucial for the success of the intervention, very limited evidence is available in countries like Ethiopia on compliance and its predictors. The aim of this study was to estimate the Iron-Folic Acid (IFA) supplementation compliance rate and its predictors among pregnant women in Wolaita Zone, Southern Ethiopia.

**METHODS:** A cross-sectional study was conducted in eight randomly selected health centers in Wolaita Zone, Southern Ethiopia. Six-hundred-forty-seven pregnant women were included using multistage sampling procedure. Data were entered to EpiInfo and exported to SPSS for analysis. Descriptive statistics were obtained. A multiple linear regression model was constructed to estimate the variability coefficient of the compliance rate due to selected factors.

**RESULTS:** Of 647 pregnant women, only 18 (2.8%) had received the supplement for three months and more but 273 (42.2%) and 255 (39.4%) were given for one and two months, respectively. Overall, the compliance rate was 73.2% (95% CI: 70.72, 75.79). Experiencing heartburn and vomiting significantly reduced the compliance rate. Moreover, unintended pregnancy, a year change in age and women with primary, secondary and college education were less likely to comply, compared with their counterparts. In contrast, acceptability of IFA supplement, number of ANC visits and being ever married were positive predictors of IFA supplement compliance.

**CONCLUSIONS:** Pregnant women are taking less than three-fourth of IFA supplement within a given period of time. Addressing issues of side-effects, unintended pregnancy, and acceptability of the supplement are very important to improve compliance. Furthermore, educated, older and unmarried women need additional attention for successful compliance.

**KEY WORDS:** Iron-folate, compliance, pregnant women, Ethiopia



## THE EFFECT OF SOYA MILK ON CHILDREN'S NUTRITIONAL STATUS IN GASWORE COMMUNITY, RURAL BURUNDI: A RANDOMISED INTERVENTION STUDY

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**INTRODUCTION:** Poor complementary feeding is a major contributor to malnutrition among children in Burundi. Caregivers lack adequate knowledge on how to diversify foods even if the foods are available locally. In this regard, World Vision uses a behaviour change approach called, "Positive Deviance/Hearth" (PDH) to promote locally available and affordable food as a sustainable and cost-effective strategy to prevent malnutrition. To improve the quality of diet, World Vision introduced soya milk as an addition to the complementary foods of children in communities where the prevalence of stunting is high.

**Method:** One hundred and twenty six children aged 6 to 36 months whose weight-for-age z-scores were less than minus two standard deviations were admitted to the program for nutrition rehabilitation [58 in intervention and 68 in control group]. Caregivers of underweight children in the intervention group were trained on food preparation techniques of nutritious meals and were educated on soya milk, caring, hygiene and health seeking practices. A control group of caregivers were trained in the same practices with the exclusion of soya milk.

**RESULTS:** Mean weight, height and sex ratio was normally distributed at the start of the study among the two groups. By the end of 12 days the mean weight gain among the intervention group was 553.5gm while the control group gained 390.3gm. By the Day 30 follow-up underweight status among children in the intervention group had no significant difference compared with the control group ( $p=0.081$ ).

**CONCLUSION AND RECOMMENDATION:** When caregivers are educated in the appropriate use of locally available foods, children can be rehabilitated easily with cost-effective means. Incorporation of such approaches is a sustainable means in resource-limited settings.

## NUTRIENT INTAKE ADEQUACY AND FACTORS INFLUENCING FOOD CHOICES OF CVD PATIENTS ATTENDING NATIONAL CARDIO-THORACIC CENTER AT THE KORLE BU TEACHING HOSPITAL, ACCRA – GHANA

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**BACKGROUND AND AIMS:** Increasing incidence of non-communicable diseases (NCD) is strongly associated with lifestyle variables including dietary patterns, nutrient intakes and physical activity. In Ghana NCDs account for 42% of all total deaths, with cardiovascular diseases (CVDs) contributing 18%. Adequate dietary intake can affect nutrient adequacy especially antioxidant nutrients and delay the onset or reduce the risk of complications. The aim was to assess the dietary and nutrient intake adequacy of CVD patients of 40+ years and factors that influence their food choices.

**METHODOLOGY:** The study involved 180 patients [ $F=103$ , 57.2%;  $M=77$ , 42.8%], 40+years with a history of CVDs who reported at the out-patient department of the National Cardiothoracic Centre; Korle-Bu Teaching Hospital during the study period. A 3-day 24Hr recall questionnaire was used to collect data on dietary intakes. Nutrient intake was computed using Micro-Diet software. Daily intakes were compared to Recommended Daily Intake (RDI). Body composition analysis using Bio-electrical impedance analysis was also done.

**RESULTS:** Mean $\pm$ SD age was  $61.02\pm11.3$ , ranging from 40-86 years. Presence of overweight was 58(32.4%), obesity, 72(39.7%), normal weight, 45(25.1%) and underweight 5(2.79%). Women had adequate intakes for protein (63.1%), carbohydrate (71.8%), potassium (80.6%) and phosphorus (66.0%) whereas the same was not observed in the men. Inadequate intake of magnesium (84.5%), manganese (63.1%), and iron (63.1%) were recorded by the females. Both sexes recorded over 70% inadequacies for omega-6 fatty acids, fiber, vitamins A, D, and E, and copper. Patients with myocardial infarction only had adequate intakes of Vitamin A, B12 and copper. There was 61.5% inadequate intake of magnesium, calcium and, copper and sodium for both sexes. Appetite and advice from dieticians and doctors influenced food choice.

**CONCLUSIONS:** Apart from sodium, protein and carbohydrate, intake of other nutrient especially antioxidants were inadequate for most CVD types. Health personnel should intensify diet education for these patients.

**KEY WORDS:** nutrient adequacy, cardiovascular disease, antioxidant nutrients.

**METABOLIC SYNDROME AMONG FREE-LIVING ELDERLY FROM SHARPEVILLE, SOUTH AFRICA: A LONGITUDINAL COHORT STUDY WITH 10-YEAR FOLLOW-UP**

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**OBJECTIVE:** The prevalence of Metabolic Syndrome (MetS) among the black elderly population of South Africa (SA) has not been reported. This study aimed to provide evidence on the prevalence of the metabolic factors contributing to MetS among low-income elderly people. **METHODS:** This study was an ethically approved, cross-sectional survey conducted in a longitudinal elderly population cohort over the period 2004 to 2014 recruited from an elderly day-care centre where free-living elderly people visited twice a week. A total of 170 men and women were randomly selected for the baseline survey (2004). During the follow up study (2014) only 105 of the subjects included in the baseline study were continuing. Dietary intakes were measured by 24-hour recall questionnaire completed for a period of three non-consecutive days, including one weekend day and two week days. Other measurements included waist circumference (WC), blood pressure and fasting (>8 hours) venous blood samples were drawn and analysed for total cholesterol (TC), high-density lipoprotein-cholesterol (HDL-C), triglycerides (TGs) and glucose. The Friedewald formula was used to calculate low-density lipoprotein-cholesterol (LDL-C). **RESULTS:** The sample consisted of 83.2% (n=89) women and 16.8% (n=16) men. The prevalence of MetS was significantly (p=0.000) higher in 2014 at 63.4% compared to 48.8% at baseline (2004). The most prominent risk factors were central obesity (85.9%) and low serum HDL-C (71.0%) and high serum TG (68.1%) levels at baseline. At follow-up, the most prominent risk factors were central obesity (82.5%), low serum HDL-C (94.3%) and hyperglycaemia (48.1%). **CONCLUSIONS:** This study indicates that MetS is highly prevalent and rapidly increasing among this low-income elderly group. There is need to identify preventative and treatment strategies to increase wellness and reduce morbidity in vulnerable elderly South Africans highlighted by these results.

**KEY WORDS:** Metabolic Syndrome, Elderly, South Africa, Cohort

**INDIVIDUAL AND CONTEXTUAL FACTORS ARE ASSOCIATED WITH HOUSEHOLD FOOD INSECURITY IN EAST GOJJAM ZONE, ETHIOPIA: A MULTILEVEL ANALYSIS.**

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**BACKGROUND:** Food insecurity, is a public health problem which increases malnutrition, burden of communicable and non-communicable disease, decreases health service utilization, affects education system and mental health status negatively in the community. Different individual and community factors are important determinants of food insecurity. This study aimed to identify the role of individual and community level determinants of food insecurity, using multilevel analysis in East Gojjam Zone, Ethiopia.

**METHODS:** An Agroecosystem linked community-based cross sectional survey was conducted among 3108 households selected using multi-stage cluster sampling. Using an interviewer administered questionnaire, data were collected on household food access, individual and community level factor variables. Analysis was done in four steps using a two level mixed effect ordinal regression analysis. The results of fixed effect were shown as Adjusted Odds Ratios (AORs), with 95% confidence intervals (CIs). The result of random effects was presented as a variance partition coefficient and percentage change in variance. A p-value less than 0.05 was considered statistically significant.

**RESULTS:** Heterogeneity of household food insecurity was observed among clusters. After adjusting for both individual and community level factors, 1.5% (p<0.001) of the variance were attributable to cluster level. From level one factors in the final model, household head being male, marital status being in a union, higher parental education, women's participation in decisions, having additional income sources, better crop production in the survey year and application of chemical fertilizer, reduced the level of household food insecurity. From level two factors, households being from hilly and mountainous highlands and lowlands of the Abay Valley compared to midland areas and with farmland size < 1.13 hectare per household worsen household food insecurity. Heterogeneity of household food insecurity was observed among clusters.

**CONCLUSIONS:** Both community and individual level factors play a significant role in determining household food insecurity. Agroecosystem characteristic is one of the community level factors affecting household food insecurity. For better understanding of the relationship between Agroecosystem and food insecurity, prospective epidemiological study designs are recommended.

**KEY WORDS:** Household, food insecurity, multilevel, ordinal, determinants, Ethiopia.

**INDIVIDUAL AND CONTEXTUAL LEVEL FACTORS HAVE A SIGNIFICANT ROLE IN DETERMINING CHILD HEIGHT-FOR-AGE Z-SCORE IN EAST GOJJAM ZONE, AMHARA REGIONAL STATE, ETHIOPIA: A MULTILEVEL ANALYSIS**

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**BACKGROUND:** In Ethiopia, child undernutrition remains a major public health challenge and contributing factor to child mortality and morbidity. To reduce the problem, it is necessary to identify determinants of child undernutrition in specific contexts to deliver appropriate, targeted, effective and sustainable solutions. This study aimed to identify individual and community level determinants of child height for age Z-score in East Gojjam Zone, Amhara Regional State.

**METHODS:** An Agroecosystem linked cross-sectional survey was conducted among 3108 children aged 6-59 months. Multistage cluster sampling technique was used to select study participants. Data was collected on socio-demographic characteristics, child anthropometry and on potential immediate, underlying and basic individual and community level determinants of child undernutrition using UNICEF conceptual framework. Analysis was done using STATA 13. Important variables were selected using simple linear regression and multiple multilevel linear mixed effects modeling was used to identify individual and community level determinants of child height-for-age Z-score. Four models were done step by step to assess the heterogeneity of child height for age Z-score. Intra-class correlation coefficient (ICC) was calculated to estimate unexplained variance attributable to cluster level. P values less than 0.05 were considered as statistically significant.

**RESULTS:** In the empty and full models, 3.8% ( $p < 0.001$ ) and 1.4% ( $p < 0.001$ ) of the variances were because of cluster level variability. From individual level factors, child age in months, child sex, number of under five children, immunization status, breast feeding initiation time, mother's nutritional status, diarrheal morbidity, household level water treatment and household dietary diversity were significant determinants of child height for age Z-score. Also from community level determinants, Agroecosystem type, liquid waste disposal practice and latrine utilization were significantly associated

with child height-for-age Z-score. A statistically significant heterogeneity of child height-for-age Z-score was observed among clusters even after controlling for potential confounders.

**CONCLUSIONS:** Both individual and community level factors including the Agroecosystem characteristics have a significant role in determining child height-for-age Z-score in the study area. In addition to the existing efforts at individual level to improve child nutritional status, Agroecosystem and community WASH related interventions should get more attention to improve child nutritional status in the study area.

**KEY WORDS:** Stunting, children, multilevel, East Gojjam Zone, Amhara Regional State, Ethiopia

**SPATIAL VARIATIONS OF HOUSEHOLD FOOD INSECURITY IN EAST GOJJAM ZONE, AMHARA REGION, ETHIOPIA: IMPLICATIONS FOR AGROECOSYSTEM BASED INTERVENTIONS.**

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**BACKGROUND:** In Ethiopia, food insecurity remains a major public health challenge. The Agroecosystem characteristics which vary geographically have a potential to determine household food insecurity. Therefore, this study was designed to determine the spatial patterns of household food insecurity across different agroecosystems in East Gojjam Zone.

**METHODS:** An Agroecosystem linked cross sectional survey was done among 3108 study participants. The study area was divided into five agroecosystems: namely hilly and mountainous highlands, midland plains with black soil, midland plains with brown soil, midland plains with red soil and lowlands of Abay valley. Data was collected using interviewer administered questionnaire on socio demographic variables, food access and geographical location after five days training and pre testing of the tool to maintain data quality. Data was collated using EPI Info version 3.5 and exported to SaTScan and SPSS 20 for further analysis. To identify the most likely clusters using SaTScan software, the Log Likelihood Ratio (LLR) at 95% Confidence Interval (CI) and P value less than 0.05 as the level of significance were considered.

**RESULTS:** The overall prevalence of household food insecurity was 65.3% (95% CI: 63.5, 67.00). The lowlands of Abay Valley

(70.6%, 95% CI: 66.9, 74.2) and hilly and mountainous highlands (69.8%, 95% CI: 65.9, 73.3) showed significantly higher household food insecurity prevalence compared to midland plains with black soil (61.7%, 95% CI: 58.1, 65.6), midland plains with red soil (63.5%, 95% CI: 59.9, 65.0) and midland plains with brown soil (61.5%, 95% CI: 57.4, 65.3). Similarly, the SaTScan spatial analysis identified clusters from hilly and mountainous highlands (LLR: 11.64; P: 0.0088) and lowlands of Abay valley (LLR: 8.23; P: 0.025) as the most likely primary and secondary clusters for food insecurity, respectively. Higher prevalence of household food insecurity was observed with significant micro level geographical variations. The lowlands of Abay valley and hilly and mountainous highlands were the most vulnerable to food insecurity.

**CONCLUSIONS:** Intervention strategies and plans shall consider Agroecosystem based micro level food insecurity inequalities in planning interventions. Further research is needed to determine the temporal variation of household food insecurity. Also it is very important to validate the spatial analysis results applicability to design geographically targeted interventions.

**KEY WORDS:** - Household, food insecurity, spatial analysis, SaTScan, agroecosystem, Ethiopia.

## **6. RECOVERY, RELAPSE, AND EPISODES OF DEFAULT IN THE MANAGEMENT OF ACUTE MALNUTRITION IN CHILDREN IN HUMANITARIAN EMERGENCIES: A SYSTEMATIC REVIEW.**

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**BACKGROUND AND OBJECTIVES:** This systematic review, commissioned by the Humanitarian Evidence Programme (HEP) and carried out by a research team from the University of Sheffield, represents the first attempt to apply systematic review methodology to establish the relationships between recovery and relapse and between default rates and repeated episodes of default or relapse in the management of acute malnutrition in children in humanitarian emergencies in low- and middle-income countries.

**METHODS:** Quantitative, qualitative, mixed methods academic literature and grey published programme reports were identified and reviewed. Peer-reviewed literature search was conducted in 14 academic databases. Grey literature, including programme reports, were searched in Google Scholar and 36 websites of relevant organisations, and by engaging with stakeholders in the nutrition field. Studies published prior to 1980 were excluded, as were any papers not published in English.

**RESULTS:** A total of 9,574 articles, studies and programme reports relating to acute malnutrition were retrieved from the searches conducted. Following the removal of duplicates, screening and quality appraisal, 24 articles and reports were eligible for review. 23 of these focused on sub-Saharan Africa: eight were conducted in Malawi, 5 in Ethiopia, 3 in Niger, 3 in Sudan and the remaining 4 in Angola, Chad, Kenya and Sierra Leone. One study was conducted in Afghanistan. Most studies and programme reports reported on quantitative outcomes and only two contained both quantitative and qualitative outcomes. The 22 quantitative studies included 8 clinical efficacy and effectiveness trials using randomized controlled designs, 7 observational cohort studies and 7 programme evaluation reports. Only 6 of the 24 studies included in this review addressed the issue of relapse and/or reported relapse rates. None of the studies addressed the relationship between relapse and default or return default, and little evidence was found on the long-term impact of programmes implemented to manage MAM and SAM in emergencies.

**CONCLUSIONS:** This review provides further confirmation that RUTF used in an outpatient setting is effective at promoting recovery from SAM and reducing mortality. It could not be established whether default rates reported were lower according to the WHO 2013 protocol. Data relating to relapse is limited, therefore, we could not establish the relationship between recovery and relapse, or recovery and default or their episodes. More research on default and relapse post-intervention is needed.

**KEY WORDS:** Acute malnutrition, Children, Humanitarian, Emergency, Systematic Review.

**Conflict of interest:** No conflict of interest.

**Acknowledgement:** DFID/Oxfam GB, Feinstein International, UKAid

## **TIME TO CURE AND PREDICTORS OF RECOVERY AMONG CHILDREN AGED 6-59 MONTHS WITH SEVERE ACUTE MALNUTRITION ADMITTED TO JIMMA UNIVERSITY MEDICAL CENTER, JIMMA, ETHIOPIA.**

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**BACKGROUND:** Treatment at stabilization center is an important intervention to avert the huge burden of mortality for children with complicated severe acute malnutrition (SAM). Despite improvement in hospital coverage and the development of standardized WHO treatment guidelines, recent reviews indicate a wide variation in

recovery rate (34-88%) due to several context-specific factors. This study assessed the contextual predictors of recovery.

**OBJECTIVE:** This study aimed to estimate and determine predictors of time to recovery among children aged 6-59 month with severe acute malnutrition. **METHODS:** An institution based retrospective cohort study design was used among 375 children aged 6-59 months admitted to Jimma university medical center from September 2014 to September 2016. All eligible children were enrolled and assessed using a pretested questionnaire. Kaplan Meir estimate and survival curve was used to compare the time to recovery using log-rank test among different characteristics. Cox Proportional Hazard Model was used to identify significant predictors of time to recovery. A p value less than 0.05 was considered statistically significant. **RESULTS:** The rate of recovery was 4.06 per 100 person days. Median time of recovery for cohort of SAM children's was 19 days (95%CI: 17.95-20.05). Independent predictors of time to recovery were: Play stimulation (AHR=1.93, 95%CI: 1.23-3.03), vaccination status (AHR=2.26, 95% CI: 1.12-4.57), TB (AHR= 0.48, 95% CI: 0.27-0.87), malaria (AHR=0.34,95%CI:0.13-0.88), use of amoxicillin (AHR=1.54, 95%CI: 0.008-2.34), deworming (AHR=1.8, 95%CI: 1.18-2.73) and shock (AHR=0.18, 95%CI: 0.05-0.59). **CONCLUSION AND RECOMMENDATION:** The findings showed that average length of stay on treatment and median time for recovery are within the sphere standard. Appropriate provision of routine medication, psychosocial stimulation and management of medical co-morbidity as per the national SAM management protocol are needed to promote fast recovery. **KEY WORDS:** Retrospective cohort, predictors, recovery, severe acute malnutrition, Jimma.

## 7. ASSOCIATION BETWEEN BREAKFAST INTAKE AND SHORT-TERM MEMORY, PERFORMANCE AND MOOD AMONG SAUDI FEMALE ADOLESCENTS

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**BACKGROUND AND OBJECTIVE:** Breakfast consumption is labelled the most important meal of the day. It might be of significant importance for adolescent students as it might influence their short-term memory, performance and mood. However, the prevalence of skipping breakfast among adolescents in Saudi Arabia is high. This study aimed to investigate the association between breakfast intake

and short-term memory, performance and mood among Saudi female adolescents.

**METHODS:** A Cross-sectional study was conducted in a female secondary school in Riyadh involving 170 15-19 year olds. Structured questionnaires on breakfast eating habits, student performance at school, a standardized questionnaire mood and feeling and a standardized short-term memory test. Chi<sup>2</sup> test and ANOVA statistical analysis were used to assess association between breakfast intake and the studied parameters.

**RESULTS:** Only 39% of participants had their daily breakfast. Not having enough time and not feeling hungry were the two main reasons of skipping breakfast indicated by students 42% and 37%, respectively. Frequency of breakfast intake was strongly and positively associated with improved performance ( $R^2=0.87$ ,  $p<0.001$ ), and to short-term memory score ( $R^2=0.5$ ,  $p<0.05$ ). However, no correlation with student's mood was obtained. And daily breakfast intake was found.

**CONCLUSION:** This study confirmed the high rate of skipping breakfast among Saudi female adolescents, and provides further evidence on the beneficial effect of breakfast intake on student's short-term memory as well as their school performance. Nutrition education program targeting this population should be implemented to enhance awareness on the importance of breakfast intake.

**KEY WORDS:** Breakfast intake, mood, short-term memory, performance, Saudi female adolescents.

## 8. PREVALENCE AND ASSOCIATED FACTORS OF ANAEMIA AMONG ADOLESCENT GIRLS ATTENDING HIGH SCHOOLS IN DEMBIA DISTRICT, NORTHWEST ETHIOPIA, 2017

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**INTRODUCTION:** Anaemia is a global public health problem affecting both developing and developed countries. Adolescent girls are more vulnerable because of increased iron requirements related to their rapid growth and menstrual loss. However, adolescents are ignored and there is a scarcity of evidence on anaemia in this group in Ethiopia. This study assessed the prevalence and associated factors of anaemia among late adolescent girls attending high schools in Dembia District, Northwest Ethiopia.

**METHODS:** A school-based cross-sectional study was conducted in Dembia District from March 1 to April 30/ 2017. From three randomly selected high schools, 462 adolescents were included

using simple random sampling techniques. A Standardized and structured questionnaire was used to collect data. Capillary blood samples were taken from participants using the portable Hb201+ instrument to measure hemoglobin. Bivariate and multivariable binary logistic regression analyses were employed to identify factors associated with anemia. Adjusted Odds Ratio (AOR) with corresponding 95% Confidence Interval (CI) was computed to show the strength of association.

**RESULTS:** The overall prevalence of anaemia was 25.5%, (95%CI, 21.4, and 29.2). Of the total anemic adolescents, 109(92.4%) had mild anaemia, while 7(5.9%) and 2(1.7%) were found with moderate and severe anaemia, respectively. Dietary diversity score ((AOR =4.2(95% CI;1.7, 10.5)), Household food security status ((AOR= 4.1(95% CI; 1.3, 13.2)), living status of the adolescents with either of the two family (( AOR=2;(95%CI;1.14,3.6)) and with the Guardians [( AOR=2.4;(95%CI;1.02,5.6)] showed statistically significant association with anaemia.

**CONCLUSIONS:** Anaemia is a moderate public health in Dembia District. Dietary diversity score, household food security status and living status of adolescents were the key determinants of anemia. Therefore, improving dietary diversification and household food security are vital to reduce the burden of anemia.

**KEYWORDS:** Anemia, adolescent girls, dietary diversity, Ethiopia

## 9. DIETARY DIVERSITY PRACTICE AND ASSOCIATED FACTORS AMONG ADOLESCENT GIRLS IN DEMBIA DISTRICT, NORTHWEST ETHIOPIA, 2017: INSTITUTION BASED CROSS-SECTIONAL STUDY

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**BACKGROUND:** Dietary diversity is defined as the number food groups or items consumed over a reference period of time and usually it is a problem in developing countries including Ethiopia. Inadequate dietary diversity is a major public health problem and can result in physical, emotional, psychological, and chemical changes among adolescents. However, studies on dietary diversity among school children are very limited. This study aimed at determining dietary practice and determinants among adolescents in Dembia district of Ethiopia.

**METHODS:** A school-based cross-sectional study was conducted from March 1 to April 15, 2017, at Dembia district, northwest Ethiopia. A total of 474 female subjects were selected using the multi-stage sampling technique. A structured and pre-tested

questionnaire was used to collect data. Food and Nutrition Technical Assistant (FANTA, 2016) 24 hour dietary recall method was employed to assess the dietary diversity practice. Bi-variable logistic regression model was used for variable selection and p-values less than 0.2 were included in the multi-variable logistic regression model. In the multi-variable analysis, Adjusted Odds Ratio (AOR) with the 95% corresponding 95% Confidence Interval (CI) were used to show the strength of associations and variables with p-values of <0.05 were considered statistically significant.

**RESULTS:** In this study, 32.25% (95% CI: 27.9-36.8) of the adolescents had adequate dietary diversity practice. According to the multivariable analysis, Muslim religion followers (AOR=0.29; 95% CI :( 0.11-0.74), private workers (AOR=0.34; 95%CI :( 0.14-0.87), middle wealth index (AOR=0.47; 95%CI :( 0.28-0.82), rich wealth index (AOR=0.33; 95%CI :( 0.18-0.59), and thinness (AOR=3.49; 95%CI :( 1.28-9.5) were markedly associated with dietary diversity practice.

**CONCLUSIONS:** The findings showed that only one-third of adolescent girls have adequate dietary diversity and husband occupation, religion, wealth index or economic status and nutritional status of the adolescent were significantly associated with dietary diversity practice. For improving the dietary diversity of the adolescent, School based nutrition education with the content of dietary diversity must be given.

**KEY WORDS:** Dietary practice, dietary diversity, adolescent, Dembia district, Ethiopia

## O010: FOOD HYGIENE CONDITIONS AND MICROBIAL CONTAMINATION OF MINIMALLY PROCESSED FRUITS IN CENTRAL WARD, NAIROBI COUNTY

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**BACKGROUND AND OBJECTIVES:** Minimally processed fruits (MPF) vended as street foods despite numerous benefits, can cause food-borne illnesses due to poor hygiene practices and unsanitary conditions. This study sought to assess food hygiene condition in minimally processed fruit vending businesses in Nairobi Central Ward.

**METHODS:** A cross sectional study with analytical component through convenient sampling of 76 street food vending

environments (FVEs). An observational checklist was prepared using codex food hygiene and safety principles captured data. Inferential statistics established variable relationships at 95% confidence interval. Food Hygiene Condition (FHC) was ranked according to Bloom cut off points on calculated percentage scores.

**RESULTS:** The vending places were washable and cleanable but the environmental surrounding was not very clean as 68% of the stalls had garbage and waste nearby. Most (75%) of the FVEs had no houseflies, 89% had adequate water, and 30% had drainage system. Therefore, FHC was generally poor in 57.9% of the cases. Fruit salad samples had the highest bacterial load (log<sub>10</sub> 4.65cfu/g) and coliforms (log<sub>10</sub> 0.78cfu/g) while pineapples (mean log<sub>10</sub> 3.50cfu/g) had the highest mould and yeast count. Hence fruit salad samples were highly contaminated while pineapple and pawpaw samples were least contaminated. However there was no significant association between FHC and microbial contamination of MPF.

**CONCLUSION:** FHC were poor and MPF were microbiologically unsafe. Periodic hygiene training and policy on ready-to-eat food vending should be implemented.

**Key words:** minimally processed fruits, food hygiene condition, street food vendors, microbial contamination

## 10. FOOD HYGIENE KNOWLEDGE AND PRACTICES AMONG MINIMALLY PROCESSED FRUITS STREET VENDORS IN CENTRAL WARD, NAIROBI COUNTY

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**BACKGROUND AND OBJECTIVES:** Minimally processed fruits (MPF) vended as street foods, despite numerous benefits, can cause food-borne illnesses due to poor hygiene practices and unsanitary conditions. This study sought to assess food hygiene knowledge and practices in minimally processed fruit vending businesses in Nairobi Central Ward.

**METHODS:** The method used was cross sectional with analytical component through convenient sampling of 323 street food vendors (FVs). Observational checklist and structured questionnaires, were prepared using codex food hygiene and safety principles captured data. Inferential statistics established variable relationships at 95% confidence interval. Food Hygiene Knowledge (FHK) and Food

Hygiene Practice (FHP) levels were ranked according to Bloom cut off points on calculated percentage scores.

**RESULTS:** Most vendors (62.8%) had low FHK and poor FHP (98.7%). FHK and FHP significantly varied in the clusters ( $p < 0.05$ ). Majority (76.6%) had knowledge on preparation of fruits and ensured general standards of hygiene (86.1%). Food safety standards and regulations were mainly acquired by observation (58.6%). Only 16.6% had been trained on food hygiene and knowledgeable on medical certificates (27.4%). Prepared fruits were handled properly, stored and covered (90%). Dustbins were present (90%), 96% were uncovered and 38% filled up. Poor waste disposal (40%); dirty (67%) and cracked (87.0%) work surfaces; unwashed fruits (18%); unwashed hands (52.6%); no aprons (53.9%); present jewelry (73.7%); handling of money (40.0%) and fruits with bare hands (18.4%); and no utensils drying racks (44%) were observed.

**CONCLUSION:** Food hygiene knowledge was low and food hygiene practices were poor and both significantly varied in the clusters ( $p < 0.05$ ). Periodic hygiene training and policy on ready-to-eat food vending should be implemented.

**Keywords:** minimally processed fruits, food hygiene, knowledge, practices, street food vendors, microbial contamination

## IN SILICO SIMULATION OF BACTERIOPHAGES AND SALMONELLA TYPHI POPULATION DYNAMICS

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**BACKGROUND:** Salmonella typhi is a causative agent of food poisoning and enteric fever. The Simulation of bacteriophages' efficiency in bacteria treatment is the integration of their lytic cycle in destroying bacteria with those found in the disciplines of mathematics, statistics and computational systems in order to find the exact numbers of phages that can totally lysate bacteria. **OBJECTIVES:** This study was conducted to create a simulative model for the development of dynamic interactions between phages and their bacterial host (Salmonella typhi). **METHODS:** The model was developed from calculations of bacteriophage replication to solve the distinct mechanisms of their efficiency including changes in lifecycles, therapeutic dose and mortality rates. Simulated data are compared with data obtained in vitro to assess the suitability of the model for multiplicity of infection. **RESULTS:** In vitro observations showed that the strength and mechanisms of bacteriophage can alter the determination of Salmonella typhi as antimicrobial therapy. The exponential growth

curves solved the interactions of bacteriophage with their host in certain time decay, the changes in concentrations over time was solved by differential equations used to determine the therapeutic outcome. **CONCLUSION:** In silico predicting of the potentiality of phages in lysing *Salmonella typhi* was estimated by using this model due the experimental conditions (in vitro). For more accurate estimations the model was programmed in MS Excel and simulated as a simple computer program. **SIGNIFICANCE AND IMPACT:** Predicting the potentiality of lytic phages in lysing *Salmonella typhi* can be estimated by using this mathematical model due the experiments environment conditions. Therefore, it is likely that the mathematical model could be made to work computationally by changing their values according to the laboratorial experiment conditions.

## 11. PREVALENCE AND RISK FACTORS FOR RAISED BLOOD PRESSURE AMONG ADOLESCENTS (10-19 YEARS): A COMMUNITY-BASED STUDY

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**BACKGROUND AND OBJECTIVES:** Raised blood pressure is a cardiovascular disease risk factor. Its control hinges on early identification. This study assessed blood pressure (BP) and body mass index (BMI) in adolescents (10-19 years) in three rural communities of Igbo-Etiti local government area, Enugu State, Nigeria.

**METHODS:** Multi-stage random sampling technique was used to select 408 adolescents from Ukehe, Idoha and Ikolo communities. A structured questionnaire was administered and measurements of weight, height, and BP were taken using standard methods. Hypertension was defined as systolic BP (SBP) and/ or diastolic BP (DBP) greater than the 95th percentile for age, gender and height on three separate readings. BP greater than 90th percentile but less than the 95th percentile for age, gender and height defines pre-hypertension. Bivariate analysis using Pearson correlation and Chi square with Cochran's statistics were used to identify risk factors of raised blood pressure. Significance was accepted at  $P < 0.05$ .

**RESULTS:** There were 46.9% boys and 53.1% girls. Most (90.3%) were students. Some (10.2%) had ever smoked cigarette and 52.9% had ever consumed alcohol. About 26% had >7-hours sleep daily. Mean SBP percentile ( $P < 0.01$ ) and DBP percentile ( $P < 0.001$ ) were significantly higher in boys but BMI was significantly higher in girls ( $P < 0.001$ ). Only 3.5% were overweight. None was obese and 14.5% were underweight. Systolic (6.5%) and diastolic (5.5%)

hypertension was found and 2.0% had both systolic and diastolic hypertension. Overall prevalence of hypertension was 14.0%; males (OR=2.960, 95% C.I.=1.608-5.450,  $P < 0.001$ ), ever consumed alcohol (OR=0.410, 95% C.I.=0.221-0.762,  $P < 0.01$ ), daily hours of sleep (OR = 1.829, 95% C.I.=0.960-3.483,  $P < 0.05$ ) and BMI (OR = 0.233, 95% C.I.=0.073-0.747,  $P < 0.05$ ) were significant risk factors. There was a strong positive correlation between SBP and DBP ( $r = 0.212$ ,  $P = 0.000$ ).

**CONCLUSIONS:** Hypertension was prevalent among the adolescents. Alcohol consumption, gender, hours of sleep and BMI was risk factors and should be targets for intervention.

**KEYWORDS:** Adolescents, blood pressure, risk factors, rural, Nigeria

## 19. INVESTIGATING THE IMPACT OF GENES, OBESITY AND NUTRITION ON CARDIOMETABOLIC TRAITS IN KUMASI, GHANA: THE GONG PILOT STUDY

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**BACKGROUND AND OBJECTIVE:** Non-communicable diseases (NCDs) are multifactorial arising from the interaction of several factors including diet, physical activity and changes in living environments and genetic factors. Numerous studies have examined gene-lifestyle interactions in European and Asian populations. However, to date, there are no such studies in the Kumasi population in Ghana who are increasingly at risk of NCDs. We aim to assess the impact of nutritional status and genetic factors in non-communicable disease. In addition, it aimed to validate the tools developed for data collection.

**METHODS:** Three hundred healthy adults (Asante by ancestry) [M=128; F=172] were recruited from the urban Oforikrom Municipality in Kumasi, Ghana after health screening. Trained field workers administered a semi-quantitative pilot food frequency questionnaire (FFQ) and a repeat 3-day 24-hour dietary recall are being used to assess dietary intakes (to validate FFQ). Physical activity assessment is based on the global physical activity questionnaire (GPAQ). The study will assess gene-diet interactions on cardiometabolic traits via metabolic phenotyping for which blood



and urine samples will be sent to the University of Reading, UK for analysis.

**RESULTS:** Data, whole blood and urine samples from subjects recruited from the towns of Ayeduase, Ayigya, Oforilrom, Kotei and Bomso were collected by a trained research team including field workers and phlebotomists. Validation of the FFQ is currently on going. The design and practicalities of the study and the related challenges as well as the capacity building aspects of the project will be presented.

**CONCLUSIONS:** This is the first study of its kind in this Kumasi population and the initial findings will influence the expansion of this work.

**KEYWORDS:** GONG, non-communicable disease, urban, diet, Kumasi

## 20. FACTORS ASSOCIATED WITH FAT-FREE MASS IN BREASTFED AFRICAN INFANTS LIVING IN HIV-PRONE AREAS

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**BACKGROUND AND OBJECTIVES:** The balance between body fat and fat-free mass that constitutes an individual's weight is influenced by many factors, and is a potent indicator of previous and present exposures with ramifications for current and future health and disease. How breastfeeding practices influence body composition in infancy and early childhood has not been adequately studied, more so in the context of maternal HIV-infection. Two prospective cohort studies in Kenya and South Africa assessed how breastfeeding in the first six months of life influence body composition in children born to HIV-infected mothers.

**METHODS:** Human milk intake and breastfeeding pattern from birth to 6 months were determined using the deuterium-dose-to mother method. Similarly, infant and maternal fat-free mass was determined using the deuterium dilution method. In the case of South Africa, exclusivity of breastfeeding at 6 weeks, 3 months and 6 months following birth of the infants was correlated with infant fat-free mass at 12 months. In Kenya exclusive breastfeeding (EBF) rates were assessed cross-sectionally at 6 weeks and 6 months

postpartum among 75 HIV-positive and 68 HIV-negative women attending postnatal care.

**RESULTS:** Both breast milk output and the mode of breastfeeding had no influence on maternal body composition in both countries. South African infants who were exclusively breastfed consistently for 6 months had a higher per cent fat-free mass at 12 months compared with infants who were not exclusively breastfed for 6 months. Kenyan HIV-infected mothers tended to practice more exclusive breastfeeding than HIV-uninfected ones. Kenyan infants' body composition was lower if the HIV-infected mother was on anti-retroviral therapy and not by maternal sero-positivity per se. Breast milk output was adequate and was not influenced by maternal HIV-status. Breast milk quantity and breastfeeding mode did not influence maternal fat-free mass, and infants exclusively breastfed for 6 months had a higher per cent fat-free mass at 12 months.

**CONCLUSIONS:** These results give objective evidence to support the WHO guidelines for exclusive breastfeeding for 6 months. The long-term influence of both exclusive breastfeeding and exposure to ARV on child growth and development warrant further investigation.

**KEY WORDS:** Breastfeeding, HIV, deuterium oxide, infants, Kenya, South Africa

## 21. CHILDREN BECOME MALNOURISHED ONE YEAR AFTER NUTRITION EDUCATION IN THE KAYA NUTRITION EDUCATION CENTER IN BURKINA FASO.

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**BACKGROUND AND OBJECTIVE:** Nutrition education is an integral part of successful care and prevention of malnutrition. We examined the outcome of malnourished children one year after nutrition education.

**METHODS:** This was a cross-sectional study involving 135 children followed up one year after they left the nutrition education centre (CEN). We used logistic regression to identify factors associated with nutritional status after their exit from the center.

**RESULTS:** We recorded five deaths and 30 children were lost to follow up. Of the 100 children found one year after their release from CEN. At birth, 40% had a birth weight of less than 2500 grams (low birth weight) A total of 48% of children received food (apart from breastmilk) before 6 months of age. We noted a relapse in malnutrition in 15% of cases. Vaccination was not up to date in 16% of children. In univariate analysis, children breastfed up to 6 months

were protected against relapse into malnutrition. Taking colostrum at birth was a protective factor against malnutrition (OR = 0.14, P-value = 0.002 and IC [0.41-0.49]), children born at home were 4 times more likely to relapse compared to children born in a health center. LBW of less than 2500 grams was associated with relapse into malnutrition after discharge at CEN. In multivariate analysis, only LBW was significantly associated with malnutrition (OR = 4.9 P-value = 0.019 and IC [1.29-18.65]).

**CONCLUSIONS:** The nutritional situation one year after nutrition education is critical and deserves special attention from the different institutions involved in improving the living conditions of households and child survival. LBW is a significant factor in childhood malnutrition.

**KEY WORDS:** Children, malnutrition, nutritional education, Kaya.

## 22. ASSOCIATIONS BETWEEN PLASMA PHOSPHOLIPID FATTY ACID PATTERNS AND CHANGES OVER TEN YEARS IN ANTHROPOMETRIC INDICES IN BLACK SOUTH AFRICAN ADULTS: A PROSPECTIVE COHORT STUDY

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**INTRODUCTION/BACKGROUND:** South Africa has the highest prevalence of obesity in sub-Saharan Africa. Individual fatty acids (FA) and FA patterns both in the diet and tissues have been associated with obesity in various populations in Europe and the USA. However, data is lacking in black communities of African descent.

**METHODS:** We used principal component analysis to derive factor patterns with the use of 26 plasma phospholipid FAs from randomly selected participants of the cohort of the South African arm of the Prospective Urban and Rural Epidemiology (PURE) study. We examined prospective associations between six plasma phospholipid FA patterns derived at baseline and 10-year changes in anthropometric indices including weight, body mass index (BMI), waist circumference (WC) and waist: height ratio (WHR) in 412 black South African adults. We applied sequential adjusted linear regression models in SAS (version 9.4) to investigate the associations.

**RESULTS:** Three plasma phospholipid FA patterns, high-Satfat, high-linoleic acid (LA) and n-9 long chain monounsaturated FA (LC-MUFA) were positively associated with 10-year changes in all anthropometric outcomes. The high-satfat pattern presented with high positive loadings of saturated FAs (stearic, arachidic, behenic and lignoceric acids). The high-LA pattern presented with positive loadings of LA, eicosadienoic and gondoic acids. The n-9 MUFA pattern presented with positive loadings of MUFAs (gondoic and nervonic acids).

**CONCLUSIONS:** The three patterns derived at baseline may indicate unique FA metabolism associated with gain of fat mass over time in this group of black South African adults.

**KEYWORDS:** Saturated fats, anthropometric indices, black Africans, phospholipid fatty acids, PURE.

## 23. TITLE: EVALUATION OF PERSISTENT ORGANOCHLORINE PESTICIDE RESIDUES IN CATTLE FEED AND WATER IN SOME DAIRY FARMS IN GAUTENG PROVINCE OF SOUTH AFRICA

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**BACKGROUND AND OBJECTIVE:** A significant health problem caused by organochlorine pesticides (OCP) in man includes cancer, immune suppression, growth retardation in children and liver damage. The major entry of these pesticides into animal's body is through ingestion of contaminated feed and water. These animals then pass on the OCP to man through milk and meat. This study evaluated the contamination level of feed and water samples collected from selected farms in an agriculturally active area of Gauteng province of South Africa.

**METHODS:** Thirty-eight feed (hay, silage, pasture) and water samples given to cattle were collected from twelve dairy cattle farms in central Gauteng province of South Africa. The contamination level of OCP in feed and water were quantified using two-dimensional gas chromatograph time-of-flight mass spectrometry (GCXGC TOF MS).

**RESULTS:** Among the pesticide residues analysed, the mean concentration of endosulfan I were the highest in water (0.20 mg/kg) and feeds (0.24 mg/kg) respectively which is above maximum residue limit (MRL) established by FAO/WHO. In the case of DDT and its isomers, the concentration ranged from 0.03 to 0.09 mg/kg,

which were above the MRL by FAO/WHO. Meanwhile in water, they were recovered at levels ranging from 0.02 to 0.06 mg/kg.

**CONCLUSIONS:** The occurrence of pesticide residues above the MRL in the feed and water consumed by South African cattle can affect food security and health. Therefore, there is a need for South African farmers to be trained on innovative approach for reducing and eliminating exposure to OCP-contaminated feeds and water.

**Keywords:** Food security, Organochlorine, Residues, Water, Feeds, Dairy farm

#### 24. PREVALENCE AND DETERMINANTS OF OVERWEIGHT AND OBESITY IN PRE-SCHOOL CHILDREN IN THE DANSOMAN SUBURB GREATER ACCRA REGION, GHANA.

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**BACKGROUND/ OBJECTIVES:** Obesity accounts for about three-quarters of deaths in developing countries and its increasing incidence in such countries with pre-existing problems of under-nutrition is of concern. In pre-school children, it is worrying because of the implications for quality of life in adolescence and adulthood. In Ghana, data collected in surveys over the years have shown an increase in overweight and obesity in pre-school children but factors determining these conditions have not been exhaustively studied. This study looked at the prevalence of overweight and obesity, and determined factors associated with their incidence in pre-school children in Dansoman, a microcosmic suburb of the Greater Accra region.

**METHODS:** A cross-sectional study was carried out with a total of 265 pre-school child-parent pairs (M=132; F=133). Overweight and obesity was measured by anthropometry. Birth weight, dietary habits, and physical activity levels of the children were recorded. Socio-demographic, socio-economic status and anthropometric characteristics of the parents were also collected. Relationships between dependent (Overweight and Obesity) and independent variables were determined using multivariate regression analysis.

**RESULTS:** Prevalence of overweight and obesity were 7.9% and 9.4% respectively. Parental Body Mass Index (BMI) and dietary fat intake were positive predictors of the incidence of overweight. Activity levels, dietary fat intake, and parent BMI were positive predictors to the incidence of obesity. However, parent's monthly income was a negative predictor for the incidence of obesity.

**CONCLUSIONS:** Prevalence of overweight and obesity were higher than previously reported in the Ghana Demographic and Health Survey. Parental obesity, diet and lifestyle have an effect on the incidence of overweight and obesity in pre-school children. Parental education and involvement are key in tackling the problem of pre-school obesity since the predicting factors found in the study could be influenced by them.

**KEY WORDS:** Prevalence, overweight, obesity, pre-school children, parents, Dansoman

#### 25. EVALUATION DE L'ETAT NUTRITIONNEL DES DIABETIQUES NON INSULINODEPENDANTS ADMIS A L'HOPITAL MOHAMMED SEKKAT, CASABLANCA, MAROC

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**Résumé :**

**Introduction:** Le diabète est l'une des maladies non transmissibles, liée au mode de vie, qui se caractérise de plus en plus par la sédentarité. L'objectif du présent travail est de faire une évaluation nutritionnelle des patients diabétiques non insulino dépendants admis à l'Hôpital Mohammed SEKKAT. Casablanca, Maroc.

**Matériels et méthodes:** Cette étude menée au Centre Hospitalier Provincial Sekkat à Casablanca. La population étudiée se compose, de 64 diabétiques non insulino dépendants hospitalisés et non hospitalisés (71,9% des femmes et 28,1 % des hommes). Les informations de la surveillance glycémique de chaque patient sont obtenues grâce à la « Feuille de Surveillance Diabétique ». L'enquête alimentaire été faite à l'aide de « l'Histoire Alimentaire » accompagné du manuel « Aliments et Préparations Typiques de la Population Marocaine ». L'apport quantitative en micronutriments (calcium, vitamine D et le fer) de cette population est comparée aux recommandations de l'Agence Nationale d'Accréditation et d'Évaluation en Santé.

**Résultats:** Parmi les 64 patients diabétiques de type 2 enquêtés, les femmes sont en obésité classe I ( $30,21 \pm 4,78$ ) avec un TT/TH élevé ( $0,94 \pm 0,06$ ) tandis que les hommes sont à la limite pour passer à une préobésité avec un TT/TH normal ( $0,96 \pm 0,07$ ). Les apports en vitamine D, sont en dessous de l'Apport Suffisant chez toutes les différentes tranches d'âges, hommes et femmes, de même pour le Calcium. Cependant le fer a un apport moyen de 13,4 et 20,7 mg respectivement chez les femmes et hommes.

**Conclusion:** La population diabétique à l'étude ici est âgée, et souffre de plusieurs problèmes avec une hétérogénéité caractérisée par la coexistence d'autres problèmes nutritionnels. Toutefois, la gestion du traitement du diabète au niveau hospitalier doit strictement commencer par une évaluation complète et individualisée de l'état nutritionnel.

**Mot clés :** Diabète, Insulinodépendant, Anthropométrie, Alimentation, État nutritionnel.

## 25. EVALUATION OF THE NUTRITIONAL STATUS OF NON-INSULIN DEPENDENT DIABETICS ATTENDING THE MOHAMMED SEKKAT HOSPITAL, CASABLANCA, MOROCCO

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**INTRODUCTION:** Diabetes is one of the life-style non-communicable diseases that is increasingly characterized by sedentary lifestyle. The objective of this work was to undertake a nutritional assessment of non-insulin-dependent diabetes patients admitted to Mohammed SEKKAT Hospital, Casablanca, Morocco.

**MATERIALS AND METHODS:** This study was conducted at the Sekkat Provincial Hospital in Casablanca in a study population of 64 NIDDM hospitalized and out-patient diabetics (F=71.9%; M=28.1%). Glycemic monitoring information for each patient was obtained through the "Diabetic Surveillance Sheet". A food intake survey was conducted using "Food History" followed by analysis using the manual "Food and Typical Preparations for the Moroccan Population". The quantitative intake of micronutrients (calcium, vitamin D and iron) of the study population was compared to the recommendations of the National Agency for Accreditation and Evaluation in Health.

**RESULTS:** Of the 64 type 2 diabetes patients surveyed, women were of class I obesity (BMI,  $30.21 \pm 4.78$ ) with high TT / TH ( $0.94 \pm 0.06$ ) while men were mainly in the pre-obesity (overweight) category with a normal TT / TH ( $0.96 \pm 0.07$ ). Vitamin D intake was below the Adequate Intake for all the different age groups, men and women, and so was Calcium intake. However, there was an average intake of iron of 13.4 and 20.7 mg respectively among women and men.

**CONCLUSION:** The diabetes population under study here was elderly and suffered from several problems with a heterogeneity

characterized by the coexistence of other nutritional problems. We recommend that management of diabetes at the hospital level begin with a comprehensive and individualized assessment of nutritional status.

**KEY WORDS:** Diabetes, insulin-dependent, anthropometry, diet, nutritional status.

## 26. DIETARY PATTERNS OF UNIVERSITY STUDENTS AND THEIR ASSOCIATION WITH OVERWEIGHT AND OBESITY

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**BACKGROUND AND OBJECTIVES:** Unhealthy dietary habits in low and middle-income countries are risk factors for the onset of chronic non-communicable diseases, due to the nutrition transition. Identification of dietary patterns may be an important strategy for promoting healthy eating habits among young adults. There is paucity of data evaluating dietary patterns of young adults in Nigeria. This study aimed to identify dietary patterns of university students and their association with overweight/obesity.

**METHODS:** A qualitative food frequency questionnaire was administered to 1610 randomly selected university students recruited from five tertiary institutions in South East, Nigeria. Dietary patterns were derived using principal component analysis of 124 food and beverage items. Body mass index was calculated from height and weight measurements. Logistic regression was used to test the association between dietary patterns and overweight/obesity.

**RESULTS:** Three dietary patterns were identified namely traditional, bread/drinks and snacks, and these explained 42.9% of cumulative variance in food consumption. The "traditional pattern" was characterized by high intake of legumes, fruits, vegetables, fats/oils, fish/seafood, milk/dairy and meat products, and explained 28.4% of variability in food consumption. The "bread and drinks" pattern consisted of bread, cocoa beverages, tea, coffee and carbonated drinks, and accounted for 7.7% of variability in food consumption. The "snack" pattern was typified by high intake of snacks and breakfast cereals, and represented 6.7% of variability in food consumption. About 13.4% and 6.5% of the students were overweight and obesity, respectively. Multiple regression revealed the bread and drinks pattern were significantly associated with

overweight (odds ratio (OR) =1.15,  $P=0.018$ ). Adjustment for sex showed females were significantly more likely to adopt the "healthy pattern" than males (OR=0.822;  $P=0.014$ ).

**CONCLUSION:** Our findings suggests that a dietary pattern high in calories may reflect the dietary habits of university students in Nigeria and this may be associated with overweight and obesity.

**KEYWORDS:** Dietary patterns, university students, overweight, Nigeria

## 27. INTEGRATING NUTRITION INTO THE TRAINING CURRICULA OF AGRICULTURAL AND HEALTH PROFESSIONAL SCHOOLS IN BURKINA FASO: ACHIEVEMENTS, LESSONS LEARNED AND CHALLENGES.

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**INTRODUCTION:** Capacity development in nutrition is a prerequisite to successfully operationalizing the multisectoral approach. A pilot experience of integrating nutrition into the training curricula of professional schools was conducted between 2012 and 2015 at Agricultural Center of CAP Matourkou and at the health school of ENSP in Burkina Faso. The objective of the study was to know what the achievements of this pilot experience, lessons learned and challenges.

**METHODS:** This was a cross-sectional, qualitative study conducted in 2017 through a documentary review, individual interviews and focus group discussions. In total 45 key stakeholders involved in the process and 20 graduates were interviewed. Four focus groups were conducted involving 8 students each. A written test was conducted involving 78 students.

**RESULTS:** The desk review showed that the total time allocation to the nutrition teaching ranged from 20 to 37 hours. On a scale of 1 to 4, the weight assigned to nutrition was 1 to 2. From 2013 to 2017, 8510 students have benefited from nutrition teaching. Knowledge assessment of the students was satisfactory. Graduates who have benefited from the programme declared the acquired knowledge and skills were useful to their professional work in the area of prevention and management of malnutrition. The participatory approach along with the leadership of the management board and teachers were key to achievement and especially to sustainability after the end of the project lifetime. Positive factors included advocacy, teachers' training and monitoring. Limiting factors were

tendency to decreased time allocation, reduced availability of qualified teachers for nutrition, unavailability of practical exercises and lack of framework for experience sharing.

**CONCLUSION:** This experience is a successful initiative that has systematically strengthened the integration of nutrition into the agricultural and health sector. An impact assessment should be done in a few years. This experience could be duplicated in other professional schools.

**KEYWORDS:** Integration, nutrition, agriculture, curricula, Burkina Faso.

## 28. FEEDING CHALLENGES OF AUTISTIC CHILDREN AND THE EFFECT ON THEIR NUTRITIONAL STATUS

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**INTRODUCTION:** Some Autistic children have psychomotor challenges and this tends to affect their ability to eat well hence posing serious eating difficulties which can affect their nutritional status and overall health.

**AIMS AND OBJECTIVES:** To assess feeding difficulties and coping mechanisms of autistic children and the effect on their nutritional status.

**METHOD:** Fifty-five children aged 2 to 20 years from 5 institutions had their parents interviewed using questionnaire on feeding behaviour of their autistic children. The children's Anthropometric measurements were taken and body weight category was determined by BMI for age percentile reference values.

**RESULTS:** Mean age of children was 11.8±4.2 years, Female to male ratio was 1:1.5. Obesity and overweight constituted two-thirds 36(65%) of the Autistic children. Males and females were equally malnourished. The older children (13.5±4.2yrs) were significantly overweight and obese than the younger children (8.6±2.7yrs), ( $p < 0.001$ ). The categories of feeding challenges included, food choices 54(98.2%), the food forms 55(100%) and psychomotor skills 45(81.8%). Specific feeding problems were sensory difficulties 30(54.5%), motor difficulty 16(29.1%), low fiber foods, 28(50.9%), Soft textured food 34(61.8%), Crunchy foods 28(50.9%), Colour of food 38(69.1%) and Picky eating (89.1%). The different categories of feeding challenges affected malnutrition equally ( $p=0.945$ ). Parents either use reduction in the quantity of food, apply pressure

on the child to eat, reward the child for eating or remove the food from the diet; to counter the feeding challenges.

**CONCLUSION:** The feeding difficulties resulted in poor dietary behaviours and high levels of overweight and obesity.

**KEY WORDS:** child, autistic, feeding difficulty, malnutrition, overweight, obesity

## 29. WEIGHT GAIN DURING PREGNANCY IN SUB-SAHARAN AFRICA: A SYSTEMATIC REVIEW AND META-ANALYSIS

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**INTRODUCTION:** During pregnancy, a woman's body undergoes many changes requiring additional energy that can be fulfilled by gaining adequate gestational weight. Women who gain inadequate weight are at a increased risk of premature birth or bearing a baby with low-birth weight, which are risk factors for child mortality. By contrast, women who gain excessive weight are at a high risk of different problems like gestational diabetes and long-term obesity. The aim of this review was to assess gestational weight gain (GWG) in Sub-Saharan Africa.

**METHODS:** Databases such as PUBMED, MEDLINE, EMBASE, SCOPUS and CINAHL were used to identify literature published from 1990 to 2017. Two independent appraisers appraised the quality of the studies. Findings were synthesised and proportions of GWG were pooled together using Stat direct.

**RESULTS:** Of 877 retrieved studies, 74 underwent full text review and 21(n=9,818 women) met inclusion criteria. Twelve studies classified GWG according to the United States Institute of Medicine recommendations. The proportion of inadequate GWG ranged from 15.7% to 96.6%. The pooled estimate of inadequate GWG among underweight women is 88% (95%CI: 75-96). The proportion of adequate GWG ranged from 3.1% to 61.7%. The pooled estimate of adequate GWG among underweight women is 12% (95%CI: 3-24).

**CONCLUSION:** Despite the world focus on preventing excessive GWG, Sub-Saharan African women are suffering from inadequate GWG. Managing pre-pregnancy weight could help women to gain appropriate gestational weight.

**KEY WORDS:** GWG, Pre-pregnancy weight, Sub-Saharan Africa

## 30. THE NUTRITIONAL AND SOCIAL CONTRIBUTION OF MEAT IN THE DIET OF YOUNG MEN IN URBAN AND RURAL ZAMBIA: A MIXED METHODS STUDY.

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**BACKGROUND/OBJECTIVES:** Global demand for meat and dairy products has escalated with the demand particularly increasing in East and South Asia and Latin America countries. The effect has been termed the livestock revolution. These consumption patterns have serious consequences for environmental sustainability and food security.

The aim of this study was to assess the nutritional contribution of meat in the diet of young adult men in urban and rural Zambian populations; and to ascertain the social importance of meat in these two populations.

**METHODS:** A mixed method study, 20 male participants 18-30 years were selected each from an urban (Lusaka) and rural (Chongwe) area. Food frequency questionnaire, 24-hour dietary recall for 4 days, anthropometric measurements, qualitative interviews and a background questionnaire were used to collect demographic data and nutrient intake data. Nutri Survey dietary software, SPSS and NVIVO were used for analyses.

**RESULTS:** Participants at both locations had an isocaloric diet. All macronutrient intakes except carbohydrates were significantly higher in the urban compared to the rural population. There was 15% protein contribution to energy as compared to 11.5% protein contribution to energy among rural population ( $P<0.05$ ). The urban population had protein and fat intakes above the recommended intakes. Chicken was viewed as meat for visitors and showing respect/authority at household level, beef was considered meat for the wealthy, and highly essential for successful celebrations.

**CONCLUSIONS:** The study found significant differences in nutrient intake relating to the consumption of meat. The study also found that participants held strong socio-cultural importance to meat consumption, detailing the symbolic meanings of these meats such as respect, authority, good gesture and prosperity among others.

**KEY WORDS:** Meat, diet, nutrient adequacy, young men, urban, rural

### 31. DRIVERS OF HEALTHY FOOD CHOICES AMONG ADOLESCENT GIRLS IN A PERIURBAN AREA IN THE EASTERN REGION, GHANA.

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**BACKGROUND:** During adolescence, girls experience dramatic physiological and morphological changes that prepare their body for maternity. Therefore unhealthy food choices could impede adolescent girls' nutritional status, sexual maturation and their future offspring's health status. This study aimed to determine the drivers of healthy food choices among the adolescent girls in a peri-urban district in Ghana.

**METHODS:** This cross-sectional study involved 270 adolescent girls from the Lower Manya Krobo District. Socio-economic information as well as dietary intake was collected using validated questionnaire. Drivers of food choice were determined using food choice scoring questionnaire. The participants who consumed from whole grains, fruits and vegetables four times or more in a week were considered as making healthy choices since these foods are associated with the prevention of non-communicable diseases. The factors (physiological, psychological, economic, environmental, nutritional knowledge and social factors) associated with the adolescent girls' food choices were determined using univariate and multiple logistic regression analysis.

**RESULTS:** The following frequency of consumption of cereals (96.3%), sweets (75.6%), fish and sea foods (60%), tubers (44.5%), vegetables (39.6%), fruits (34.4%) and meat (23.7%) were found among the adolescents. However, 38.9% of the adolescent girls made healthy choice, based on their intake of cereals, fruits and vegetables four times or more in a week. The food choices was associated with age group with late adolescents more likely to make healthy food choices compared to the early adolescent [AOR (95% CI= 2.16(1.12-4.16)]. There was no association between nutrition education, psychological factors (body image) and the food choices of study participants after controlling for important covariates.

**CONCLUSIONS:** Healthy food choices were not common among the adolescent girls. Their food choices related to their age group with late adolescents making healthier food choices compared to early adolescents.

**KEYWORDS:** Adolescent girls, food choices, peri-urban, Ghana.

### 32. DETERMINANTS OF MORTALITY IN CHILDREN AGED 0-59 MONTHS DIAGNOSED WITH COMPLICATED SEVERE ACUTE MALNUTRITION IN TWO HOSPITALS IN GHANA: A RETROSPECTIVE STUDY.

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**INTRODUCTION:** Complicated severe acute malnutrition poses an enormous threat to child survival. However, knowledge of the quantitative contribution to mortality of anthropometric and clinical characteristics of these children at admission is limited. The aim of this study was to retrospectively investigate the determinants of mortality amongst infants and children diagnosed with complicated SAM.

**METHODS:** A retrospective study was conducted which reviewed the medical records of children aged 0-59 months, admitted, treated and discharged for SAM between January 2013 and June 2017 at the Princess Marie Louis Children's hospital (Greater Accra Region) and the Komfo Anokye teaching hospital (Ashanti Region) in Ghana. Data was analysed using SAS version 9.4. Fisher's Pearson correlation and logistic regression were used to determine the association between admission variables and mortality.

**RESULTS:** Two hundred, eighty nine (289) records were included in the study. Discharge, death and abscond rates were 77.7%, 17.7% and 3.8% respectively. Average length of hospital stay was 11 days with 5.8 g/kg/day weight gain. Median time to death was 5.0 days (IQR: 2.0-9.0), with infants <6 months dying earlier (1.5 days; 95% CI: 0.7-3.2; P=0.001) compared to the 6-59 month group (5.9 days). 29.8% of the deaths occurred within the first 48 hours of admission and 66.0% by the seventh day. Shock, convulsion, oedema and HIV positive status were associated with 7.1 (95% CI: 2.7-20.5; P < 0.001), 4.2 (95% CI: 1.6-10.7; P < 0.001), 2.5 (95% CI: 1.2-5.5; P = 0.02) and 3.1 (95% CI: 1.3-7.2; P = 0.03) increased risk of death. MUAC <11.5 cm and WHZ ≤ -3 were associated 3.9 and 1.7 times risk of death though not statistical significant (P = 0.38 and P = 0.53 respectively)

**CONCLUSION:** The high death rate beyond the internationally accepted minimum observed in this study requires appropriate

interventions and their effective implementation to reduce SAM deaths in hospitals.

**KEY WORDS:** Severe acute malnutrition, medical complications, mortality, infants and children, hospital.

#### 15. MOTHERS' NUTRITIONAL KNOWLEDGE ON INDIGENOUS FOODS AND LEVEL OF CONSUMPTION IN THE NABDAM DISTRICT OF GHANA.

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**BACKGROUND:** Malnutrition affects over 30% of the World's population and undermines development in developing countries. In Ghana, undernutrition contributes to about half of all child deaths beyond early infancy. Finding sustainable nutrition across countries, calls for identifying indigenous foods acceptable to communities. This study sought to assess the existing nutritional knowledge on indigenous foods by mothers and the level of consumption.

**METHODS:** A mixed method approach was used. Seven focus group discussions and nine individuals participated in the qualitative study. A cross-sectional survey was also undertaken among 400 mothers in the Nabdham district of the Upper East region of Ghana.

**RESULTS:** The mean age of respondents was 33.3 (+/-10.9) years. The average number of children per mother was two. Majority (77.6%) of participants had no formal education. However, nutritional knowledge was very good (above 75%) in all the food categories, except for fruits (less than 10%). Most (about 95%), had their source of knowledge through informal education. Relationship between nutritional knowledge and consumption of indigenous food was statistically significant at 5% level of testing (Pearson Chi<sup>2</sup> (1) = 5.86; P-value = 0.015). In the qualitative study, a discussant had this to say; "Our local foods are very healthy, but are getting extinct so we feed our children with what is available" **FGD 4 respondent 7.**

**DISCUSSION:** Though the majority of the women had no formal education, their knowledge of the nutritional value of indigenous foods was very good. The availability of indigenous foods coupled with socio-cultural beliefs are a stronger influence for mother's food choices for their children. Interventions should tackle factors affecting the availability and cultural perception of giving these foods to children.

**KEY WORDS:** Nutritional knowledge, indigenous foods, consumption, education, mothers.

#### 33. SENSORY EVALUATION AND PHYSICOCHEMICAL PROPERTIES OF SORREL (*HIBISCUS SABDARIFFA*) SEED OIL PRODUCT

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**BACKGROUND AND OBJECTIVES:** Oilseeds are vital sources of oils of nutritional and pharmaceutical importance. However, high importation cost of edible oil necessitates exploration of locally available sources of edible oil. The present is on the production of edible oil from locally sourced sorrel seeds, examining its physicochemical properties, and sensory evaluation.

**METHODS:** Oil was extracted from clean dried sorrel seeds using Soxhlet extractor and stored in sterilized bottles. The physicochemical properties were determined using the American Society for Testing and Materials (ASTM) methods. Agilent 6890 N Model gas chromatography with an Agilent 122-5532 type column 30m long and split-splitless injector was used. Extracted oil was used to make stew from which sensory evaluation was carried out using a nine-point hedonics scale and groundnut oil as control. The product was evaluated for texture, flavour, colour, and general acceptability.

**RESULTS:** Sorrel seed oil was found to have high relative density value (0.916 at 15°C), refractive index value (1.475 at 40°C), saponification value (189mgKOH/g), iodine value (103mg) and β-carotene (14.20mg). It had equal value for unsaponification and peroxide values (10.10g/kg and 10.10Meq/kg), respectively. Sorrel oil had lower acid value (0.60mgKOH/g) and melting point (20°C). The physicochemical properties show that sorrel oil is a drying oil with very low propensity for rancidity. It is a rich source of nutrients useable for cooking. It had higher iodine value and lower melting point showing the degree of unsaturation. The oil is heavier than control and would not break down, smoke, burn, or give food unpleasant taste. The sensory properties were highly acceptable.

**CONCLUSIONS:** The sensory attributes show that it compares favourably with existing oil. It is fairly acceptable for flavor and colour when compared with the control. Food industries are encouraged to explore the commercialization possibilities of the oil.

**KEYWORDS:** Sorrel oil, edible oil, physicochemical properties, sensory evaluation



#### 34. DIET DURING PREGNANCY AND INFANT COGNITIVE DEVELOPMENT IN NORTHERN UGANDA

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**BACKGROUND:** Adequate nutrition during pregnancy is essential for prenatal and postnatal brain development. Limited evidence exists from resource poor settings linking diet during pregnancy and early infant cognition.

**OBJECTIVES:** To examine the association between measures of dietary intake during pregnancy and cognitive development at 6 and 12 months in a cohort of Ugandan children.

**METHODS:** a total of 219 pregnant mother-infant pairs were recruited from Gulu Regional Referral Hospital in northern Uganda. Data were collected on diet (food insecurity, dietary diversity and vitamin B12 status) during pregnancy as well as infant cognitive development (using age-appropriate Mullen Scales of Early Learning) at 6 and 12 months.

**RESULTS:** Of the 219 pregnant women, 112 (51.1%) were severely food insecure; 21 (9.6%) had low diet diversity, 102 (46.6%) had medium diet diversity and 96 (43.8%) had high diet diversity. The mean vitamin B12 level during pregnancy was 293.8pg/mL and 51 (23.3%) of the participants were B12 deficient. The result of a multivariable regression controlling for maternal height, social economic status, education level, occupation, marital status, HIV status and quality of home care showed no association between food insecurity and infant cognition at 6 or 12 months. There was a positive association between diet diversity and cognitive score at 6 months ( $p=0.002$ ) but not at 12 months ( $p=0.574$ ). Prenatal vitamin B12 concentration was negatively associated with infant cognition at 12 months ( $p=0.001$ ) but not at 6 months ( $p=0.439$ ).

**CONCLUSIONS:** Dietary diversity during pregnancy is positively associated with higher infant cognitive scores at 6 months. Contrary

to our prediction, higher levels of prenatal vitamin B12 were found to be associated with poorer infant cognition at 12months.

**KEY WORDS:** Food insecurity, Dietary diversity, Vitamin B12, Cognitive development.

#### 35. ASSESSMENT OF THE EFFECT OF WAIST- TO- HIP RATIO ON CARDIOVASCULAR RISK AMONG MARKET WOMEN IN ABEOKUTA SOUTH LOCAL GOVERNMENT OGUN STATE, NIGERIA.

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**BACKGROUND AND OBJECTIVE:** This study was carried out to assess the effect of waist-to- hip ratio on cardiovascular risk among market women in Abeokuta South Local Government area in Nigeria.

**METHODS:** A total of 1,600 structured questionnaires were administered to market women in the area using a simple random sampling technique. Data were analysed using, excel, Total Diet assessment (TDA) and descriptive statistics (frequency count, mean and mode of Statistical Package for Social Science (SPSS, version 21.0).

**RESULTS:** The results of socio-economic characteristics showed that 36.1% of the women surveyed were between 31-40 years; 53.4% were Christians, 69.5% were married and 46.9% had secondary level of education. The majority (61.6%) claimed not to have medical problems, or family history of cardiovascular diseases but have knowledge about the health issues (43.6%) mainly through media (40.2%). More than half (60.3%) do not skip meals and ate mainly at home (94.7%). Thirty nine percent (39%) of the women had normal body mass index; 8.3% had obesity grade II. The majority (78.3%) of respondents had normal waist-to-hip ratio, systolic (52.9%) and diastolic (61.6%) blood pressure. Results of nutrient intake showed calorie (2069 kcal), carbohydrate (116.59), protein (38.33) and fat (55.39) gams respectively. Calcium (10.34 mg), vitamin A (145.82 mg), vitamin C (50.77 mg), zinc (7.95 mg), iron (10.88 mg), magnesium (58.23 mg), sodium (527.46 mg) and potassium (391.09 mg) were found in the food the women ate. Results of physical activity pattern among the market women showed that morning chores (83.1%) was the major activity the market women did. The majority (57.7%) displayed their wares in the afternoon and cooking (69.1%) at night.

**CONCLUSIONS:** Although the majority had normal waist-to-hip ratio, risk of cardiovascular disease was high.

### 37. A STUDY OF ANOREXIA IN ADOLESCENTS IN FEZ, MOROCCO

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**BACKGROUND AND OBJECTIVE:** Anorexia is an eating disorder (ED) that mainly affects adolescents. The objective was to estimate the prevalence of anorexia among adolescent and it's associated risk factors.

**METHODS:** A cross-sectional survey was carried out in a representative sample of 367 students from both public and private colleges and high schools. A self-administered questionnaire with items on socio-demographic characteristics, lifestyle and food was administered. The screening of ED was made using a specific Eating Attitudes Test (EAT-26). Depressive disorders were assessed by the Hospital scale Anxiety and Depression (HAD). Anthropometric measurements were carried out in a standard manner in all adolescents.

**RESULTS:** The mean age was 15.58 ( $\pm$  2.01) years with a range of 12-19 years. The mean body mass index (BMI) was 19.99 ( $\pm$  2.47). The prevalence of anorexia was 10.5% (95% CI [1.1-4.9%]). Anorexia prevalence was higher among girls compared to boys (14,1% vs 6,5%  $p$  <0.015). The factors associated with anorexia were: meal skipping (OR = 7,93 [95% CI: 2,05-30,66]  $p$  <0.003), hyperactivity (OR=4,37 [95% CI: 1.42-13,41]  $p$  <0.010), depression (OR = 3,65 [95% CI: 1,22- 10,91]  $p$  <0.021) and anxiety (OR = 7,57 [95% CI: 1,42 - 40,31]  $p$  <0.018).

**CONCLUSION:** Anorexia is a frequent health problem in our context and undertaking a preventive strategy should be a priority for the local health policy makers.

**KEY WORDS:** Adolescent, anorexia, prevalence, factors, Morocco.

### 38. STUDY OF BULIMIA IN SCHOOLED ADOLESCENTS IN MOROCCO: FEZ CITY REGION

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**BACKGROUND OBJECTIVE:** Bulimia is an eating disorder (ED) that mainly affects adolescents. The objective is to estimate the prevalence of bulimia among adolescent and it's associated risk factors.

**METHODS:** A cross-sectional survey was carried out on a representative sample of 367 students from colleges and high school degree both from the public and private. A self-administered questionnaire with items on socio-demographic characteristics, lifestyle and food was administered. The screening of ED was made using a specific Eating Attitudes Test (EAT-26). Depressive disorders were assessed by the Hospital scale Anxiety and Depression (HAD). Anthropometric measurements were carried out in a standard manner in all adolescents.

**RESULTS:** The mean age was 15.58 ( $\pm$  2.01) years with a range of [12-19]. The mean body mass index (BMI) was 19.99 ( $\pm$  2.47). The sex ratio M / F = 0.94. The prevalence of bulimia was 9.6% [CI 95 %: 6.8-17.3 %]. Bulimia prevalence was higher among girls compared to boys (13,5% vs 5,3%,  $p$  <0.007). Associated factors to bulimia are: sex (OR = 2,74 [95% CI: 1,04 – 7,23]  $p$  <0.041), overweight (OR = 4.55 [95% CI: 1.15 - 20.00]  $p$  <0.03), fear of gaining weight (OR = 14.01 [95% CI: 1.68 - 116.86]  $p$  <0.015), comments about weight (OR = 3,22 [95% CI: 1,20 - 8,61]  $p$  <0.034), depression (OR = 3,71 [95% CI: 1,30 - 10,57]  $p$  <0.014) and anxiety (OR = 4,43 [95% CI: 1,17 – 16,79]  $p$  <0.028).

**CONCLUSION:** Bulimia is a frequent health problem in our context, hence the need to undertake preventive measures for this pathology.

**KEY WORDS:** Adolescent, bulimia, prevalence, factors, Morocco.

### 39. POSITIVE DEVIANCE APPROACH: A TOOL FOR EXPLORING INFANT AND YOUNG CHILD FEEDING IN RURAL POPOKABAKA, DEMOCRATIC REPUBLIC OF CONGO.

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**BACKGROUND:** Popokabaka is a health zone among the most affected by malnutrition in the Democratic Republic of Congo. The present study explored mothers' positive behaviors and practices regarding infant and young child feeding (IYCF), in relation to food hygiene, cooking and composition, children's health, food consumption habits as well as childhood stimulation.

**METHODOLOGY:** This was a case study using a mixed method approach conducted in April 2017 in Popokabaka city health area. Eighteen in-depth interviews, ten observations and ten food weighings were conducted with ten positive-deviant and eight non-positive-deviant mothers. Positive deviant mothers were those with well-nourished children according to WHO and FANTA's indicators. Inductive techniques and non-parametric tests were used for qualitative and quantitative data, respectively.

**RESULTS:** Positive-deviant mothers had a good level of knowledge on IYCF and their attitude towards IYCF was positive. Social support received from their family members enabled them to successfully practice recommended IYCF practices, provide an adequate and balanced diet to their children and in remain close to them. They also gave safe drinking water to their children, and corn-flour soft porridge or a mixture of corn and cassava flours as a staple food to eat. Nevertheless, they were similar to the non-positive deviant mothers in terms of poor knowledge on hand washing and optimal complementary feeding.

**CONCLUSIONS:** This study has brought into light some local and affordable solutions such as the importance of social support, food habits and hygiene that, if implemented, could help, prevent malnutrition and improve nutritional status of children in Popokabaka health zone.

**KEY WORDS:** Positive deviance, children, prevention, acute malnutrition.

**BACKGROUND:** Vulnerability to indoor pollution depends on the individual's nutritional status as well as the nature and duration of exposure. The aim of this study was to assess body mass index and dietary diversity among kitchen workers in Morogoro Municipality, Tanzania.

**METHODOLOGY:** A total of 360 randomly selected kitchen workers from hotels, institutions, fast food restaurants and street food vendors were studied in a cross sectional study and their weight and height were measured using standard methods. Body mass index was calculated and categorized using World Health Organization criteria. Information on socio-demographic, respiratory symptom and type of fuel used was collected using pretested questionnaire. Dietary diversity was assessed using FAO/FANTA guideline. Data analysis was done using SPSS version 18 and Microsoft excel version 10.

**RESULTS:** There were more female kitchen workers (65.3%) who were relatively younger, mean age 28 (SD 7.6) years compared to 32.6 (SD 7.4) years for males. More males were overweight (52%) or obese (21.6%) compared to females (46% and 11% respectively). Prevalence of obesity was higher among hotel workers (25%) and the lowest amongst street food vendors (8.3%). There was no association between BMI and cooking fuel or respiratory symptoms. The majority (68%) of respondents consumed more than 4 food groups per day preceding the survey. However, the most commonly consumed groups were cereals, fats/oils, and sugars. Vegetable consumption was also high, reported by about 75% of the respondents. Eggs, milk and fruits were the least consumed food groups reported by 3.2, 13.5 and 38.1% of respondents respectively.

**CONCLUSIONS:** Overweight and obesity were common among kitchen workers, more common among males than females. More research is needed to support the present results especially on the kinds of particulate matter produced from kitchen fumes and the impact of exposure on health.

**KEY WORDS:** Kitchen workers, BMI, Dietary diversity, overweight

#### 40. BODY MASS INDEX AND DIETARY DIVERSITY OF KITCHEN WORKERS USING DIFFERENT TYPES OF COOKING FUELS IN MOROGORO, TANZANIA

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OR

#### 41. STRENGTHENING THE WOMEN'S EMPOWERMENT PATHWAY TO IMPROVE THE AGRICULTURE SECTOR'S CONTRIBUTION TO IMPROVED NUTRITION AND DIETARY DIVERSITY: LESSONS LEARNED ON PROMOTION OF HOUSEHOLD GARDENING IN AGP2

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**BACKGROUND:** Ethiopia has among countries, the highest rates of undernutrition globally. Improving nutrition is a government priority under the multi-sectoral National Nutrition Program (NNP2), which includes the Ministry of Agriculture and Livestock Resources (MoALR). To date, MoALR sought to influence nutrition outcomes using the increased production and agricultural income pathways. Yet the empowerment of women pathway has particular significance for household nutrition. African best practices have shown that women who are reached by appropriate nutrition-sensitive agriculture (NSA) programs can deliver improved child nutrition outcomes.

**INTERVENTION:** Homestead gardening is an effective NSA strategy within the empowerment of women pathway: gardens are found close to home where women have greater decision-making autonomy. However most Ethiopian agricultural extension workers (AEWs) lack expertise to promote homestead gardening. CDSF jointly with AGP2 developed the first detailed, nutrition-focused homestead gardening training program for the agriculture sector, designed to build capacity of AEWs to promote homestead gardening and NSA technologies to women farmers.

**METHODS:** The training utilizes hands-on, gender-sensitive training approaches. Participants learn about the nutritional values of fruits and vegetables, and practice seed bed preparation for trench, permagarden and keyhole designs. NSA technologies for propagation, cultivation and post-harvest handling of fruits and vegetables appropriate to different agro-ecological zones are introduced.

**RESULTS:** Training 113 trainers in four regions took place in 2018. Cascade training will happen over the next several months. Feedback from regional trainers suggests the program is filling an important niche, and will help to improve NSA technology uptake and the effectiveness of nutrition results under AGP2.

**IMPLICATIONS:** The agriculture sector previously emphasized cash crop production, assuming that increased productivity and income would result in improved nutrition, which has not happened. NSA technologies are only now being recognized for their importance. Building NSA skills of AEWs related to homestead gardening has potential to improve nutrition outcomes.

**KEYWORDS:** nutrition-sensitive agriculture, women's empowerment, homestead gardening, dietary diversity, capacity building.

## **42. PROVITAMIN A MAIZE BIOFORTIFICATION IN SUB-SAHARAN AFRICA: PRODUCTS AND TECHNOLOGIES**

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**BACKGROUND AND OBJECTIVES:** The potential role of maize in combating food insecurity in sub-Saharan Africa (SSA) is undoubtable due to its wide production and consumption. However, its role in curbing nutrition insecurity is questionable due to lack of key micronutrients such as vitamin A. This negates its capacity to be a suitable solution for both food and nutrition challenges which are associated with many African countries. This, in combination with low provitamin A (proVA) diet have contributed to high prevalence of "hidden hunger" related conditions in the form of vitamin A deficiency (VAD) triggered illnesses among others. Some years ago, HarvestPlus and partners introduced proVA maize biofortification in Africa to fight VAD. It is important to evaluate the progress of biofortification in terms of the performances of the products' (maize varieties) performance, the breeding and biotechnological strategies specifically applicable to maize biofortification, success and challenges of maize provitamin A biofortification in SSA.

**METHODS:** Desktop research where literature review of published reports, articles on maize biofortification in Africa, proVA maize variety catalogues, release proposals and the World Health Organisation (WHO) website for country VAD prevalence was conducted.

**RESULTS:** There are considerable disparities between rural and urban VAD prevalence in most maize consuming African countries with rural areas having higher VAD prevalence. Both conventional and molecular breeding technologies can be deployed in maize provitamin A biofortification. Over 50 high performing OPVs and hybrid maize varieties were released. Consumer scepticism, technical challenges, the negative stigma of the coloured maize and high cost of proVA quantification are the major challenges facing proVA biofortification in SSA.

**CONCLUSION:** Maize proVA biofortification has proved to be an important innovation for addressing both food and nutrition insecurity in SSA. To upscale this innovation there is need for the

development of cheaper, efficient and high throughput proVA quantification technologies.

**KEY WORDS:** biofortification, maize, provitamin A, vitamin A deficiency, maize

**43. Use of a combined protocol for acute malnutrition to treat severe acute malnourished children to full recovery in Mogadishu, Somalia: prospective cohort study**

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**Introduction:** Community-based Management of Acute Malnutrition (CMAM) guidelines have distinct treatment protocols for severely (SAM) versus moderately acute malnourished (MAM) children. We tested a unified treatment protocol that treats SAM children to full recovery in the same location, with two Ready-to-Use Therapeutic Food (RUTF) sachets per day for SAM and one RUTF sachet per day for MAM to determine whether the recovery rate meets Sphere humanitarian minimum standards.

**Methods:** The study was conducted in the Outpatient Therapeutic Program (OTP) of Karaan Clinic, Mogadishu, Somalia. SAM children with no complications were enrolled between January-April 2018 and treated using the protocol described above. The children were prospectively followed, for a maximum treatment period of 28 weeks. Their treatment outcome and length of treatment were captured.

**Results:** 727 SAM children (59% girls, 41% boys) without complications were enrolled. Median age was 8 months (range 6-54). 636 (87%) were enrolled on MUAC <115mm, remaining enrolled on weight-for-height Z-score <-3. No child was enrolled on bilateral pitting oedema. As of May 2018, 493 children (68% of total) have eligible treatment outcomes. The final results will be available in September 2018. So far, 482 fully recovered (98%), 7 defaulted (1%), and 4 (1%) were referred. The median weeks to full recovery was 13 (range 7-22). Default (n=7) occurred at median 12 weeks (range: 7-13), all occurring in the moderate zone. We expect that the recovery rate will be lower when the full results are available, as it will include more data on defaulters and non-responders.

**Conclusions:** A unified SAM treatment protocol appears to produce high recovery rates. The adoption of this protocol has potential to improve recovery rates in areas reporting high SAM rates, while simplifying the logistics for providers and care seekers.

**Key words:** CMAM, acute malnutrition, SAM, MAM, Somalia

**44. The power of multisectoral governance in addressing malnutrition: Insights from Sustainable Nutrition for All Uganda and Zambia**

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**Background and Objectives:** Addressing malnutrition requires a strong focus on governance. Increasingly, attention is being placed on how political leadership and national strategies are translated at the subnational level, and ultimately, how they can lead to tangible impact on the ground. This paper draws on valuable experiences from national and local governance structures in Zambia and Uganda to distil the enablers and constraints of multi-sectoral governance and implementation.

**Program intervention:** The model, Sustainable Nutrition for All (SN4A), completed its first phase in Uganda and Zambia in 2017 and is currently in its second phase. To ensure sustainability and scalability of the approach, SN4A works with local and district level authorities.

**Methods:** Focus group discussions were conducted in 2017 with the District Nutrition Coordination Committees (DNCC) and sub-county NCCs in the SN4A districts.

**Key findings:** District and sub-district (sub-county in Uganda and hub in Zambia) staff are involved in the implementation, reflections, and monitoring and evaluation (M&E) of the SN4A approach. At the district level, key stakeholders develop and implement a unified nutrition action plan with targets for improved nutrition.

**Conclusion:** Although DNCCs, SNCCs/ Hub NCCs have been created and progress has been made in terms of capacity building and other nutrition activities, a gap still remains between national policies and local governance. Working across sectors requires a different set of strategies and skills, including the ability and authority to coordinate between sectors. Capacities and skills should not only be technical in nature but also strategic, particularly

in how to work across a range of sectors with different stakeholders. At the district level, key skills required include planning, advocacy, support supervision and M&E. At the sub-district level, technical and facilitation skills are particularly important, and sectors need to have additional training on nutrition implementation. Adequate funding is the glue that holds vertical and horizontal implementation of nutrition policies. Inter-sectoral coordination needs leadership and involves time, energy, funds and skills and managing these requires resources. It also takes time to build alliances and systems to support a broad-based effort in addressing malnutrition.

**Key word:** Multi-sectoral Governance; District Nutrition Coordination Committees

#### 45. WEIGHT MANAGEMENT: ATTEMPT AND FAILURE AT LOSING WEIGHT AMONG OBESE SOUTH AFRICAN POPULATION.

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**INTRODUCTION AND BACKGROUND:** The high prevalence of overweight and obesity is of concern in South Africa and has been linked to increased risk of chronic diseases. Weight management is crucial and is one of the strategies believed to play a role to curb this high prevalence. This paper presents reasons for attempt and failure at losing weight among obese South African population.

**METHODS:** This was a community based cross-sectional quantitative study conducted among the nine ethnic groups in South Africa using a structured questionnaire and anthropometric measurements to calculate body mass index (BMI). Descriptive statistics were used to determine reasons for attempt and failure at weight management.

**RESULTS:** The sample consisted of 1050 adults (463 males and 587 females). Majority of the individuals (n=562, 54%) were overweight and obese, regardless of their ethnicity, area of residence, and socioeconomic status. Majority of females 227

(71%) attempted to lose weight. In nearly 50% of those who attempted to lose weight, the main reason for failure to lose weight was that they felt lazy to exercise. On the other hand 91 (37%) of those who did not try to lose weight said they did not have time.

**CONCLUSIONS:** The implication is that, some of the mitigating factors identified in the findings could act as a barrier to weight management for health. Even though, the motivation to lose weight is dependent on the individuals themselves, the assumption was that, individuals who acknowledged that their body weight was a threat to their health agreed to make the effort to manage their weight. This is crucial to understand and address if effective relevant public health interventions are to be designed.

**Keywords:** chronic diseases; overweight and obese; weight management; public health interventions

#### 46. MULTI-SECTOR PARTICIPATORY APPROACHES TO ENHANCE DIETARY DIVERSITY FOR IMPROVED INFANT AND YOUNG CHILD FEEDING IN RURAL UGANDA AND TANZANIA

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**Background:** In Uganda and Tanzania <20% of children 6-23m receive a minimum acceptable diet and majority are from rural communities. Although rural households may have high illiteracy and often limited food availability, they have land resources and a daily routine of crop production activities to be explored for increasing supply of diverse foods. Identifying viable local agrobiodiversity-based alternatives to improve IYC diets calls for addressing malnutrition as a health problem, and as a nutrition-sensitive development opportunity drawn from complementary sectors like agriculture, health, early childhood development and education. Objective was to develop and test agrobiodiversity-based strategies that address IYC dietary shortfalls.

**Methods:** Two participatory approaches were explored: 1). Multi-Sector Stakeholder Engagement for Learning, Feedback, and Scaling. This engaged actors from development- and research-oriented sectors and was carried out at two levels, Multi-sector research for development platform at district level and Community learning alliance for sustainability and scaling at sub-county/ward level. 2). Household Experimentation and Learning that involved; Testing of participatory production, food preparation, and child feeding strategies; Household self-dietary intake recording, diagnosis, and learning; Community-level participatory validation of IYC dietary shortfalls and developing improved recipes targeting protein, iron, and vitamin A.

**Findings:** Through multi-sector platforms there was a reduction of redundant activities, and capitalisation on combined strengths such as access to resources, opportunities, skills, and knowledge for jointly identifying and solving problems. 49.5% of the 404 children interviewed had consumed at least one animal-source food 24hrs preceding the end-line survey and a significant increase in households and children consuming more diverse diets especially ASFs, vitamin A-rich fruits and vegetables was reported. There was an observed realisation among farmers that small children respond positively to improved diets which they themselves can provide.

**Conclusions:** Multi-level stakeholders' active engagement and whole-household participatory approaches led to better production and consumption practices among target population.

**Key words:** Multi-sector approaches, Participatory approaches, Dietary diversity, Infants and young children, Uganda, Tanzania.

#### 47. MULTI-SECTORAL JOINT EFFORTS IN NUTRITION INTERVENTIONS: PROMISING PRACTICES FROM KILINDI DISTRICT, TANZANIA

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**Background:** Malnutrition in all its forms; underweight, micronutrient deficiencies, overweight and obesity is a critical challenge in both developing and developed countries. To address malnutrition, a better understanding of the determinants and processes that influence diet is needed. World Vision Tanzania (WVT) is addressing malnutrition by implementing Integrated Food and Nutrition Security (IFaNS) through the lens of nutrition sensitive and nutrition specific actions.

**Methodology:** WVT facilitated formation of 6 nutrition working groups (NWGs), 25 commercial producer groups (CPGs) and 69 saving groups (SGs). Two secondary schools and one primary school implemented a school feeding program. Two boreholes with water distribution systems were constructed in two villages. Gender mainstreaming has been a critical piece that enhances male involvement in maternal infant and young child nutrition. Mass distribution of vitamin A and deworming drugs has taken place twice a year.

**Results:** 2253 (683 males, 1570 females) participated in CPGs and SGs with easy accessibility to loan facilities. A total of 90 (35 males, 55 females) NWGs conducted household nutrition counseling on preparation of nutrition dense foods using locally available materials. There were 1335 primary school pupils and 806 adolescents from secondary school who benefited from school feeding program. In total, 12850 people benefited from clean water for household use, increased sanitation and hygiene behaviours and improved irrigation for backyard gardens. Increased male involvement in maternal and child care has occurred. Vitamin A and deworming campaigns have resulted in 98 % coverage.

**Conclusion:** Multi-sectoral programming under IFaNS approach has been an effective way in addressing malnutrition.

**Key Words:** Malnutrition, Effective, Multi-Sectoral, Promising Practices

#### 48. IDENTIFYING DIETARY STRATEGIES TO IMPROVE NUTRIENT ADEQUACY AMONG ETHIOPIAN INFANTS AND YOUNG CHILDREN USING LINEAR MODELLING

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**Background:** Optimal Infant and Young Child Feeding practices are crucial for child survival. However, in Ethiopia local food-based dietary guidelines do not exist to provide guidance. Objective was

to determine nutrient adequacy of young children's (6-8, 9-11 and 12-23 months) diet and to identify best possible strategies to improve complementary feeding.

**Methods:** Data from Ethiopian National Food Consumption Survey were analysed to estimate risk of inadequate and excess nutrient intakes (%) using the Estimated Average Requirement cut-point and probability approaches for usual diets (observed), usual diet + multiple micronutrient powders (MMP), every second day (simulated), usual diet + MNP daily (simulated). Linear programming (LP) analyses, Optifood, was used to identify nutrient gaps in local diets; to develop Food-Based Dietary Recommendations (FBDRs) to improve dietary adequacy for 6-8, 9-11 and 12-23 months old infants in four regions of Ethiopia; and to assess whether these FBDRs or these FBDRs + MNP would likely ensure dietary adequacy for most infants in the population.

**Results:** LP analysis showed it was not possible to select any diet that achieved 100% of the RNI, for zinc and iron (infants < 12 months) in all regions; and for calcium, niacin, thiamine, folate, vitamin B<sub>12</sub> and B<sub>6</sub> in some regions and age-groups. The set of regional FBDRs were considerably different for four regions, increased nutrient adequacy but some nutrients remain sub-optimal.

**Conclusion:** Region-specific FBDRs alone, for all infants, likely will not ensure dietary adequacy. However, in combination with daily (for 6-12 months of age) and every other day (for 12-23 months of age) MNP supplementation can ensure nutrient adequacy without leading to a substantial increase in risk of excess iron or zinc intakes. MNP should not replace FBDRs, but should be promoted within a set of FBDRs together with breast-feeding on demand during the first two years of age.

**Key words:** Optifood analysis, nutrient adequacy, food based dietary recommendations, young children, Ethiopia.

#### 49. Prevalence and risk factors of overweight and obesity among children and adolescents in Zimbabwe

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**Background:** Obesity prevalence has been on an increase worldwide with the epidemic affecting all countries including those like Zimbabwe where stunting and undernutrition remain prevalent.

This paper analysed prevalence and determinants of obesity among children and adolescents in Zimbabwe.

**Methods:** Data from the Zimbabwe Demographic Health Surveys (from 1988-2015) was analysed. A mixed survey assessing BMI, dietary and physical activity habits was carried out in children 9-18 years between March and June 2018 to fill the gaps for missing data in this age group.

**Key findings:** The national prevalence of overweight in children under five was 5.6% with huge discrepancies among provinces. Disaggregated data showed an increase in the prevalence of obesity from 2010 to 2015 in Matabeleland South (5.3% to 6.1%), Midlands (4.2% to 6.5%), and Harare doubling its burden from 4.6% to 8.4%. Increased rates of overweight and obesity in children less than 5 years was associated with the mother BMI  $\geq 25\text{kgm}^{-2}$ , increased level of education, residing in urban areas and a higher wealth quintile. For adolescents (15-19 years), overweight and obesity is 10 times higher among girls than boys (13.3% versus 1.4%) and higher among urban than rural adolescents (46.4% vs 27.7% for men and 20.9% vs 7.3%). Similar pattern was observed among adult women versus adult men (34.9% versus 12.5%). Data for the age group 9-14 is still undergoing analysis.

**Program Implications:** Discrepancies in the prevalence of obesity between boys and girls is worrying and will require further in-depth investigations and tailored actions in Zimbabwe. There is also a need to strengthen double duty actions to reduce the prevalence of obesity and undernutrition and to develop nutrition interventions targeting school age children.

**Key Words:** Overweight, obesity, adolescence, Nutrition

#### 50. INTEGRATED MANAGEMENT OF ACUTE MALNUTRITION: LESSONS LEARNED FROM THE 2016-2017 EL NINO EMERGENCY RESPONSE IN ZIMBABWE

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**Background:** El-Nino weather phenomenon of 2015-2016 negatively impacted the agricultural season, resulting in a protracted food and nutrition insecurity situation. Per the January, 2016 Zimbabwe Vulnerability Assessment Committee (ZimVAC) assessment, 4.1 million rural people in Zimbabwe were food insecure during the peak hunger period (January to March 2017).



This increased vulnerability to malnutrition among the affected population. In February 2016 Government of Zimbabwe declared a state of Drought Disaster, culminating in an updated humanitarian response plan and mobilization of resources by UNICEF and other United Nations agencies, Government, local and international NGOs. Twenty five districts were identified as most affected by the drought and integrated emergency nutrition response was implemented in those districts.. The response package included procurement of essential nutrition commodities, inception of the weekly nutrition coordination meetings, training/retraining on IMAM and IYCF Nutrition surveillance were enhanced through ZIMVAC and SMART survey.

**Key Findings:** To enhance sustainability of active screening, El-Nino response provided a platform to expand the screening approach, from use of VHWS to piloting the mother-led MUAC approach. Task shifting of VAS also improved coverage. Global Acute Malnutrition declined from 5.7% (2016) to 3.1% (2017) arising from a concerted multi-sectoral response, in fund raising, planning, implementation and monitoring. In turn, integration resulted in increased value for money and increased program coverage by reaching more beneficiaries using a minimum pool of resources.. Surveillance enabled targeting, adjustment of acute malnutrition caseloads and forecasting of IMAM supplies. On-job mentorship improved the quality of care and improved the cure rate.

**Conclusion:** Close partnership between government and stakeholders that draw on each other's strengths was the key driver for the swift implementation of the Nutrition response to the el-nino emergency and paved the way for smooth recovery and transition to regular programmes.

**Key words:** Acute Malnutrition, Government, Nutrition, El-Nino

#### 51. Mathematical Modelling for evidence base decision making in nutrition policies and programs: a Consortium approach

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Considerable work has been done by modelers to facilitate the decision-making process in nutrition, using established epidemiological evidence about the impact of interventions on key nutrition outcomes. However, country decision-makers' awareness of those powerful tools remains limited; and uptake is more often

driven by tool modelers and their sponsors than by endogenous programmatic demand or policy needs. With support from BMGF and from the Sackler Institute for Nutrition Science, the Nutrition Modeling Consortium aims to promote the use of evidence-based modeling in nutrition policy making via the pursuit of two goals: 1) disseminate technical information to end-users in LMIC about how nutrition modeling tools can serve their specific needs; and 2) roll out a concerted effort to advance the tools' capacities and enhance their inter-operability. The end result of this initiative is to increase the effectiveness of nutrition policies and programs in measurable ways.

This presentation will focus on the first goal. It will highlight the key tools covered by the consortium; present a number of case studies demonstrating the different purposes for which individual tools have been used; show the complementarity of the tools in the design of nutrition interventions (from advocacy to allocative efficiency to costing); and engage with the decision-making audience in defining uses that they would like to see the tools fulfill, as well as exploring possible applications of the tools in their specific contexts

**Keywords:** Program optimization; nutrition modeling; evidence-based policy making

#### 52. RESILIENT MORINGA: A CROP FOR SUSTAINABLE NUTRITION, HEALTH, AND AGRICULTURE IN AFRICA

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**Introduction and Background:** Nutrients and isothiocyanates (ITCs) formed in the leaves of *Moringa oleifera* (MICs) have potential to provide chemically stable, low-cost, and sustainable diet-based therapeutic agents to prevent and treat malnutrition, chronic inflammation, and related metabolic conditions in developing countries. Plant-produced ITCs are known to convey cytoprotective and anti-inflammatory activity by affecting several intercellular pathways including induction of Phase II detoxifying enzymes. In addition to moringa's nutrient density and sustainable cultivability, MICs confer unique physical and chemical properties, rendering them relatively stable compounds unlike other ITCs formed in cruciferous vegetables.

**Methods:** A simple extraction/biotransformation was developed to convert moringa glucosinolates into MICs resulting in a food-grade moringa concentrate (MC) that contains approximately 3% MICs by dry weight. MC, and MICs purified by high pressure liquid chromatography, were evaluated for thermal stability, anti-inflammatory activity invitro, and anti-diabetic and anti-obesity properties in vivo.

**Results:** Our studies showed MICs can significantly decrease inflammatory cytokine expression in macrophages and reduce glucose production in liver cells more effectively than SF. The animal study showed using a 5% MC supplementation in a very high-fat diet decreased weight gain by 20%, improved blood glucose metabolism, reduced the appearance of fatty liver, and decreased circulating levels of insulin, leptin, inflammatory cytokines, cholesterol, and triglycerides compared to the control mice.

**Conclusion:** Our phytochemical analysis and mechanist studies further support the use of moringa for its nutritional, cytoprotective and therapeutic effects. These data suggest MC to be a promising dietary agent for the prevention and treatment of pathological states related to malnutrition and chronic inflammation. Ongoing work in Kenya to develop best practices for sustainable cultivation of moringa, combined with further animals studies, will provide a conceptual framework to support further pre-clinical and clinical studies for dietary integration of MC.

**Key Words:** Moringa, nutrition, inflammation, diabetes, isothiocyanates

### 53. Adherence to Self-Care Recommendations and Associated Factors among Adult Heart Failure Patients at Gondar University Referral Hospital, Northwest Ethiopia

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**Background:** Nowadays, heart failure related morbidity and mortality is increasing globally. It affects younger age Africans more than Europeans and Americans. Though medication is available, low sodium diet, regular exercise, and weight monitoring are essential to control heart failure symptoms and its exacerbations, poor adherence to these treatment recommendations is contributing to an increasing in hospitalization, morbidity, and

mortality. Therefore, the aim of this study was to assess adult heart failure patients' adherence to self-care recommendations and its associated factors.

**Methods:** A hospital-based cross-sectional study was conducted among 310 adult heart failure patients selected by systematic random sampling technique at Gondar University Referral Hospital, from February to May, 2017. Data were collected through face to face interview and from patients' medical records. The collected data were analysed using SPSS version 20. Binary logistic regression was used to check the effect of different factors on patients' adherence level.

**Results:** Of 310 study participants only, 22.3% ( 95% CI, 17.4%-26.8%) of heart failure patients reported good adherence to their self-care recommendations. Adherence to self-care was positively associated with being male in gender (AOR=2.34, 95% CI: 1.18-4.62), good level of heart failure knowledge (AOR =2.49, 95% CI: 1.276-4.856) and absence of chronic comorbid diseases (AOR =2.57, 95% CI: 1.28-5.14).

**Conclusions and Recommendations:** Overall, heart failure patients' adherence to self-care recommendations is poor and selective. Being male in gender, absence of chronic comorbidity, and good level of heart failure knowledge were positively associated with adherence to self-care recommendations. It is therefore strategic to plan improving heart failure patients' knowledge about heart failure signs, symptoms and its treatment to improve patients' adherence level.

**Keywords:** Self-care, Heart Failure, Adherence, Gondar, Ethiopia.

### 54. ASSESSMENT OF KNOWLEDGE & PRACTICES OF WORKING MOTHERS TOWARDS EXCLUSIVE BREASTFEEDING IN FIVE HEALTH CARE CENTRES AT KHARTOUM LOCALITY

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**BACKGROUND:** There are increasing numbers of women who join the workforce in both rural and urban areas of Sudan, and their contribution to the economy is very considerable. At the same time, their ability to exclusively and continually breastfeed their infants and young children is essential to ensure a healthy, well nourished, and economically productive future workforce. A cross sectional study was carried out in five health care centers in Khartoum Locality to assess the knowledge & practice of working mothers towards exclusive breastfeeding.

**MATERIAL & METHODS:** Two hundred mothers were selected by convenience sampling to participate in this study. The data was collected using a questionnaire, and was analyzed by using SPSS program.

**RESULTS:** Revealed that working mothers have short inter-pregnancy intervals. More than half of the working mothers (56%) did not benefit from maternity leave. Regarding working mothers' knowledge, the result revealed that 52% of the mothers stated that exclusive breastfeeding provides all the nutrition required by a healthy new born up to the age of six month and 18% stated that, formula-feeding is more convenient than breastfeeding and 75% agreed that formula fed babies increased the babies weight more than breast fed infants. As for bonding, 54% of the working mothers who fed formula to their children missed out bonding experiences, 48% of the mothers intended to resume work believed that formula feeding is a better choice. Only 35% of the working mothers practiced exclusive breastfeeding, 45% initiated breastfeeding within 1 hour of birth, 68% started providing complementary feeding before the age of 6 months, and 74% did not express milk when going to work. No relationship was detected between family size and practice of breastfeeding, education level and breastfeeding practices, nutritional status for babies and breastfeeding practices ( $P$  value  $\geq 0.05$ ). Significant relationship was detected between mothers' occupation and breast feeding practices ( $P=0.00$ ) where mothers working in the governmental sector had more tendency to practice exclusive breastfeeding (89.5%) than those in the private sector.

**RECOMMENDATIONS:** Provision of information on breastfeeding in health facilities, and promotion of legislations on maternity leave and nursing hours.

**KEYWORDS:** Knowledge, practice, exclusive breastfeeding, working mothers, Sudan

#### 55. PREDICTORS OF GLUCOSE CONTROL IN CHILDREN AND ADOLESCENTS WITH TYPE 1 DIABETES: RESULTS OF A CROSS-SECTIONAL STUDY IN KHARTOUM, SUDAN.

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**BACKGROUND:** Type 1 diabetes mellitus (T1DM) is a rapidly growing problem in Sudan as well as other African countries.

Children and adolescents with type 1 diabetes have previously been found to have poor glycemic control. Strict glycemic control reduces the incidence and progression of chronic complications. The aim of this study was to identify the factors associated with glycemic control among children and adolescents.

**METHODS:** The study was a health-center based descriptive cross-sectional study. Data on socioeconomic, demographic, disease history, and diabetes specific variables was obtained. Glycemic control was assessed by measuring glycosylated hemoglobin (HbA1C). Linear regression analysis was done to determine factors associated with glycemic control.

**RESULTS:** One hundred Sudanese children with T1DM aged from (1-18) years were recruited for the study (63 % females). Most of the study children (80%) had high random blood glucose levels. Less than half (40%) suffered from presence of urine glucose and one quarter of them had urine ketones. In addition, Glycosylated hemoglobin (HbA1c) level of the study children showed that more than three quarters of them (76%) had poor glycemic control. It was found that there was no relationship between nutritional status and glycemic control. However, there is a relationship between socioeconomic status and glycemic control ( $P= 0.025$ )

**CONCLUSIONS:** To improve metabolic control, more frequent Blood Glucose Monitoring (BGM) should be encouraged among children and adolescents with T1DM. Emphasis needs to be put on providing families with children with diabetes with the medical, financial and social support for better control of their diabetes.

**KEYWORDS:** Diabetes mellitus; Glycemic control; Children; Adolescents; Sudan.

#### 56. REVIEW OF APPROACHES AND EVIDENCE ON PRIVATE SECTOR ENGAGEMENT IN ACCESS TO NATURALLY NUTRITIOUS FOODS AND SCALE UP OF FORTIFIED FOODS

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**Background:** The private sector produces virtually all food consumed globally. Recently, businesses have made various commitments to reduce malnutrition, but how to translate these commitments into concrete actions has yet to be determined. This presents an opportunity to enhance food systems to support global

nutrition by leveraging the skills, expertise and resources of the private sector. The DFID-funded Maximising the Quality of Scaling Up Nutrition Plus (MQSUN+) project recently assessed existing business initiatives aimed at reducing malnutrition and provided recommendations to support sustainable actions moving forward.

**Methods:** MQSUN+ collected information through desk research and interviews with 85 people representing 65 organisations, including 33 for-profit businesses, 22 development organisations, 6 donor agencies and 4 research organisations. Of the 33 businesses, 17 were multinational corporations, 7 regional businesses, and 9 small and medium-sized enterprises (SMEs).

**Results:** Two of the identified pillars through which the private sector may have directly or indirectly impacted nutrition were: 1) access to naturally nutritious foods, and 2) scale up of fortified foods. For each pillar, one or more pathways laid out actions along private sector value chains—from product development to sales. For Pillar 1, the most successful pathways supported SMEs through vertical integration in global value chains, partnerships between smallholder farmers and larger companies and technology solutions to increase farmers' access to inputs and technical advice. For Pillar 2, fortification of staple foods and condiments was the most successful pathway due to decades of experience, advocacy, legislation and support.

**Conclusion:** The review recommended the following business engagement in nutrition: creating partnerships between businesses and NGOs/technical agencies; vertical integration of smallholder farmers and other supply chain actors; sharing of resources; proximity solutions for production through sales; and innovative use of existing technologies. These findings may support governments, donors and civil society to develop approaches to leverage business investments for more effective nutrition impact.

**Key words:** private sector, business, nutrition, fortification, food system

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**Background:** In 2016, the UN Network for Scaling Up Nutrition (SUN) and SUN Movement Secretariat (SMS) developed a checklist on the criteria and characteristics for 'good' national nutrition plans. The checklist is intended to guide the development of new nutrition plans and to assist in the review of existing plans and other planning documents. Together with SMS, the DFID-funded Maximising the Quality of Scaling Up Nutrition Plus (MQSUN+) project is supporting the systematic review of 12+ national nutrition plans, based on this checklist, to assess quality and equity considerations and provide recommendations for improvement.

**Methods:** SMS and MQSUN+ developed a review protocol based on the checklist that was adapted to an online survey and pilot tested on two country nutrition plans. The survey includes both quantitative and qualitative questions. Two reviewers assessed each country plan using the protocol and online tool. The collated analysis will include both high-level cross-country summary results and individual country plan assessment and recommendations.

**Results:** To date, 10 country plans have been reviewed, and it is expected that an additional 5 reviews will be completed. While analysis is ongoing, the initial results demonstrate that most reviewed country plans had at least the basic essential components of a situational analysis, goals, objectives, and targets, planned priority actions, and governance mechanisms. Other components had mixed results or are currently being further evaluated. The full findings will be completed by September 2018.

**Conclusion:** The multisectoral nutrition planning process across countries varies. This review highlights 'good' examples for cross-country learning, and provides country-specific recommendations or next steps for future planning efforts. The review also provided the opportunity to test the 'good' national nutrition plan checklist on application and feasibility, and where to strengthen guidance to support SUN countries in scaling up nutrition action.

**Key words:** nutrition, multisectoral, SUN, Scaling Up Nutrition, planning

## 57. SYSTEMATIC REVIEW OF SUN COUNTRIES' NATIONAL NUTRITION ACTION PLANS

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## 58. EFFECTIVE MULTISECTORAL ACTION IN NUTRITION BRIDGING THE HUMANITARIAN-DEVELOPMENT DIVIDE

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**Background:** In nutrition, humanitarian and development action are divided between the narrow set of nutrition-specific activities by humanitarian organisations and the prevention-focused multisectoral strategies associated with development efforts. The DFID-funded Maximising the Quality of Scaling Up Nutrition Plus (MQSUN+) project recently conducted a study to capture the field and organisational experiences that hinder or promote alignment between these divisions.

**Programme Intervention:** MQSUN+ provides technical assistance to Scaling Up Nutrition (SUN) countries and the SUN Movement Secretariat to catalyse multisectoral country efforts to scale up nutrition efforts, including global guidance and direct country support looking at the humanitarian-development divide.

**Methods:** MQSUN+ conducted this study using a multi-country qualitative research design, including a documentary analysis and focus group and key informant interviews undertaken with 42 stakeholders.

**Key Findings:** In general, the studied countries all had some of level of functionality of humanitarian and development efforts, including established or forthcoming nutrition policies and programmes, current nutrition data collection and government interest and/or engagement in addressing malnutrition. Existing challenges are limited human resources or capacity to provide services; continued conflict to adequately carry out or expand development activities; lack of coordination between different actors; and inconsistent access to funding, supplies and infrastructure.

**Programme Implications:** Key recommendations from the study include: develop/revise national nutrition plans/strategies to streamline nutrition action; engage humanitarian actors in the SUN/development process (and vice versa) to ensure actions are aligned and integrated; strengthen SUN platforms, such as multi-stakeholder platform, SUN Donor Network, SUN Business Network, etc. and extend participation to actors in resilience; and improve government capacity and coordination, at both national and regional levels, to address nutrition in both humanitarian and development efforts. MQSUN+ has incorporated these recommendations when providing technical assistance to numerous African countries currently experiencing fragile contexts.

**Key words:** humanitarian, development, nutrition, technical assistance, policy

## 59. COMPARATIVE ANALYSIS OF WEIGHT GAIN IN RATS FED WITH CORN OIL AND OLIVE OIL SUPPLEMENTED DIETS

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**Background:** Corn oil and olive oil contain a considerable amount of monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA) with low saturated fatty acids (SFA) and studies have shown their consumption has health benefits. The study aimed to compare the effect of corn oil and olive oil supplemented diet on the body weight, and biochemical parameters of Wister rats.

**Method:** A total of 9, three-weeks old male rats were randomly divided into three equal groups (n=3) and fed ad libitum for eight (8) weeks. Group A was considered as control and fed with standard chow, group B was supplemented with olive oil (20g/100g) and group C was supplemented with corn oil (20g/100g). At the end of the experimental trial, the rats were sacrificed for biochemical analysis. Data obtained were analysed for means, ANOVA and Pearson correlations at a significant level of  $P < 0.05$ .

**Results:** There was no significant difference ( $P > 0.05$ ) in the mean actual weight gain of all the groups over the study period. A moderate correlation was observed between feed intake and actual weight gain ( $r = 0.350$ ;  $p = 0.003$ ) and between the weight of the rat and the actual weight gain ( $r = 0.329$ ;  $p = 0.005$ ). The study found no association between feed weight and weights of rats, the type of feed also had no significant effect on weight gains of the rats. A marginal negative correlation ( $r = -0.230$ ;  $p = 0.052$ ) was observed between feed type and rat weight. There was no significant difference ( $P > 0.05$ ) in all the mean organ weights with the exception of kidney that showed a marginal significant difference ( $P = 0.052$ ).

**Conclusion:** The oil supplemented diets had no significant effect on the weight and organ weight of the rats. Genetic tendency to gain weight and the quantity of feed intake play more role in weight gain than the type of feed consumed.

**Key words:** corn oil dietary supplemented diet, olive oil dietary supplemented diet, biochemical parameters, rats

## 60 What are the Stories of Change in the Nutrition landscape in Ghana?

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**Background:** There is heightened global- and national-level interest and commitment in nutrition. The capacity to leverage this interest to transform the nutrition landscape is critical to addressing the high and persistent rates of malnutrition in Africa. The Transform Nutrition West Africa (TNWA) Stories of Change Initiative aims to improve the agenda setting, conceptualization, and implementation of policies and planning related to nutrition at national and subnational levels in three countries in West Africa, including Ghana. In the current paper, we describe initial findings of the initiative's efforts to understand what the nutrition priorities are in Ghana with respect to outcomes, processes, and opportunities.

**Methods:** An initial consultative meeting with multiple stakeholders across government and non-government agencies in Accra in July 2018 generated preliminary ideas of key areas of focus across the nutrition landscape in Ghana. Subsequently, exploratory interviews with eight key informants (plus one submitted statement) was conducted. The data from the consultation and interviews were analyzed using thematic analysis, to prioritize the potential key nutrition issues, the drivers of change, and opportunities for stakeholder engagement.

**Findings:** the key changes that were reported to have occurred in Ghana over the past 10 years by stakeholders were 1) expanded economy and infrastructure development [roads, health facilities, health insurance], 2) decline in rates of maternal and child mortality and child stunting, but increased maternal obesity, 3) increased implementation of social protection programs [school meals, cash transfer to ultra-poor], and 4) changes in food systems [food security and energy dense food access]. Further, national, and sub-national multi-sectoral platforms were established, and national nutrition policy was approved. However, private sector and non-government actors have not been adequately plugged into the process for change, and there is limited understanding of why obesity is rising rapidly among women.

**Conclusions:** Diverse range of actions and players were identified as relevant for leveraging change in nutrition in Ghana. Coordinated action is needed at local and national levels to drive sustained change across sectors.

**Keywords:** nutrition landscape, malnutrition, stories of change, obesity, social protection programs

## **61. NUTRITIONAL STATUS OF CHILDREN BELOW FIVE YEARS AND ITS ASSOCIATION WITH INTESTINAL PARASITES IN ADADLE WOREDA, SOMALI REGION OF ETHIOPIA**

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**Background:** Children of pastoralist and sedentary communities in the Ethiopian Somali Regional State (ESRS) are at high risk for undernutrition and intestinal parasitic infections (IPIs), but specific up-to-date data is not available. We aimed to assess the association between nutritional status and IPIs in children 1 to 5 years of age living in the ESRS.

**Methods:** A clustered cross-sectional study OF 492 CHILDREN was carried out in the Adadle district of ESRS. Stool samples were examined using single Kato-Katz and sodium acetate-acetic acid-formalin methods. Anthropometrics, hemoglobin, plasma ferritin, soluble transferrin receptor, C-reactive protein, alpha-1-acid glycoprotein and retinol binding protein were measured. Demographics, socioeconomic factors, duration of exclusive breastfeeding, and food variety score (FVS) were determined using a questionnaire.

**Results:** The median Z-scores (IQR) of height for age, weight for age and weight for height were -1.5 (-2.2, -1.0), -1.8 (-2.7, -1.0) and -1.2 (-2.5, 0.0), respectively. Low middle upper arm circumference (MUAC<12.5 cm) was found in 16% of the children. Anemia, iron deficiency (ID) and vitamin A deficiency (VAD) were 75%, 91% and 30% respectively. At least one IPI was found in 47% of the children. The most prevalent IPIs were *Giardia lamblia* (22%) followed by *Ascaris lumbricoides* (15%) and *Entamoeba histolytica* (4%). The median FVS was 2 (IQR 2-4). Exclusive breastfeeding up to six months was associated with a lower risk of anemia (odds ratio [OR]: 0.75, 95% CI: 0.68-0.82). Low FVS was associated with an elevated risk of anemia (OR: 0.69, 95% CI: 0.63-0.75) and the risk of MUAC<12.5 cm was higher in *Giardia lamblia* infected children (OR: 1.22, 95% CI: 1.11-1.33).

**Conclusion:** The prevalence of anemia, ID, VAD, and IPIs are extremely high in young children living in ESRS. Appropriate interventions addressing the low dietary diversity are urgently needed in this region.

**Key Words:** Children <5 years, undernutrition, ESRS, micronutrient deficiencies, intestinal parasitic infections

## 62. VALUE CHAIN OF MICRO-NUTRIENT-RICH FOODS: THE CASE OF AFRICAN INDIGENOUS VEGETABLES IN KENYA

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**INTRODUCTION:** Even though African Indigenous Vegetables (AIVs) have been part of food systems for generations, they used to be primarily considered as food for rural and poor households. However, AIVs are important source of micronutrients such as vitamin A and C, iron, calcium, magnesium, and anti-oxidants required for normal growth and health. In this way, AIVs contribute to reduction of "hidden hunger". Given the benefits of indigenous vegetables, it is clear that their promotion will go a long way to improve pressing challenges of food and nutrition security.

**METHODS:** Funded by the German Ministry of Education and Research (BMBF), project HORTINLEA conducted a panel survey in rural and peri-urban areas of Kenya in 2014, 2015 and 2016 with the aim of understanding performance of AIV value chains. Using the value chain framework, AIV production practices, consumption preferences and market options are assessed.

**RESULTS:** African nightshade was the most common AIV variety in terms of production, marketing and consumption. Most households sell their AIVs directly to consumers at local open markets. Some also sell to middlemen and retailers, however, they do not have contract with the buyer. Even though most producers sell AIVs individually, some sell AIVs in groups (e.g. in rural county of Kakamega). Sell of AIVs to supermarkets is limited to less than two percent of respondents, the highest being amaranth followed by African nightshade and cowpea. Most traders and consumers use local open markets as their main channel of markets for AIVs.

**CONCLUSIONS:** Local open markets are the most viable channel of AIV marketing for producers, traders and consumers. Improving the marketing condition of AIVs via formal contract among AIV producers and retailers/supermarkets would improve performance of AIV value chain. In addition, value addition along the value chain could create employment opportunities.

**KEY WORDS:** African indigenous vegetables, value chain, micro-nutrient, Kenya.

## 63. BALANCING WORK RESPONSIBILITIES WITH CHILDCARE AND BREASTFEEDING: THE PERSPECTIVES OF INFORMALLY WORKING WOMEN IN KWAZULU-NATAL, SOUTH AFRICA.

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**INTRODUCTION/BACKGROUND:** Returning to work is a major barrier to exclusive and sustained breastfeeding among working women. In South Africa, many women are in informal work without access to maternity benefits, and little is known about their feeding and child care practices.

**OBJECTIVE:** To explore the understanding and perceptions of child care and feeding practices, and the challenges within the context of informal work, among mothers and men working in the informal economy.

**METHODS:** A cross-sectional non-probability design was used. Purposive and snowball sampling were used to recruit participants in an urban and a rural site in KwaZulu-Natal. Focus group discussions (FGDs) were conducted with men and women working informally. All participating women were mothers with children under five years. Framework analysis was used. All participants provided written informed consent.

**RESULTS:** Fourteen FGDs were conducted between April-July 2017. Both men and women acknowledged the importance of breastfeeding, and were knowledgeable about breastfeeding benefits and dangers of formula feeding. Having a baby was a vulnerable time for women working in the informal sector, and financial and familial pressures required the women to return to work soon after the baby was born. This frequently led to changes in feeding practices and early introduction of other food and fluids. Mothers mentioned formula milk, rooibos tea, and maize porridge as food and fluids commonly given to babies upon returning to work. Some mothers were able to bring their children to work with them but mentioned that the work environment was often unhygienic, unsafe and not conducive for breastfeeding. The men in the FGDs highlighted that breastfeeding in public places was not acceptable, and mentioned that cultural attitudes were key barriers to women breastfeeding in the workplace.

**CONCLUSION:** There is a need for interventions to promote breastfeeding in the workplace and to sustain breastfeeding after return to work.

**KEYWORDS:** breast feeding; working women; workplace; child health; South Africa; informal economy.

#### **64. FROM HIV AND INFANT FEEDING GUIDELINES TO PRACTICE: IMPLEMENTATION OF A TEAM-BASED, ON-SITE INTERVENTION TO IMPROVE HEALTH WORKER KNOWLEDGE, ATTITUDES AND SELF-EFFICACY**

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**INTRODUCTION/BACKGROUND:** HIV and infant feeding guidelines have changed frequently in recent years leading to confusion among health workers (HWs) responsible for providing counselling to HIV-infected mothers.

**OBJECTIVE:** We describe an intervention to disseminate revised 2016 WHO HIV and infant feeding guidelines to primary healthcare (PHC) teams.

**METHODS:** We convened reference groups to explore current practices in infant feeding and challenges faced by HWs providing breastfeeding counselling. The findings, together with a significant-learning taxonomy and the theory of planned behaviour, were used to develop a participatory team-based mentoring programme to change attitudes, and improve knowledge and self-efficacy of HWs providing breastfeeding counselling to HIV-infected mothers.

Three workshops were undertaken at PHC clinics, lasting 1-2 hours over three consecutive weeks. Activities comprised participants identifying their own knowledge gaps around breastfeeding, discussion of breastfeeding controversies, key breastfeeding and HIV messages, exploring the advantages of breastfeeding, progressive breastfeeding case studies highlighting breastfeeding challenges in the context of HIV, and individual clinical mentoring.

**RESULTS:** In total 303 health workers were identified to participate in the intervention from 24 clinics. Attendance in workshops was high (87.5%, 84.8% and 84.5%). The most common knowledge gap prioritised by participants was the role of HIV viral load and ART adherence monitoring in counselling breastfeeding mothers (173 participants), followed by management of breast conditions (79), and timing of breastfeeding cessation (68). Participants reported key learnings namely, how to manage breast conditions (101); the importance of ART adherence during breastfeeding (25); promoting expressing and storing of breastmilk (18 participants); and risks of

mixed feeding (10). Participants indicated that learnings would change their practice.

**CONCLUSION:** A team-based approach where participants with different roles and responsibilities learn together on-site, using an intervention guided by participants own identified learning gaps, provides a novel approach to changing HIV attitudes and improving knowledge about counselling HIV-infected breastfeeding mothers.

**KEY WORDS:** Infant feeding; breastfeeding; HIV; mentoring, South Africa

#### **65. IMPROVED RATES OF EXCLUSIVE BREASTFEEDING BUT HIGH RATES OF EARLY BREASTFEEDING CESSATION: FINDINGS OF TWO CROSS-SECTIONAL SURVEYS IN KWAZULU-NATAL, SOUTH AFRICA.**

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**INTRODUCTION/BACKGROUND:** Rates of exclusive breastfeeding (EBF) have been low in South Africa, and there have been several recent initiatives to support breastfeeding in KwaZulu-Natal.

**OBJECTIVE:** To determine the trends in breastfeeding practices at 14 weeks of age between 2014 and 2017.

**METHODS:** Cross-sectional surveys were undertaken in primary health care clinics at two time points using multistage-stratified random sampling. All mothers and caregivers of infants aged 13- <15 weeks of age attending the clinics during the study period were requested to participate in a structured interview to explore feeding practices since birth. Data were collected on android devices and analysed with STATA. All participants provided written informed consent.

**RESULTS:** At baseline and follow-up 4172 and 929 interviews respectively were conducted with child-carers. Socio-economic and demographic information was similar at baseline and follow-up. EBF rate increased non-significantly from 44.6% at baseline to 50.5% at follow-up ( $p=0.9$ ), and rates of mixed feeding reduced significantly from 23.2% to 16.3% ( $p=0.016$ ). However, rates of non-breastfeeding at 14weeks did not change between baseline and



follow-up (31.9% vs 32.8%;  $p=0.15$ ). Among 3649 and 788 mothers interviewed the proportion who were EBF improved significantly from 49.4% to 59.3 ( $p=0.002$ ). However, the proportion who did not initiate breastfeeding was similar (10.0% vs 7.2%;  $p=0.1$ ), as was the proportion of mothers had stopped breastfeeding by 14 weeks (17.0% vs 17.1%;  $p=0.15$ ). Most mothers who had stopped breastfeeding did so in the first month at both time points (69.4% vs 62.3%). Commonest reasons for stopping breastfeeding reported by mothers at follow-up were having to go back to work, perceptions of insufficient milk and poor health of the mother, including HIV.

**CONCLUSIONS:** Although rates of EBF improved, high rates of non-breastfeeding at 14 weeks remained. If sustained breastfeeding is to be improved, stronger support is required for breastfeeding challenges to reduce early breastfeeding cessation.

#### 66. EFFECT OF MALTED SORGHUM-BASED PORRIDGE SUPPLEMENTATION ON THE ANTHROPOMETRIC AND BIOCHEMICAL OUTCOMES OF INFANTS AND YOUNG CHILDREN AGED 6 TO 18 MONTHS WITH MODERATE ACUTE MALNUTRITION IN ARUA DISTRICT, UGANDA

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**INTRODUCTION:** Energy rich and nutrient-dense hydrolysable malted sorghum based porridge (MSBP) was used in the treatment of infants and younger children (IYC) aged 6-18 months with moderate acute malnutrition (MAM) compared to fortified corn soy blend (CSB+), the standard of care in Uganda. Evidence-based studies of this nature had not yet been conducted in Uganda. This study evaluated the effect of MSBP and CSB+ in combination with nutrition education on anthropometric and biochemical outcomes among IYC aged 6 to 18 months with MAM.

**METHOD:** A double-blind cluster randomized control trial study was conducted with 220 IYC diagnosed with MAM. This study was conducted using 24 clusters of 8-10 with MAM in Arua District. Daily dose of 150g of MSBP or CSB+ was fed to IYC for three months. Weekly anthropometric measurements of IYC were conducted. Haemoglobin level was determined only at baseline and end of study. At three months, the mean anthropometric outcomes of weight gain, length gain, length-for-age z-scores, weight-for-age z-scores, length-for-weight z-scores, and the biochemical mean of blood haemoglobin levels in the treatment and control groups were

compared using the independent t-test. The z-test was used to compare proportions of the outcome indicators between the treatment and control groups.

**RESULTS:** At three months, the mean weight-for-age z-score difference of IYC in the treatment group was significantly higher than those in the control group ( $p=0.01$ ). The change in mean haemoglobin levels was significantly smaller in the treatment group when compared to that of the control group ( $p=0.01$ ).

**CONCLUSION:** MSBP supplementation to IYC with MAM results in comparable recovery rates in regards to weight-for-length z-scores and improved haemoglobin levels, similar to that of CSB+.

**KEY WORD:** malted sorghum-based porridge, MAM, IYC

#### 67. FORMULATION, SENSORY ATTRIBUTES AND NUTRIENT DENSITY OF A MALTED SORGHUM BASED PORRIDGE FOR THE MANAGEMENT OF INFANTS AND YOUNG CHILDREN WITH MODERATE ACUTE MALNUTRITION

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**INTRODUCTION:** Substitution of a portion of maize in the fortified corn-soy blend (CSB+) with enzyme active sorghum malt would lower the quantity of maize extruded. This would reduce the cost of production and boost coverage in the management of infants and young children (IYC) with moderate acute malnutrition (MAM) in Uganda. This study developed energy and nutrient dense malted sorghum based porridge (MSBP) for managing MAM.

**METHODS:** MSBP was formulated (using the NutVal software) from malted sorghum flour and extruded soy-maize flour. Four MSBP formulations (F617, F593, F892 and F940) met the specifications of a supplemental food for IYC with MAM and were subsequently assessed for consumer acceptability ( $n = 51$  mothers). Extruded soy and maize were combined in a ratio of 3:7 for F617 and F593 formulations, 1:1 for F892 and F940, and 4:1 for corn soy blend (CSB+), the standard of care of IYC with MAM. For F617 and F892 formulations, 25% sorghum malt was added; while 30% sorghum malt was added for F593 and F940 formulations. Analysis of variance was used to compare the acceptability scores and viscosity of the different MSBP formulations to test for significant differences between the means scores.

**RESULTS:** The formulations had significantly different ( $p<0.05$ ) acceptability scores for flavour, taste, mouth feel, sweetness and overall acceptability. F617 had significantly ( $p<0.05$ ) higher mean acceptability scores than F93, F892 and F940. F617 had significantly ( $p<0.05$ ) higher energy and nutrient contents than SCB+. F617 at a flour rate of 25%, had energy density, protein density and viscosity of 1.6kcal/g, 4g/100kcal and 2809cP.

**CONCLUSION:** A quarter of sorghum malt mixed with three quarters of extruded soy-maize (F617) produced an energy-rich, nutrient-dense MSBP with acceptable sensory attributes at optimal viscosity.

**KEY WORD:** sorghum malt, moderate acute malnutrition, infants, young children

#### 68. ASSESSING MULTISECTORAL COORDINATION FOR NUTRITION POLICY EFFECTIVENESS: ANALYSIS OF FACILITATORS, CONSTRAINTS AND SOLUTIONS FOR EFFECTIVE IMPLEMENTATION AT THE WOREDA LEVEL

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**BACKGROUND:** Ethiopia has demonstrated a strong policy commitment to nutrition through development of a National Nutrition Strategy (NNP I) followed by NNP II. Both NNP's have emphasized the establishing and strengthening of the national and subnational multisector coordination bodies as critical in achieving the goals of the NNPs. In the past, ENGINE project invested in building capacity for multisectoral coordination at the woreda level. This study focuses on understanding the facilitators, barriers and constraints involved in the conversion of policy initiatives into actions at the woreda level.

**METHODS:** The study was qualitative with purposive sampling. A total of 80 KIIs and 12 FDGs conducted at woreda and regional levels covering 12 woredas in four big regions from (model – ENGINE support establishment of coordination bodies and provided routine follow up support,) non-model (ENGINE support in establishing the coordination boards, but not the routine follow-up) and non-ENGINE woredas - received no ENGINE support.

**RESULTS:** Overall, 36.6% of respondents reported involvement in the implementation of the NNP. Many more respondents from the Model woreda reported the presence of a formal nutrition coordination committee (47.8%) than the non-Model (8.3%) and the

non-ENGINE woredas (16.7%). The main challenges for implementing the NNP in their woreda were lack of budget/resources (39.4%), lack of collaboration/coordination (14.1%), transportation/logistical challenges (14.1%), and lack of strong leadership/political commitment and attention (12.7%). The ways to improve collaboration between sectors in their woreda, included defining the roles and responsibilities of the sectors, including making them responsible for nutrition activities (16.9%), appointing a responsible coordinator or coordinating body to lead, organize and evaluate collaboration (28.2%), and improving the coordination of collaborating and shared sector planning (26.8%).

**CONCLUSIONS:** There has been significant progress on governance and implementation of the NNP. There is a higher level of awareness of the NNP in Model woredas. In addition, Model woredas have consistently identified the need for more capacity and a clearer identification of specific roles and responsibilities as essential elements for achieving progress in the NNP.

**KEY WORDS:** Multisectoral, Coordination, NNP, Policy, Ethiopia

#### 69. EVALUATION OF HERMETIC TECHNOLOGIES IN CONTROLLING MOULD PROLIFERATION AND MYCOTOXIN CONTAMINATION OF STORED MAIZE

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**INTRODUCTION:** Hermetic storage technologies provide a reliable solution for maize grain that reduce losses and may also preserve food safety. Several studies report the effectiveness of these technologies against post-harvest insects in Africa but provide limited evidence on effectiveness against mould proliferation and mycotoxin contamination. Therefore, a trial was conducted to compare hermetic technologies with farmer practice in their effectiveness against both mould proliferation and mycotoxin contamination.

**METHODS:** The trial was conducted for eight months in a semi-arid region in Eastern Kenya. Three factors were used: 1) natural or artificial fungal inoculation with *Fusarium* and *Aspergillus*; 2) low (12-13%) or high (14-15%) grain moisture levels; 3) ten storage technologies including two controls, the standard woven polypropylene bags with grain treated with insecticide and one

without. The experimental design was a 2 x 2 x 10, Randomized Complete Block Design (RCBD) with 3 replications. Each grain sample was divided in two for mycotoxin analysis (*aflatoxins* and *fumonisin*), and fungal analysis and sampling was done at baseline and every 120 days.

**RESULTS:** In non-inoculated grain, fungal populations were varied but included mycotoxin-producing *aspergillus* and *fusarium spp.* Fungal population and mycotoxin levels increased with higher moisture in both inoculated and non-inoculated grain. At 8 months, *Aflatoxin* levels increased by 45.2% and no significant difference in *fumonisin* ( $P>0.05$ ). *Aflatoxin* and *fumonisin* were significantly high even in non-inoculated grains at high moisture indicating the need to adequately dry grain before storage in hermetic technologies. In inoculated grain at high moisture, there was an increase in aflatoxin in both hermetic treatments and the control by 2.91 ppb and 16.19 ppb respectively.

**CONCLUSIONS:** Hermetic storage technologies can be an effective solution to reduce mould proliferation and mycotoxin contamination during on-farm storage, thereby reducing potential human and animal exposure to mycotoxins if maize is adequately dried.

**KEY WORDS:** Post-harvest loss; hermetic storage; mycotoxins; health; food insecurity

## 70. SEASONAL VARIATION IN HOUSEHOLD FOOD ACCESS AND DIETARY DIVERSITY OF MOTHER-INFANT DYADS IN TWO AGRO-ECOLOGICAL ZONES OF RONGAI, NAKURU COUNTY, KENYA

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**INTRODUCTION:** Little is known on the influence of seasonality on dietary diversity. This study examined the effects of seasonality on household dietary diversity and diet quality of women and children in two agro-ecological zones of Rongai sub-county, Kenya.

**METHODS:** A cross-sectional study of 388 mother-child pairs was conducted in two agro- ecological zones during lean and plenty season. Household food insecurity access scale was used to measure food security. Household dietary diversity scores (HDDS) were computed based on 12 food groups. 24 Hour Dietary Recall

was used to generate dietary diversity scores (DDS) of women and children.

**RESULTS:** Food secure households in agricultural low potential areas were more ( $P<0.05$ ) during plenty season (57.3%) compared to lean season (36.8%) however HDDS were not different. In high potential areas, the proportions increased from 55.8% to 73.5% while HDDS decreased ( $P<0.05$ ). The DDS of mothers in low potential areas increased from  $3.78\pm0.98$  in lean season to  $3.84\pm1.15$  during plenty season, and from  $4.77\pm1.16$  to  $4.70\pm1.10$  in high potential areas. Mothers who achieved minimum dietary diversity (MDD) also increased; low potential areas (13.9% vs. 57.8%,  $P<0.001$ ) and high potential areas (20.0% vs. 49.1%,  $P<0.001$ ) in lean and plenty seasons. Children's DDS decreased from  $3.57\pm0.085$  to  $3.51\pm0.067$  in low potential areas, and from  $3.56\pm0.072$  to  $3.39\pm0.087$  in high potential areas during lean and plenty season respectively. Furthermore, children who achieved MDD significantly ( $P<0.05$ ) decreased from 58.9% in lean season to 47% during plenty season in low potential areas while there was no difference ( $P>0.05$ ) in high potential areas (lean, 47 %, plenty season 47.1%).

**CONCLUSIONS:** Household food access and dietary diversity of women and children are influenced by seasonality. Thus, it is important to develop area specific nutrition interventions that consider seasonal variation in food access to adequately address diet quality.

**KEYWORDS:** Agro-ecological zones; Seasonal variations; Dietary diversity; Diet quality

## 71. SOCIAL DYNAMICS SURROUNDING INFANT AND YOUNG CHILD FEEDING PRACTICES IN UGANDA: THE ROLE OF FATHERS

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**INTRODUCTION:** Smallholder farmers face high food insecurity and undernutrition. Interventions addressing these shortfalls are affected by decision making and power relations within households and communities. Fathers are often not actively involved in nutrition interventions. This study explored the nutrition status and feeding practices of children aged 6-59 months and role of fathers among farming households in Uganda.

**METHODS:** A structured questionnaire assessed household characteristics, child nutrition status, minimum dietary diversity and feeding practices of 433 farming households in Kiboga,

Kyankwanzi, Mukono, and Wakiso districts. Multi-stage systematic random sampling was used to identify the villages and households.

**RESULTS:** Children with minimum dietary diversity were 37% ( $\geq 4$  food groups); 12% underweight and 38% stunted. Information on child feeding was from health centre (39%) and community health worker (25%). Among the 85% male headed households, 24% of fathers were involved a few times in decision making over child feeding, 31% half/most of the time and 35% not at all. Participation was attributed to having/using money for food (35-40%), desire for healthy children (16-34%), father not physically available (35%), and not concerned with child welfare (32%). Regarding actual child feeding, 23% fed a few times, 22% half/most of the time, and 52% not at all. Child feeding was attributed to being responsible (21-43%), interest in child welfare (29%), and not having time (47%). Receiving information on nutrition was significantly associated with father involvement in decision making ( $p < 0.01$ ) and/or child feeding ( $p < 0.05$ ). Dietary diversity was significantly associated with father making decisions on child feeding ( $p < 0.01$ ) and feeding ( $p < 0.01$ ). Dietary diversity is a good indicator of diet quality.

**CONCLUSIONS:** Fathers' participation should be harnessed to increase intervention outcomes. This can be through activities and information targeting both mothers and fathers. Maximising avenues of information access beyond community health workers and health centres will be beneficial.

**KEY WORDS:** Dietary diversity; gender; father; child; nutrition; decision-making

## 72. EFFECT OF THRESHING GROUNDS ON FUNGAL INVASION AND MYCOTOXINS CONTAMINATION OF SORGHUM GRAIN

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**BACKGROUND AND OBJECTIVES:** Sanitation from harvest to storage are key factors in eliminating sources of infection and reducing levels of mycotoxigenic fungal invasion, and thereby mycotoxins contamination. This study was conducted at Haramaya University, eastern Ethiopia, for two consecutive years to investigate the effects of threshing methods on fungal invasion and mycotoxins contamination of sorghum grains.

**METHODS:** Treatments consisted in four threshing grounds (Threshing on bare ground, cow-dung painted ground, concrete asphalt and canvas). The threshed grain was kept separately in bags in three replications in a completely randomized design and stored for five months. Mycotoxins analyses were done using enzyme-linked immune-sorbent assay (ELISA).

**RESULTS:** The results revealed that all the sorghum grain samples taken from different threshing methods were contaminated with both *Aspergillus* and *Fusarium* species. There were variations in fungal invasion between samples taken immediately after threshing and stored samples. The level of *Aspergillus* spp invasion was much higher in the latter in sorghum grain threshed on bare ground. The concentration of aflatoxin B<sub>1</sub> gradually increased whereas the total fumonisin concentration was decreased with the storage duration both in 2013 and 2014. On stored sorghum grain, the highest (1.97  $\mu\text{gkg}^{-1}$ ) and the lowest (0.70  $\mu\text{gkg}^{-1}$ ) mean aflatoxin B<sub>1</sub> concentration were recorded from sorghum grains threshed on bare ground and on canvas, respectively. Sorghum grain from on canvas threshing ground had significantly lower mean total fumonisin content (142.5, 54.9  $\mu\text{gkg}^{-1}$ ) than grain from the other methods at threshing in the year 2013 and 2014, respectively.

**CONCLUSIONS:** The current finding clearly demonstrated that threshing might have effect on fungal invasion and mycotoxins contamination of sorghum grains. It is, therefore, threshing sorghum on canvas is suggested to offer a safe threshing option for farmers in the sorghum growing areas of Ethiopia.

**KEY WORDS:** Aflatoxin, ELISA, Fumonisin, Mycotoxins, Threshing, Sorghum

## 73. HIGH CARBOHYDRATE INTAKE AND LOW MEAL FREQUENCY ARE ASSOCIATED WITH UNACCEPTABLE GLYCEMIC STATUS AMONG ADULTS WITH TYPE 2 DIABETES IN MALAWI

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**BACKGROUND AND OBJECTIVES:** Diet is integral to type 2 diabetes mellitus (T2DM) management, but this is currently inadequately addressed in Malawi. Understanding local food

consumption is culturally important to inform dietary interventions. Diet and associations with glycemic status among adults diagnosed with T2DM in Malawi was the focus of this study.

**METHODS:** A cross-sectional study (n=428) was conducted in 2017 at urban (n=288) and semi-urban (n=140) government hospitals, targeting adults diagnosed with T2DM. Demographic, anthropometric, physical activity, dietary quality, and glycemic status (HbA1c) were assessed. Twenty-four-hour and typical day recalls were used to derive individual dietary diversity scores (IDDS), preventive diet scores and macronutrient percentage of total energy based on WHO guidelines for chronic disease prevention. Binary logistic regression was used to examine the associations of dietary factors with HbA1C $\geq$ 8%.

**RESULTS:** Mean HbA1c of both males (9.49%) and females (9.17%) was above the recommended target (<8%). The mean kcal intake/day (2345 $\pm$ 556 vs. 1769 $\pm$ 424) and percent of total calories from carbohydrate (79.62% vs. 75.57%) were both significantly (p<0.001) higher than WHO recommendations among participants with HbA1C $\geq$ 8% than HbA1C<8%. Overall, there were disproportionately low daily intakes of fruits and vegetables. Furthermore, a significant (p<0.001) proportion of participants with HbA1C $\geq$ 8% had  $\leq$ 3 meals/day, while 69.38% of those with HbA1C $\geq$ 8% did not follow dietary recommendations compared to those with HbA1c<8% (p<0.05). There were no significant differences for IDDS and preventive diet scores relative to glycemic status. Consuming a diet high in carbohydrates (OR:1.15; CI= 1.09-1.21; p<0.001) and having  $\leq$ 3 meals per day (OR: 2.13; CI=1.16-3.91; p<0.05) increased the odds of not achieving the recommended HbA1C target of <8%.

**CONCLUSIONS:** Dietary quality, especially relative to carbohydrate intake and meal regularity, is poor and negatively impacts glycemic status in this target group. Therefore, dietary interventions that focus on carbohydrate counting, total dietary quality, and meal planning are urgently needed in Malawi.

**KEY WORDS:** Type 2 diabetes mellitus (T2DM), Glycemic status, Diet, Malawi

#### 74. ASSOCIATION OF FARMERS' SORGHUM GRAIN POSTHARVEST HANDLING PRACTICES WITH AFLATOXIN AND FUMONISIN CONTAMINATION IN EAST HARARGHE ZONE, ETHIOPIA

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**BACKGROUND:** Improper postharvest handling practices and adverse climatic conditions are conducive for fungal growth and toxin production. The objective of the present study was to investigate the association of sorghum grain postharvest farmers' handling practices with aflatoxin B<sub>1</sub> and total fumonisin contamination in three districts (Babile, Haramaya and Kersa) of East Hararghe Zone, eastern Ethiopia.

**METHODS:** A total of 90 sorghum grain samples were collected in two rounds, i.e. from farmers' threshing yards at the time of threshing and from underground pits 5 - 6 months after storage in the year 2013/14. Quantification of the mycotoxins was done using enzyme-linked immunosorbent assay (ELISA).

**RESULTS:** Farmers threshed their sorghum grain either on bare ground threshing floor, on cow-dung painted ground or on canvas and the underground storage pits were differently managed in all the three study districts. Variation in mycotoxin contamination levels were observed from sorghum grain threshed using different threshing methods. The highest (8.52  $\mu$ g kg<sup>-1</sup> grain) mean aflatoxin B<sub>1</sub> and mean total fumonisin (1085.1  $\mu$ g kg<sup>-1</sup> grain) were detected from Babile sorghum grain samples threshed on bare ground. The maximum (2002.8  $\mu$ g kg<sup>-1</sup> grain) total fumonisin was detected from Haramaya sorghum grain samples threshed on bare ground near to sorghum field. Variation in mycotoxin levels was also observed on sorghum grain samples collected from the underground storage pits. High aflatoxin B<sub>1</sub> and total fumonisin levels were recorded from sorghum grain samples collected from bare underground storage pits in all the three study districts.

**CONCLUSIONS:** Use of bare underground pits for sorghum grain storage had a high risk of mycotoxins. The findings call for intervention strategies through awareness creation programmes to be implemented by subsistence farmers to reduce grain contamination by aflatoxin B<sub>1</sub> and total fumonisin.

**KEY WORDS:** Aflatoxin, ELISA, Fumonisin, Grain, Mycotoxins, Postharvest, Sorghum

#### 75. PHENOTYPING ELITE PROVITAMIN A MAIZE GENOTYPES FOR DROUGHT TOLERANCE USING MORPHO-PHYSIOLOGICAL TRAITS AND PROLINE

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**BACKGROUND AND OBJECTIVES:** Food and nutrition security are the major challenges facing sub-Saharan Africa (SSA). Maize has a potential role to play in combating food insecurity given its wide production and consumption in this region. However, maize lacks key micronutrients such as vitamin A which affects its suitability to solve both food and nutrition insecurity. This has led to high prevalence of vitamin A deficiency (VAD) particularly in rural SSA. To remedy VAD, HarvestPlus and partners introduced provitamin A maize biofortification in SSA. On the other hand, maize production in the region is constantly under threat from droughts. To counteract this drought tolerance breeding is deemed a sustainable solution. However, drought is a complex trait which is conditioned by many genes and affected by genotype and environment interaction. Therefore, requires integrated approaches of selecting candidate genotypes.

**METHODOLOGY:** Forty-eight elite provitamin A maize inbred lines and 6 checks were screened in the greenhouse and the field for drought tolerance after imposing drought stress a week before flowering. Anthesis silking interval (ASI), number of Ears per Pant (EPP), stomatal conductance, leaf senescence, chlorophyll content, leaf rolling, grain yield and proline content were measured. Drought tolerance index, ANOVA, Pearson's correlation coefficient and principal component analysis were computed.

**RESULTS:** Preliminary results show that lines that had high grain yield under stress and optimum condition maintained high values for yield components such as ear size and ear number. High proline content was observed and was positively correlated to grain yield under drought stress. First two principal components were most important contributing 59.22% of the total variation. Seven lines were earmarked as highly drought tolerant with twenty-four lines being moderately drought tolerant.

#### CONCLUSION

ASI and EPP were effective in selecting drought tolerant genotypes. Proline content can be another trait to use in screening for maize drought tolerance.

**KEY WORDS:** Drought, biofortification, provitamin A, maize

#### SEVERE ACUTE MALNUTRITION, NORTHWEST ETHIOPIA: RETROSPECTIVE COHORT STUDY

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**BACKGROUND:** Globally, more than 29 million children under five years (an estimated 5%) suffer from severe acute malnutrition. Severe acute malnutrition is related to a mortality risk nine times higher than that of the well-nourished child. Little is known regarding predictors of time to recover among children with malnutrition. Therefore, this particular study was aimed to determine treatment outcome and predictors of time to recover among children aged 6-59 months with severe acute malnutrition admitted to a stabilization center.

**METHOD:** A retrospective cohort study was undertaken in 416 children under five years old. Data were extracted from a randomly selected subjects' charts after getting ethical clearance. Data were cleaned, coded and entered to Epi-info 7 and analyzed by STATA version 14. The descriptive outcome summary was computed by using tables, Kaplan Meir graphs. Multivariable Cox proportional hazards model was fitted to identify predictors of time to recovery.

**RESULT:** A total of 416 records was recruited in the analysis. At the end of the follow up, 288 (69.2%) were cured and all in all median recovery time of this study was 11 days. Children without kwashiorkor AHR: 1.48(95% CI: 1.01, 2.16), children who haven't anemia AHR: 1.36(95% CI: 1.07, 1.74), children without TB disease AHR: 1.6(95% CI: 1.04, 2.43) and those with normal body temperature at admission AHR: 1.58(95% CI: 1.04, 2.4), were independent predictors of time to recovery.

**CONCLUSION:** In this study the recovery rate was generally low. Children who haven't kwashiorkor, tuberculosis, anemia or altered body temperature at admission were identified predictors of time to recovery. Therefore, the intervention modalities could be addressed in identified factors are strongly recommended in order to achieve a better recovery rate.

**KEY WORDS:** Recovery rate, severe acute malnutrition, Gondar

#### 76. TREATMENT OUTCOME AND PREDICTORS OF TIME TO RECOVERY AMONG CHILDREN AGED 6-59 MONTHS WITH

#### 77. DRIVERS OF MATERNAL FOOD CHOICES FOR CHILDREN UNDER 5 YEARS IN AKUAPIM NORTH DISTRICT, EASTERN REGION, GHANA.

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**BACKGROUND:** Good nutrition in the early years of life is crucial for the growth and development of children. Feed content during the early years is determined by caregivers, particularly mothers. This study aimed to answer the question of what drives mothers' food choices for their children aged 5 years or younger in a typical Ghanaian health district.

**METHODS:** We deployed a community-based cross-section study using a mixed-method design. Focus group discussions (FGDs) and quantitative surveys involving mothers of children under five years were conducted. The Quantitative data was collected using a questionnaire and analyzed using SPSS version 20. Bivariate Chi-squared analysis and logistic regression were used to determine associations between the study outcome and predictor variables. Qualitative data was transcribed verbatim and analyzed manually.

**RESULTS:** Among children aged 0-6 months, 67.1% were exclusively breastfed. Of children aged 6-59 months, 78.9 % were fed from at least four food groups. Exclusive breastfeeding was associated with mother's educational level (aOR = 1.861; 95% CI, 1.040-3.330), but not employment status (aOR = 1.378; 95% CI, 0.125-15.193). Feeding from at least four food groups was associated with child's food preference (aOR = 0.587; 95% CI, 0.276-1.247), perceived nutritional value (aOR = 0.094; 95% CI, 0.009-0.971) and smell (aOR = 0.377; 95% CI, 0.197-0.723), but not food availability (aOR = 0.856; 95% CI, 0.399-1.835), value for money (aOR = 0.648; 95% CI, 0.317-1.324) or family influence (aOR = 0.612; 95% CI, 0.282-1.330). The qualitative FGDs identified child's preference, perceived health or nutritional benefit of the food as important drivers of their choices. Participants admitted that the strong influences of parents and in-laws impact their choices of foods for children.

**CONCLUSIONS:** The study has determined factors that drive maternal food choices for children under five years to include maternal educational level, child's food preference, perceived health/nutritional value, and food smell.

**KEY WORDS:** Food choices, drivers, children under 5 years, exclusive breastfeeding.

**78. DETERMINANTS OF PHYTATE TO CALCIUM MOLAR RATIO IN THE DIETS OF PREGNANT WOMEN IN RURAL BANGLADESH: A CROSS-SECTIONAL STUDY**

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**BACKGROUND:** Inadequate calcium intake may increase the risk of gestational complications in pregnant women with suboptimal calcium status and may increase the risk of bone loss during pregnancy. Monotonous plant-based diets often contain high levels of phytate and increased phytate to calcium molar ratio may inhibit the bioavailability of calcium in the diets. This study assessed the dietary components that significantly predict the phytate to calcium molar ratio and hence the bioavailability of calcium in the diets of pregnant women in rural Bangladesh.

**METHODS:** A multiple pass recall (MPR) approach was used to assess the nutrients intake in the diets, with in-depth probing interview covering 24-hour dietary recall conducted among 717 pregnant women who were in either their second or third trimester. The pregnant women were selected based on multi-stage random sampling process.

**RESULTS:** Inadequate intakes of energy and nutrients was found in the diets of the pregnant women. The mean estimated calcium intake was only 192.2 mg/d. Mean phytate to calcium molar ratio in the diets of these women was found higher (0.27; 1<sup>st</sup> - 3.7) than the critical value of 0.24. Phytate to calcium molar ratio was found to decrease with the increased quintiles of calcium to phosphorus ratio, fat to fiber ratio and calcium intake whereas the ratio decreased with the increased quintiles of phytate intake. Four independent regression models were developed to measure the variance in phytate to calcium molar ratio in the diets. A 100 g increase in calcium intake had resultant in 0.14 unit decrease in phytate to calcium molar ratio, in absolute units. Moreover, phytate intake decreased by 100 mg was translated as 0.06 unit reduction in phytate to calcium molar ratio.

**CONCLUSIONS:** High phytate intake, low calcium to phosphorus ratio, low fat to fiber ratio, and low calcium intakes have a significant role in determining differences in phytate to calcium molar ratio hence the calcium bioavailability in the diets of pregnant women in rural Bangladesh.

**KEY WORDS:** Phytate to calcium molar ratio, calcium, pregnant women

## 79. TWO X-CHROMOSOMES AND DEEP PURSES: RISK FACTORS FOR OVERWEIGHT AND OBESITY IN SCHOOL-GOING CHILDREN IN ABUJA, NIGERIA

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**INTRODUCTION:** Paediatric obesity poses significant health challenges especially since it tracks into adulthood and leads to a sequelae of chronic diseases. This study examined the prevalence and risk factors of overweight and obesity among school children (aged 6-12) in Abuja, Nigeria.

**METHODS:** Ten schools (5 private, 5 public) were randomly selected from the school's list and pupils whose parents/guardians consented were randomly recruited. In addition to anthropometric measurements, a structured and validated questionnaire was used to elicit other relevant information from the children. Six hundred and five children (54.8% females) were studied. Appropriate statistical tools were applied in data analysis.

**RESULTS:** The results indicate (from a BMI perspective) that 3.6% (irrespective of sex), 11.9% (14.2% females; 9.0% males), and 4.2% (4.7% females; 3.6% males) of the children were thin, overweight and obese, respectively. There were more thin children in public schools than in private schools (4.4% vs 2.7%). While 20% and 6.3% of children attending private schools were overweight and obese, respectively, the figures for their counterparts in public schools were 4.1% and 2.2%, respectively. Put differently, 82.2% and 73.1% of the overweight and obese children were from private schools while 65% and 61.5%, respectively, of the affected children were females. Additionally, the bulk of the overweight and obese children (94.5% and 80.8%, respectively) came from homes where parents earned >₦100,000.00 monthly. The use of waist to height ratio, waist circumference and percentage fat mass to diagnose overweight and obesity corroborate these findings.

**CONCLUSION:** Being a female and having "rich" parents may predispose to overweight and obesity. Urgent targeted public health and nutrition action is needed to address these problems.

**KEYWORDS:** children, Nigeria, obesity, overweight, risk factors

## 80. ANEMIA PREVALENCE AND ASSOCIATED FACTORS IN CHILDREN AGED 2-5 YEARS IN SOUTHERN ETHIOPIA: A CROSS-SECTIONAL STUDY

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**INTRODUCTION:** This cross-sectional study was part of a field trial on anemia prevention in South Ethiopia (Pan African Clinical Trials registry number, PACTR201705002283263). Anemia is a major public health problem in Ethiopia. The current Ethiopian Demographic Survey (EDHS) indicated that 57% of children under-five years are anemic. This study aimed to investigate factors associated with anemia in children 2 to 5 years of age.

**METHOD:** Census was done on 3900 households, and 340 children were randomly selected using a simple random selection technique. Structured questionnaires were used capturing household food insecurity and dietary diversity based on Food and Agriculture Organization, and demographic and socio-economic data. Hemoglobin levels were determined using Hemocue machines<sup>®</sup>30. Serum ferritin was analyzed with electro chemiluminescence immunoassay "ECLIA". C-reactive protein (CRP) was measured with Roche/Hitachi cobas c systems. Weight and height were measured by weights and stadiometers (Seca877 and Seca213, respectively). Data was double entered using EpiData3.1 and analyzed using SPSS software. Bi-variable and multi-variable logistic regression analysis was done to identify factors associated with anemia.

**RESULT:** The prevalence of anemia was 32.3% (107/331). From the population of anemia cases, 40% (43/107) had ferritin level <20 mg/l and 20% (22/107) had CRP >5mg/L. 73% (242/331) of the children scored very low on diversity food score. Only 15% (50/331) of children got animal product iron rich food. Food insecure households constituted 63% (207/331). Household size greater than 5 [AOR: 2.35 (1.33, 4.16)] and stunting AOR: 2.65 (1.58, 4.43)] were associated with increased risk of anemia. Domestic animal ownership [AOR: 0.42 (.24, .74)] and iron supplementation during pregnancy [AOR: 0.28 (.16, .50)] were associated with less anemia.

**CONCLUSION:** Anemia is a moderate public health problem in the area. Almost half of the anemia cases were iron deficiency related. Attention should be given to both iron-rich food and supplementation mechanisms to improve the situation.



**KEY WORDS:** Anemia, ferritin, CRP, iron-rich food, Iron supplementation.

#### 101. AWARENESS IN THE CONTEXT OF PREVALENCE OF VITAMIN A DEFICIENCY AMONG HOUSEHOLDS IN WESTERN KENYA USING A CROSS-SECTIONAL STUDY

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**INTRODUCTION:** Vitamin A (VA) deficiency (VAD) remains a widespread public health problem among women and children in the developing world. It is a major contributor to child morbidity in sub-Saharan Africa. Western Kenya experiences high infant mortality partly attributable to VAD. Increasing awareness of its role in human health has led to international efforts to eliminate VA deficiency (VAD) as a public health problem.

**METHODS:** This was a community-based study within the catchment areas served by health facilities offering ante-natal care services in Busia and Bungoma counties in Western Kenya. The study adopted cross-sectional design and purposive sampling techniques. Eight focus group discussions (FGDs) were conducted with pregnant and lactating mothers and eight key informant interviews with those in charge of health facilities until saturation. The study examined community awareness of existence, signs and symptoms, causes, control of VAD as well as attitudes, so as to identify knowledge gaps among health workers and caretakers/mothers. Data was audio recorded, transcribed, coded and thematically analyzed using ATLAS.ti version 6 software.

**RESULTS:** Most respondents stated having heard about VA/VAD but very few had the correct knowledge of signs and symptoms, causes, and control of VAD. Their attitudes towards VAD and its control were generally indifferent with a general belief that they had no control over their circumstances to reduce VAD.

**CONCLUSIONS:** Although VAD was prevalent in the study area, majority of the people in the community had a low level of awareness. There is need for health education to raise community's awareness on VAD in such settings in order to augment prevention, control and elimination efforts.

**KEYWORDS:** Vitamin A, deficiency, awareness, community, Western Kenya

#### 102. PREVALENCE OF METABOLIC SYNDROME AMONG MIDDLE-AGED ADULTS IN THE KPANDO MUNICIPALITY: A CASE-CONTROL STUDY

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**INTRODUCTION AND OBJECTIVES:** Metabolic syndrome (MetS) which previously was relatively uncommon among Africans south of the Sahara, is increasingly becoming a public health concern in recent times. It manifests as co-occurrence of several known cardiovascular risk factors, including insulin resistance, obesity, atherogenic dyslipidemia and hypertension. This study's intent was to determine the prevalence of MetS, its components and compare the dietary diversity of cases and matched controls.

**METHODS:** An age to sex one-to-one case-control study, involving 152 middle-aged adults 45-65 years. Metabolic syndrome was defined by both World Health Organization (WHO) and International Diabetes Federation (IDF) criteria. Anthropometry, lifestyle habits, physical activity and dietary diversity were assessed. A t-test and chi-square test were used to compare continuous and categorical variables respectively between the two groups and odds ratios to determine the association between risk factors and metabolic syndrome.

**RESULTS:** The overall prevalence of MetS by the WHO and IDF criteria was 34.2% and 44.7% respectively. The prevalence was found to be higher in cases (67.1%) than in controls (1.3%) with just a few cases (32.9%) being able to control their metabolic syndrome status. Comparing cases to controls, high central obesity (98.7% vs 36.8%), high BP (90.8% vs 2.6%), and high FBG (72.4% vs 1.3%) were observed. Consumption of highly diversified diets was higher among controls (77.6%) compared to cases (10.5%), just like consumption of moderately diversified diets (case: 82.9% vs. controls: 19.8%).

**CONCLUSION:** A third (WHO criteria) to almost half (IDF criteria) of the study participants had MetS. The triad of high central obesity, high BP and high FBG were mostly responsible for MetS in this study population. Protective health effects can be attained by reducing/maintaining body weight and healthy lifestyle changes such as good nutrition and physical activity.

**KEYWORDS:** Metabolic syndrome, prevalence, components, dietary diversity

### 103. SEASONAL AGRICULTURE AFFECTS THE HOUSEHOLD DIETARY DIVERSITY, CONSUMPTION PORTION SIZE AND WOMEN WEIGHT IN BORENA ZONE OF ETHIOPIA

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**INTRODUCTION:** There are commonly wide variations in seasonal food availability where there is one main crop a year which affects health and work capacity of adults.

**METHODS:** Three cross-sectional surveys were conducted in pre-harvest, harvest/farming & post-harvest seasons. Training was provided for HEWs on data collection. A household (HH) food consumption, portion size and anthropometric indices were collected from 680 HHs. A quantitative 24-hour dietary recall was conducted for each season and used to create a continuous food group dietary diversity score based on 9 food groups. HH food security, DD and nutritional status were dependent variables against which differences were examined based on seasonal variabilities. The mean HHDD were compared using a mixed effect model.

**RESULT:** About 92% of the HHs were male headed and illiterate. Thirty three percent (33%) of the HHs were food secured. Average family member was 7. Average food groups consumed were  $3.6 \pm 0.81$ ,  $3.2 \pm 1.1$  and  $5.1 \pm 1.6$  for each season respectively. There was a significant difference in HHDD across seasons. The average HH portion size consumed per day was  $1.24 \pm 0.3$ ,  $0.85 \pm 0.21$  and  $2.1 \pm 0.33$  Kgs for each season respectively. Male head of the HHs were averagely working intensive labour related to farming for  $2.1 \pm 0.4$ ,  $9.6 \pm 1.9$  and  $4 \pm 1$  for each season respectively; mothers (in addition to housekeeping), for  $6.4 \pm 1.1$  and  $3 \pm 0.8$  for each season respectively. There was a significant difference in mean mother's weight ranging from  $51.6 \pm 4.2$  to  $48.1 \pm 4.4$  for pre-harvest to post-harvest season

**CONCLUSION:** The study has demonstrated that seasonal agricultural practice is significantly associated with the HHDD and portion sizes with highest results right after harvest. The HH average portion size didn't coincide with seasonal working habits. However, the rainy season is also a period of intensive agricultural work with higher energy needs, coupled with greater exposure to infectious diseases due to the wet conditions. Since women are actively involved in agriculture during the busy planting season, children might be vulnerable to infections (diarrhea, malaria, upper respiratory infections).

**KEY WORDS:** Dietary diversity, food availability, portion size, seasonal agriculture

### 104. INFLUENCE OF DIETARY BEHAVIOR ON DAILY SALT INTAKE IN MOROCCAN PARTICIPANTS

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**INTRODUCTION:** Overconsumption of salt is a major risk factor for high blood pressure. Hypertension is a public health problem in Morocco. The objective of this pilot study was to estimate the daily salt intake of Moroccan adults by measuring the 24-hour urinary sodium excretion and to evaluate behavior of the participants in relation to salt consumption.

**METHODS:** A total of 132 participants (64 men and 68 women aged 25 to 65) were recruited in four different regions in Morocco (Casablanca, Errachidia, Meknes, Mountain of High Atlas). All participants collected their 24-hour urine in plastic containers. The samples were stored at -20°C until analysis. Dietary behavior was assessed by a questionnaire of Knowledge, attitudes and practices (KAP).

**RESULTS:** Mean daily sodium intake as measured through 24-hour urine excretion was 7065.75 (M=7402.5 mg; F= 6756.5 mg). In addition, our data showed that 71.2% of participants had a daily salt intake greater than 5 g/day (amount recommended by WHO), which could explain the prevalence of hypertension in Morocco. The results of behavior showed that participants who know that salt is bound to HBP had a lower mean sodium excretion (6897.5 mg/24h) than those who do not know (7442.5 mg/24h). On the other hand, the analysis showed that only 25% of participants reported that they control their salt intake. Indeed, the participants who control their consumption had a daily lower salt intake (2602 mg/24h) to those who do not control it (2866 mg/24h).

**CONCLUSION:** The daily salt intake exceeds the recommendations. This could increase the risk of developing high blood pressure in Morocco. Knowledge and improved practices can change the daily salt intake, which is important to raise awareness about the harmful effects of overconsumption of salt.

**KEYS WORDS:** Salt consumption; Behaviour; Hypertension; Morocco

#### 105. A FOOD CALENDAR TO RAISE AWARENESS ON THE SEASONAL AVAILABILITY OF NUTRITIOUS LOCAL FOODS IN NORTHERN KENYA

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**INTRODUCTION:** Turkana County is one of the most food insecure regions in Kenya with limited agriculture as it mainly consists of pastoral areas. As part of a BMZ/GIZ Small Grant for international agricultural research, a food calendar was developed to raise awareness on the monthly-available variety of wild and cultivated plant and animal foods to improve diet diversity.

**METHODOLOGY:** Focus group discussions were conducted in six villages of Loima sub-county to assess nutrition knowledge and monthly availability, access and use of agrobiodiversity, followed by botanical plant identification with photo documentation. Results of these studies were discussed with stakeholders from agricultural, nutrition and health NGOs and ministries, who subsequently discussed ideas for nutrition education materials promoting local agrobiodiversity for improved nutrition of rural communities. A seasonal food calendar showing monthly availability of nutritious foods to be used at household level was considered most appropriate. Based on the high illiteracy rate but available basic nutrition knowledge an image-based calendar was developed that classifies nutritious foods into the three main food groups.

**RESULTS:** In the focus group discussions 95 plant species (66 wild; 29 cultivated) were cited. The majority of the species are used as fruits (36); most of them (27) are wild. A first version of the calendar was field tested and adapted accordingly. Several local health workers and nutritionists were trained in using the tool. Workshops were conducted to introduce the calendar to 176 community members. Each showed great interest and received a copy. The tool has been shared with several NGOs and research organizations; other organizations showed interest as it can be developed for different contexts.

**CONCLUSION:** Loima sub-county has a rich diversity of plant and animal species. The seasonal food calendar helps to exploit this potential for nutrition and has been embraced among multi-sectoral stakeholders and rural communities.

**KEYWORDS:** nutrition education, multisectoral approach, agrobiodiversity, nutrition, wild edible plants

#### 106. SYMPOSIUM: ADVOCACY FOR SCALING UP BIOFORTIFIED CROPS FOR IMPROVED MICRONUTRIENT STATUS IN AFRICA: SUCCESSES, CHALLENGES AND LESSONS

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**INTRODUCTION:** Biofortification is an approach used to combat micronutrient deficiency in Africa. Through advocacy, awareness has been created on biofortification among governments, investors, development partners, farmers and consumers. Through a plethora of projects, partnerships were formed to advocate for policy changes, and increased investments in research, production and utilization of biofortified crops. The projects have been appraised and it is important to share success stories, challenges and lessons for improvement of similar future projects to achieve substantial impacts.

**METHOD:** A symposium is being organised by the Forum for Agricultural Research in Africa (FARA) in partnership with the International Potato Centre (CIP) to share success stories, challenges and lessons and to discuss how best to sustain advocacy for maximum impact at the national, regional, and global levels. There will be four presentations on the topics:

- Overview of Biofortification: making agriculture work for nutrition
- Background to Building Nutritious Food Basket (BNFB) Project, advocacy approaches and achievements
- Doing nutrition advocacy at national, regional and global levels to influence policies and mobilise resources: Experiences and Lessons

- Influencing Nutrition Policies and Programmes at African Union Commission and NEPAD: The procedure and imperatives

There will be questions and answers session followed by moderated discussions on (1) mechanisms for integrating women and youth in nutrition advocacy and policy development and implementation (2) Effective resource mobilization through advocacy.

#### EXPECTED RESULTS:

1. Improved skills and competences in doing effective nutrition advocacy
2. Enhanced knowledge on BNFB project, its successes, challenges and lessons
3. Increased awareness of the written and non-written processes, procedures, tools and opportunities for effective advocacy at national, regional and global levels
4. Improved capacities for mainstreaming women and youth in nutrition advocacy
5. Better insights into how to effectively mobilize resources through advocacy

#### CONCLUSIONS:

By continuous sharing and learning, advocacy skills and approaches will be improved resulting in better nutrition outcomes.

**KEYWORDS:** Biofortification, crops, advocacy, micronutrient deficiency

#### 107. NUTRIENT ADEQUACY OF WOMEN OF CHILD BEARING AGE IN SOUTH -EAST NIGERIA

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**BACKGROUND:** Inadequate nutrient intake by women of child bearing age leads to reproductive health problems, resulting in maternal and infant mortality. This study evaluated the nutrient adequacy of women of child-bearing age in South-East Nigeria.

**METHODS:** The study was descriptive and cross sectional in design. Three states were selected from the South East geo-

political zone of Nigeria using stratified random sampling technique. There are nine senatorial zones in the three states and one local government area was selected from each of the nine senatorial zones using simple random technique. Subjects of the study were 1200 women of child-bearing aged 15- 50 years with their under-5 children. A 24-hour dietary recall questionnaire was used as instrument to collect dietary intake, Recall data were analysed using adapted Total Dietary Assessment (TDA) Software. Nutrient Adequacy Ratio (NAR) was derived for energy and 11 nutrients by dividing the nutrient intake of each woman by her Recommended Dietary Allowance (RDA). Data were analysed using descriptive statistics, frequency counts and percentages.

**RESULTS:** Mean age of the women was 28.2(±5.6) years and BMI was 26.8(±4.8) kg/m<sup>2</sup>. The majority (96.3%) were married and 41.7% were traders. The percentage of women who met their NAR values were 80.5% for energy, Carbohydrate (90.2%), protein (82.0%), Phosphorus (51.4%), iron (60.8%) and zinc (72.7%) while 54.9% for Fat, calcium (96.2%), vitamin C (83.1%), Sodium (79.4%), Potassium (96.3%), Magnesium (80.2%) did not met their NAR values.

**CONCLUSIONS:** Nutrient adequacy ratio indicated low in intake of some micronutrients by many women and excess in intake of energy, Carbohydrate and protein which could predispose to obesity and its associated complications. Nutrition education aimed at improving proper nutrition, dietary diversification and increased micronutrient intake among women of reproductive age is recommended in South East Nigeria.

**KEY WORDS:** Women, nutrient adequacy, South-east Nigeria

#### 108. ASSESSMENT OF DETERMINANTS OF CHILD SURVIVAL IN SOUTH-WEST NIGERIA

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**BACKGROUND:** Child survival (CS) is an essential component of public health concerned with reducing child morbidity and mortality. Despite the gains attained during the millenium development goals era, 16,000 children under-five years of age still die every day and 11 children die every minute. Knowledge of factors determining under-five child survival can help in developing strategies that will improve CS.

**OBJECTIVE:** The study was conducted to assess the determinants of child survival in South-west Nigeria.

**METHODS:** A randomized cluster sampling technique involving four-stage random sampling technique was used to select 1308 mothers of under-five children (respondents) from three out of six states of South-west Nigeria. A pre-tested, interviewer-administered, semi-structured questionnaire was used to obtain information on demographic and socio-economic characteristics of mothers, child-related, maternal, paternal, and environmental factors. Data was analysed using descriptive statistics and regression at  $p < 0.05$ .

**RESULTS:** Mean age of respondents was  $30.7 \pm 6.1$  years. Factors that significantly influenced survival of under-five children ( $p < 0.05$ ) in the study area were: mothers' literacy level, place of residence, low parity, educational qualification, and mothers' age at first birth. The odds of child survival (CS) was twice higher among literate than non-literate mothers (OR:1.9; CI:1.2-2.8), urban than rural dwellers (OR:2.2; CI:1.1-4.8), mothers with at least a secondary education than uneducated (OR:2.1; CI:1.3-3.5), and respondent's age at first birth (OR:1.1; CI:1.0-1.1). Women with low parity had less likelihood of experiencing under-five death than mothers with higher parity (OR: 0.5; CI: 0.3-0.9).

**CONCLUSION:** The literacy level, place of residence, low parity, and educational qualification of mothers were determinants of CS in South-west Nigeria. There is need for all stakeholders involved in actualizing child survival strategies to develop more effective response to these determinants to ensure sustainable, realistic and practical measures that will increase the survival of under-five children in the study area.

**KEY WORDS:** Under-five children, Mothers of under-five children, Child survival determinants.

#### 109. FACTORS ASSOCIATED WITH COMPLICATED SEVERE ACUTE MALNUTRITION RELAPSE AMONG CHILDREN UNDER FIVE YEARS AT MWANAMUGIMU MULAGO HOSPITAL, UGANDA - A COMPARATIVE CROSS SECTIONAL STUDY

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**BACKGROUND:** Despite numerous efforts to improve treatment outcome of patients admitted with complicated severe acute malnutrition (SAM), a relatively high number of children relapse after recovery. These are readmitted and retaken through the whole elaborate treatment and rehabilitation process of inpatient therapeutic care (ITC). The factors associated with these complicated SAM relapses are unclear and to the best of our knowledge no study has investigated them

**METHOD:** Data on 1098 children under 5 years was analysed in this comparative cross-sectional study. At univariable analysis, categorical variables were summarized using proportions while means and standard deviations were used for continuous variables. Chi-square statistics were computed at bivariable analysis. Binary logistic regression models were constructed and odds ratios as well as their 95% confidence intervals were estimated. A multivariable binary logistic regression model was then run.

**RESULTS:** Six percent of the children <5 years admitted at the unit were complicated SAM relapses and it took them on average 8 months to relapse. Children with unemployed mothers were 3 times more likely to relapse with complicated SAM than those children with employed mothers (AOR: 3.27; CI: 1.43 – 7.50)

**CONCLUSION:** Our study showed that the prevalence of complicated SAM relapse (6%) among children under five years at the unit is slightly above that reported in the clinical reports (5%) and that reported in a CMAM programme in Sub Saharan Africa (1.9%) but less than that reported in another CMAM programme in S. Eastern Asia (17.8%). The major factor found to be significantly associated with complicated SAM relapse was having an unemployed mother. Implementers need to pay closer attention to unemployed mothers during rehabilitation, consider having relapse rate as a program performance indicator, properly ascertain relapse status and improve diagnosis during admission.

**KEY WORDS:** Complicated Severe Acute Malnutrition, Inpatient Therapeutic Care, Relapse, Community-based Management of Acute Malnutrition

#### 110. MONOSODIUM GLUTAMATE (MSG) EFFECTS ON SOME NUTRITIONAL PARAMETERS IN WISTAR STRAIN ALBINO RATS

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**BACKGROUND AND OBJECTIVE:** Use of seasonings in soups, sauces and institutional cooking are well documented. However, little is known of the long term effect(s) of these seasonings on human health. This study assessed the effects of Monosodium Glutamate (MSG) commonly referred to as “AJI-NO-MOTO” on some nutritional indices, serum micronutrient status and blood lipid profile of Wistar strain male albino rats.

**METHODS:** A total of 25 rats distributed into 5 groups of 5 rats per group were used in this experimental study. The MSG crystals were ground into powder and added to the formulated diet. The first group (control) contained 0% MSG, while the experimental groups were fed on formulated diets containing 5%, 10%, 15% and 20% MSG. All the groups were fed *ad libitum* for 28 days, weighed and sacrificed thereafter. The nutritional indices, serum concentrations of calcium, zinc, ferritin, retinol, lipid profiles and histopathological effects of MSG on the organs (liver and kidney) of the rats were determined using standard methods. Data were analyzed using ANOVA ( $p < 0.05$ ).

**RESULTS:** Weight gain in the control group (40.35 g) was significantly higher than experimental groups (26.93-36.22g) ( $p < 0.05$ ). There was significant increase in serum calcium ( $7.70 \pm 1.04$ - $13.38 \pm 0.91$  ppm), zinc ( $0.13 \pm 0.01$ - $0.33 \pm 0.22$  ppm), and retinol ( $50 \pm 5.01$ - $77 \pm 2.83$  µg/dL) compared with the control: ( $6.85 \pm 0.49$  ppm), ( $0.10 \pm 0.01$  ppm), and ( $52 \pm 1.41$  µg/dL) respectively ( $p < 0.05$ ). Serum ferritin of experimental groups ( $0.09 \pm 0.02$ - $0.79 \pm 0.20$  ppm) was not significantly different from that of control ( $0.71 \pm 0.01$  ppm) ( $p > 0.05$ ). Low density Lipoprotein (LDL) concentration increased significantly in rats in experimental groups ( $15.76 \pm 2.78$ - $30.94 \pm 20.81$ ) compared with control ( $21.51 \pm 4.50$ ). Pathological lesions were observed in the kidney and liver of rats fed with the MSG diets.

**Conclusion:** Use of MSG increased the bioavailability of some minerals and vitamins. Prolonged usage in high dose may result in kidney and liver dysfunction, hence the need for moderation in its usage.

**KEYWORDS:** Monosodium glutamate, nutritional indices, Lipid profile, Low density lipoprotein

# **111. THE IMPACT OF CLIMATE-SMART INNOVATION ON HOUSEHOLD PRODUCTIVITY, FOOD AND NUTRITIONAL SECURITY IN BENIN.**

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**INTRODUCTION:** In the context of climate change, some climate-smart innovation like Drought Tolerant Maize varieties packages were disseminated among maize-farming households in Benin, to increase productivity, yield, income, food security, nutritional status, and poverty. This paper examines the impact of adoption of drought-tolerant maize varieties on productivity, household food security and nutritional status, using country-wide cross-sectional data of about 518 maize farming households in Benin.

**METHODS:** We used respectively per capita expenditure, food per capita expenditure, households Dietary Diversity Score (HDDS), Household Food Consumption Score (SCA), Household Food Insecurity Access Scale (HFIAS) as outcome indicators of food security and nutritional status and grain yield of maize as productivity outcome indicator. To identify causal effects of Drought tolerant maize varieties adoption on productivity, food security and nutritional status, three instrumentals variables were used.

**RESULTS:** Significant differences in socio-economic and demographic characteristics between adopters and non-adopters of drought-tolerant maize varieties were found. So as to control, such differences and allow a causal interpretation of the real effect of drought-tolerant maize varieties adoption, we have estimated the Average Treatment Effect (ATT). In the end, our analyses have indicated that adoption of drought-tolerant maize varieties significantly increased household food security by 12 percentage points. This helps severely food insecure households to achieve acceptable food security status by enabling them to acquire cereals and tubers, pulses, vegetables, and fruits on a daily basis.

**CONCLUSIONS:** There was no significant impact of drought-tolerant maize varieties adoption on productivity, yet drought tolerant maize varieties can play an essential role in fighting against food insecurity in Benin.

**KEYWORDS:** Drought tolerant maize (DTM), food security, Nutritional status, Benin.

## 112. FEEDING PRACTICES ACCORDING TO WHO RECOMMENDATIONS FOR HIV EXPOSED CHILDREN IN NORTHWEST ETHIOPIA: A CROSS-SECTIONAL STUDY

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**BACKGROUND AND OBJECTIVES:** Malnutrition is a major problem and it is more severe for HIV-exposed children especially with inappropriate feeding practice. The study aimed to assess optimal complementary feeding practices and associated factors among HIV exposed infants and young children aged 6-18 months in selected Amhara Regional Hospitals, northwest Ethiopia.

**METHODS:** An institution-based cross-sectional study was conducted from March 10 to April 30, 2017. Systematic random sampling was employed to select study participants. A pretested interviewer-administered questionnaire was used to collect data. A 24hr dietary recall was used to assess child optimal complementary feeding practice, minimum acceptable diet, and meal frequency. Accordingly, children were considered to receive optimal complementary feeding when they fulfilled the criteria of timely introduction of solid, semi-solid or soft foods, and minimal acceptable diet. Both bi-variable and multivariable binary logistic regression analysis were applied to identify factors associated with optimal complementary feeding practice.

**RESULTS:** In this study, about 25.5% of HIV exposed children received optimal complementary feeding. More than two thirds, (70.7%), and more than a third (36.9%) of the children received the recommended meal frequency and the recommended minimum acceptable diet, respectively. Father's education; primary (AOR= 2.39; 95%CI: 1.18, 4.88) and higher (AOR= 2.44; 95%CI: 1.37, 4.34), rich household wealth status (AOR= 2.08; 95%CI: 1.13, 3.82), and satisfactory media exposure (AOR=1.70; 95%CI: 1.04,

2.78), and mothers HIV disclosure status (AOR= 1.78; 95%CI: 1.07, 2.98) were positively associated with optimal feeding practices.

**CONCLUSIONS:** Optimal complementary feeding practice was not in agreement with the WHO recommendation. Household wealth status, mother's HIV disclosure, and paternal educational status were positively associated with optimal complementary feeding practices among HIV exposed children. Therefore, a social safety net program for HIV positive mothers needs attention. In addition, strengthening maternal counselling about HIV status disclosure and media promotion of child feeding is important to achieve the recommended feeding practices.

**KEYWORDS:** Optimal complementary feeding, HIV exposed children, Amhara region, Ethiopia.

## 114. NUTRITIONAL QUALITY AND ACCEPTABILITY EVALUATION OF OGI FLOUR BIOFORTIFIED WITH GARLIC AND GINGER

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**INTRODUCTION:** To improve the safety and nutritional stability of *ogi*; an affordable complementary food from locally available cereals is of paramount importance. This is due to its popularity as a food item of many native African populations. The study explored the effects of garlic and ginger on organoleptic quality and nutritional acceptability of *ogi* flour by consumers during storage.

**METHODS:** *Ogi* flour was prepared from sorghum and Quality protein maize by natural fermentation technique and dried at 42± 2° C for 48 h in cabinet dryer. Microbial, Proximate, Pasting properties and sensory characteristics were evaluated for 16 weeks.

**RESULTS:** The samples showed no microbiological activity, stable pH, total titratable acidity and bulk density, increase antioxidant quality on addition of garlic and ginger. Besides, decrease in water absorption capacity, peak time and pasting temperature of all samples with garlic and ginger were lower than the boiling temperature thus all *ogi* flour samples formed paste in hot water below the boiling point. *Ogi* (maize) with 2% Garlic-2% Ginger and *Ogi* (sorghum) with 4% Garlic-2% Ginger were the most preferred with no significant difference ( $p < 0.05$ ). The addition of garlic and

ginger at 2 and 4% improved the pasting properties of *ogi* thus increasing the energy content derivable from the food samples.

**CONCLUSIONS:** The results indicate this as desirable for formulation of low viscous, less bulky and more nutritious weaning and nourishing food for nursing mothers and malnourished population. It further eases the packaging and transportation costs.

**KEY WORDS:** *Ogi*, complementary food, microbiological activity, properties, preference

#### 115. INFANT AND YOUNG CHILD FEEDING INDEX SCORES AND NUTRITIONAL STATUS OF 6-24 MONTH OLD CHILDREN IN A MUNICIPALITY IN GHANA

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**BACKGROUND AND OBJECTIVES:** Appropriate infant feeding is key to growth, development and survival during the first 1,000 days of life. Malnutrition reported by the Ghana Demographic Health Survey (2014), has been attributed to some factors including infant and young child feeding practices. Infant and child feeding index (ICFI) scores are believed to reflect nutritional status. This study aimed to assess the association between the ICFI scores and nutritional status of infant and young children.

**METHODS:** This cross-sectional study recruited 230 mother-child (6-24months) pairs, who reported at seven(7) selected Child Welfare Clinics within the Ho Municipality, Ghana. ICFI was computed using five components (breastfeeding, use of bottle, dietary diversity score, food group frequency score and feeding frequency scores). Information on ICFI was collected from the mothers/caregivers using interview questionnaire and scored as either high, medium or low. Weight (kg), and height (cm) of each child were measured and z scores calculated using the WHO Anthro Software. Data was analysed using SPSSv16, and association between ICFI scores and nutritional status analysed.

**RESULTS:** The age ranges of the children and mother/caregiver were between 12-24 months and 30-34 years respectively. From the results, 3.5% of the children were underweight (Weight-for-age), 15.2% stunted (height-for-age), 7% wasted (weight-for-height), and 17% at risk or overweight/obese (BMI-for-age). More than half (57.4%) of the children irrespective of age and gender scored low for the ICFI score. There was no association between ICFI score

and indicators of nutritional status except BMI-for-age values (< 0.05).

**CONCLUSION:** Apart from BMI-for-age, there was no association between ICFI and nutritional status of children. This implies there may be other factors influencing complementary feeding practices and nutritional status of children in a resource-poor setting like was used for the study, that future studies can explore.

**KEYWORDS:** Children, ICFS, nutritional status, infant, child feeding practices.

#### 116. THE EFFECT OF AGRICULTURAL DIVERSIFICATION ON DIETARY DIVERSITY IN RURAL HOUSEHOLDS WITH CHILDREN UNDER FIVE YEARS OF AGE.

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**INTRODUCTION/BACKGROUND:** Micronutrient deficiencies in low-income countries are associated with monotonous consumption of nutrient-deficient crops; which contributes to childhood stunting and further-reaching socio-economic consequences. The Zambian government has embarked on policy initiatives to promote agricultural diversification, which can contribute towards improving food security. This study investigates the link between agricultural diversification and two key indicators of food and nutrition in rural Zambian households with children under the age of five years.

**METHODOLOGY:** Data from the 2015 Rural Agricultural Livelihoods Survey (RALS) on 7,926 households were used. Using a two-step regression model, the Simpson Index (SI) was adapted to measure household level agricultural diversification (1 =most diversified; 0 = not diversified). Outcome variables household dietary diversity score (HDDS) (maximum score of 12 food groups) and months of inadequate household food provisioning (MIHFP) were employed.

**RESULTS:** The mean SI for agricultural diversification was 0.35 (SD=0.18). The mean MIHFP was 3.68 (SD = 1.74), while the mean HDDS was 5.87 (SD = 2.14).

Bivariate relationships between agricultural diversity index HDDS and MIHFP suggested that as households move from complete specialisation towards diversification, they experience



improvements in dietary diversity or reduction in months with inadequate food provisioning.

The two-step regression model showed insufficient evidence to suggest that households with more children under five and diversified agricultural production were more likely to have better household dietary diversity. Other factors positively associated with HDDS were land cultivated, household size, livestock units, household-head education, households receiving extension information and inputs like fertilisers.

**CONCLUSION:** Agricultural diversification was not strongly associated with improving household dietary diversity or months during which households have inadequate food provisioning. Also, the number of children under five years in each household did not appear to impact on dietary diversity. Non-sociodemographic factors not measured in the dataset could have affected household dietary diversity. Access to income may play a larger role in achieving household dietary diversity than agricultural diversification.

**KEYWORDS:** agricultural diversification, rural households, household dietary diversity, children, stunting, policy

## 117. CHARACTERISING THE FOOD ENVIRONMENTS OF DEPRIVED NEIGHBOURHOODS IN THREE AFRICAN CITIES

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**INTRODUCTION:** The rapid urbanisation of African cities has occurred alongside the nutrition transition which has seen an increase in the consumption of energy-dense, nutrient-poor foods. There is little understanding of how these new urban environments may contribute to the supply of these unhealthy diets and hence explain rising obesity and non-communicable disease prevalence.

The aim of our study was to characterise and map out the local food environment of three deprived neighbourhoods.

**METHODS:** We identified deprived neighbourhoods in three African cities that have experienced urban growth; Accra, Ho (both Ghana) and Nairobi (Kenya). Field researchers visited the three neighbourhoods and completed an audit of all food outlets or advertisements. Descriptive statistics and GIS was used to explore the supply of unhealthy foods. Latent class analysis was used to explore the interactions between each measure to build a typology of the food environments in each location.

**RESULTS:** Each neighbourhood displayed a diversity of exposures in terms of food outlets and food sold. Though many outlets sold healthy foods including grains, cereals, vegetables, items such as fats/oils and sugar sweetened beverages were commonly available in each location. Advertisements were less diverse and focused on alcohol or sugar sweetened beverages. The latent class analysis produced similar results across our three locations with classes containing; small single-item local sellers, larger sellers with greater variety of items, outlets with mainly unhealthy foods, and alcohol-led establishments.

**CONCLUSIONS:** Our study presents a detailed exploration of the food environment in three African cities that offers novel data on an under-researched topic for understanding the availability of foods and drinks. Targeted interventions aimed at improving certain environment types can help to tackle unhealthy diets. Encouraging lower availability of fats/oils and sugar sweetened beverages, or restricting the availability of certain types of advertisements may be useful approaches derived from our results.

**KEYWORDS:** Environment, GIS, availability, food.

## 118. SOCIAL AND PHYSICAL ENVIRONMENT AS DRIVERS OF FOOD CHOICE IN A LOW INCOME URBAN SETTING: A PARTICIPATORY PHOTO VOICE PROJECT IN NAIROBI CITY, KENYA: A TACLED PROJECT

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**INTRODUCTION:** Kenya is experiencing rapid urbanisation leading to changes in social and physical food environments, which are associated with non-communicable diseases (NCDs). The aim of our study was to identify which drivers in the social and physical food environment influence food choices among low income urban dwellers in Nairobi.

**METHODS:** We used participatory photography (Photo voice) with males and females aged  $\geq 13$  years living in a low income area in Nairobi. Participants used cameras to take photographs representing: places they eat; things that make eating healthy difficult or easy; a person or things that influence what they eat. Follow-up in-depth interviews allowed participants to tell the 'stories' of their photographs. NVivo was used for thematic analysis.

**RESULTS:** Poor hygiene, environmental sanitation, food contamination and adulteration were key concerns regarding foods sold in the neighbourhood. While quality and food preparation methods were major considerations in decisions on food purchase and consumption, financial access was highlighted as a major barrier to accessing good quality and healthy foods. In the home environment, urban farming was practised to supplement household food needs. Within the social food environment, family and food vendors emerged as key influencers of participants' food choices. In the family, children, spousal and parental preferences were key drivers of food purchases, and consumption. Food vendors' hospitality and services including credit, packaging and subsidized food prices also influenced participants' food choices.

**CONCLUSIONS:** There is a need to address the key drivers in the social and physical environments that emerged, with interventions to promote healthier and safer dietary practices. Poor hygiene, environmental sanitation and food adulteration reveal the continuing challenges of poor food hygiene alongside unhealthy diets associated with NCDs. Enforceable food safety legislation is essential in lowering this risk. Urban farming, could be promoted to reduce financial barriers that affect healthy food choices.

**KEY WORDS:** drivers of food choice, social environment, physical environment, women, men, adolescents, urban, Kenya

#### 119. SUSTAINABLE AGRICULTURAL PRACTICES IN KENYA AND TANZANIA: EXPERIENCE FROM A MULTI-COUNTRY BASELINE STUDY

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**INTRODUCTION/BACKGROUND:** More than 800 million people today are undernourished. Climate change including droughts and flooding is contributing to global undernourishment. Sustainable agriculture, an ecosystem approach is being promoted to beat drought and poor harvest in developing countries, and to replace traditional subsistence and intensive agriculture. Enhancing Nutrition Services to Improve Maternal and Child Health in Africa and Asia (ENRICH) is designed to integrate sustainable conservation agriculture into programs to improve nutrition of women and children. The purpose of this analysis is to assess baseline status of sustainable agricultural practices in project communities.

**METHODS:** Data used from two cross-sectional household surveys conducted in rural areas of Kenya and Tanzania. Respondents were from households with 6 to 59.9 months old children (Kenya, 598; Tanzania 648), representing random samples from clusters selected through Probability Proportional to Size (PPS).

**RESULTS:** Agriculture and farming were reported as main occupation in Kenya (45%) and Tanzania (69%). Around 85 to 90% had farming land among which 84% in Kenya and 75% in Tanzania possessed own land.

In Kenya, >50% of the respondents reported practicing conservation agriculture or improved farming practices; 26% inter-cropping, 21% contour ploughing or crop rotation, 12% row planting and 10% alley cropping. Use of improved seeds was reported by 69% respondents where use of drought tolerant varieties was 15%. In Tanzania, these rates were much lower; 3% inter-cropping, 2% crop rotation, 11% row planting and 7% alley cropping although higher rate of contour ploughing (22%); Use of drought tolerant varieties was comparatively higher in Tanzania (33%).

**CONCLUSIONS:** Sustainable agricultural practices are currently poor in project communities, particularly in Tanzania. Reasons for limited adoption of sustainable or conservation agricultural practices deserves further investigations. Multisectoral partnerships is needed to integrate sustainable agriculture into the health and nutrition programs.

**KEY WORDS:** Sustainable agriculture, conservation agriculture

**120. CONTRIBUTION OF FAMILY FEEDING AND ADHERENCE TO READY-TO-USE-THERAPEUTIC-FOOD IN THE RECOVERY OF SEVERELY ACUTE MALNOURISHED CHILDREN OF 6-59 MONTHS IN AMBULATORY CARE IN BURKINA FASO**

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**BACKGROUND AND OBJECTIVES:** The dosage of Ready-to-Use-Therapeutic-Food (RUTF) designed for hospital covers 100% of the needs of Severe Acute Malnutrition (SAM) children in ambulatory care until recovery. These children may be able to eat other foods at home and sharing food is common practice. The current dosage of RUTF may provide more than is actually needed for achieving recovery. The desire to optimize the dose of RUTF is part of a wider effort to reduce the cost of SAM treatment. This food intake study is embedded within a Randomized Controlled Trial (RCT) called MANGO conducted in the Eastern region of Burkina Faso, in Fada N'Gourma district. It aims at comparing a reduced dose of RUTF after 2 weeks of normal dose, to standard dose. The present food intake study is unique, and aims to determine the impact of family foods on treatment outcomes as well as adherence to RUTF prescription.

**METHODS:** The food intake study includes a 24-hour recall over the last day. In addition in-depth individual interviews on practices around RUTF consumption are conducted, and observations of food preparation at home will be ensured to assess local recipes. Samples of the local recipes will undergo biochemical analyzes to quantify their energy and nutritional value.

**RESULTS:** The proportion of energy and nutritional value from family foods for both groups will help conclude about the safety and effectiveness of a reduced RUTF dose for this population. The level of adherence to the prescribed RUTF diet on the outcomes of treatment will improve current SAM management protocols.

**CONCLUSION:** This study will determine the impact of family foods on SAM treatment outcomes in ambulatory care and the possibility of reducing the amount of RUTF. Practices and perceptions on the use of RUTF will help rethink SAM management taking in account families practices.

**KEY WORDS:** Severe Acute Malnutrition, Children under 5, Ready-to-Use-Therapeutic-Food, Food Intake, Adherence, Burkina Faso

**121. NUTRITIONAL PROBLEMS IN CHILDREN WITH DEVELOPMENTAL CONDITIONS ATTENDING A CHILD DEVELOPMENT CLINIC IN ACCRA: IMPLICATION FOR AND EARLY CHILDHOOD DEVELOPMENT AND CARE (ECCD) PROGRAMMES**

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**INTRODUCTION:** The process of development depends on, and is inter-linked with a child's nutritional status, health and environment. Poor nutritional status and growth failure are common in children with developmental conditions and should be detected early and managed appropriately to prevent disability.

**OBJECTIVES:** We examined nutritional problems affecting children with developmental conditions in order to determine ways in which early detection can be integrated into ECCD programmes.

**METHODS:** A cross-sectional study at the Princess Marie Louise Children's hospital, involved a retrospective review of the case notes of 170 patients attending the child development clinic of the hospital between 2010 and 2017. A record form was used to obtain information on the feeding and other nutrition-related problems, in children with developmental conditions. The data was analysed with Statistical Package for Social Sciences (SPSS) version 20.0 software.

**RESULTS:** A total of 170 patients who attended the clinic between August 2010 and July 2015 were studied. They had global developmental delay 50(29.4%), speech and language difficulties 44(25.9%) cerebral palsy 39 (22.9%), epilepsy 37(21.8%) other motor disorders 35(20.6%), genetic syndromes 20(11.8%) among others. Their ages ranged between 2 months and 165 months out of which over a third, 63(37.1) had nutrition related problems. Those with nutritional problems presented with poor weight gain, malnutrition and feeding problems such as vomiting, regurgitation, difficulties swallowing and weaning onto an adult diet. Other nutrition-related problems were low birth weight, recurrent hypoglycaemia, fussy eating, anaemia, and obesity. Altogether, 51 were referred to the dietician for further management. Although 55 caregivers (87.3%) indicated that they had breast fed their child only 34(54.0%) reported exclusive breastfeeding.

**CONCLUSION:** Nutritional problems in children with developmental conditions present in a variety of ways and ECCD programmes can become a focus of knowledge dissemination and mitigation of these problems.

**KEY WORDS:** ECCD, child development, feeding problems

## 122. ASSESSMENT OF THE IMPACT OF E-LEARNING ON SCHOOL PERFORMANCE IN HEALTH SCIENCES: CASE STUDY OF THE FACULTY OF HEALTH SCIENCES AND TECHNIQUES (UM6SS) CASABLANCA - MOROCCO

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**INTRODUCTION:** E-learning is being integrated as a fundamental part of the student learning experience in higher education. The purpose of this case study is to assess the impact of e-learning on the school performance of students in health sciences as well as the perspective of students regarding the usefulness of e-learning.

**METHODS:** A number of pilot courses have been selected in seven bachelor programmes (nursing, dietetics, laboratory, imagery, kinesitherapy, orthophony and psychomotricity). Online learning supports have been provided by the teaching staff using the institution's Learning Management Systems (LMS) according to SAMR Model (Substitution Augmentation Modification Redefinition) ranging from level 1 to 4 depending on extensiveness of the provided online materials. Analysis has been based on the obtained scores during the final evaluations. Students' perspective was collected on a Likert scale.

**RESULTS:** Overall, online support material for 7% of all courses has been provided on the LMS (ranging from 2% to 25%). Total graduation rate was 86.1% in nursing, 88.4% in imagery, 96% in laboratory, 92.3% in dietetics, and 100% in psychomotricity. For the curriculum of nursing, imagery and laboratory, a total of 25% of courses was given in level 2, augmentation. Overall, data analysis has shown no significant correlation between SAMR levels and students grades.

**CONCLUSION:** Elearning is aimed to improve school productivity and facilitate the access to additional learning material for students at any time. The results suggest that improving specific aspects of

the student experience of e-learning is needed in order to support a campus-based experience.

**KEYWORDS:** e-learning, higher education, quantitative analysis

## 123. A MULTITUDE OF INDIVIDUAL AND CONTEXTUAL FACTORS PREDICT CHILD STUNTING IN GHANA: A REGRESSION ANALYSIS OF THE GHANA MULTIPLE INDICATOR CLUSTER SURVEY (MICS) DATA

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**BACKGROUND:** Most deaths among children under-five in developing countries are attributable to malnutrition. Countries with stunting prevalence of over 20% are referred to as high burdened countries. With a current stunting prevalence of 19%, Ghana is only a per cent shy of this categorization. While, estimates from nationally representative surveys, and sub-national surveys exist of the stunting burden, few studies have concerned themselves with the many probable precipitators of stunting. This paper presents individual and contextual predictors of stunting among children under five in Ghana using data from the MICS.

**METHODS:** Univariate analyses were used to describe selected characteristics of survey respondents and their children. Bivariate level and multiple logistic regression analyses assessed the associations between stunting and several explanatory variables adjusting for potential confounders as appropriate. Odds ratios with accompanying 95% Confidence Intervals (CI) were used to assess the strength of associations between stunting and explanatory variables.

**RESULTS:** Of the 7550 cases (children) analyzed, prevalence of stunting was 27.5%. Girls had a significantly higher odds than boys to be stunted (aOR = 1.312; 95% CI, 1.111-1.549); children with malaria parasite were 3 times as likely as malaria negatives to be stunted (OR = 2.510; 95% CI, 2.150-2.931). Compared to their older counterparts, children aged 6–11 months were significantly associated with stunting (aOR = 0.218; 95% CI, 0.150–0.316). Children whose mothers had a registered health insurance showed reduced odds of stunting compared to their counterparts without health insurance (aOR = 0.711; 95% CI, 0.595–0.849).

**CONCLUSIONS:** This analysis determined individual determinants of stunting as child's age, sex, anemia status and malaria

parasitemia status, while the contextual determinants were maternal age, wealth index quintile and caregiver having a registered health insurance.

**Keywords:** Stunting, malnutrition, under-five children, Multiple Indicator Cluster Survey (MICS), Ghana.

## 125. THE IMPACT OF NUTRITION EDUCATION ON CHANGING THE FOOD HABITS AND BODY COMPOSITION OF INDUSTRY WORKERS IN MOROCCO

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**INTRODUCTION:** Nutrition education aims for voluntary improvement of dietary behaviour and adopting of healthy habits. In a work environment, nutrition education falls under the social responsibility of the employer to promote healthier dietary choices. This study aims to assess the impact of nutrition education on dietary behaviour, lifestyle and body composition on a group of industry workers.

**METHODS:** A group of 44 workers have volunteered to participate to this 6 months' trial. Participants were aged between 28 and 58 years old (43% women and 57% men). All participants have completed a cap-score questionnaire at the beginning and end of the study, the questionnaire was organised into 3 sections: food groups, dietary behaviour, and lifestyle. Anthropometric measurements (height, weight, BMI, muscle mass, fat mass, hip circumference and waist circumference) were monitored during the study. Nutrition education sessions addressed 4 topics including healthy lifestyle. Participants were free to attend to any of the workshops.

**RESULTS:** Only fifteen participants attended all sessions. Data showed that obesity lowered by 28.6% and overweight increased by 32.6%, body composition changes were not significant. Changes in dietary behaviour were not significant, while scores of food groups and lifestyle changed significantly ( $p=0.053$  and  $p=0.042$  respectively).

**CONCLUSION:** This study reveals the commitment of workers to nutrition education which could be a part in improving their dietary choices, their health and their productivity.

**KEYWORDS:** nutrition education, industry, workers, Morocco

## 126. LESSONS LEARNED IN IMPLEMENTING A DEMONSTRATION PROJECT ON WEEKLY IRON AND FOLIC ACID SUPPLEMENTATION AND NUTRITION EDUCATION INTERVENTIONS FOR IN-SCHOOL AND OUT OF SCHOOL ADOLESCENT GIRLS IN ETHIOPIA

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**BACKGROUND:** Limited and localised studies in different parts of Ethiopia show that anemia in adolescent girls is a moderate to severe public health problem. Cognizant of this, the government of Ethiopia identifies adolescence as an important opportunity for nutrition interventions, such as Weekly Iron Folic Acid Supplementation (WIFS) for adolescent girls; however, there was no implementation framework to inform effective programming. A demonstration project on WIFS & nutrition education for adolescent girls was conducted from October 2016 to December-2017 in Chifera & Damote Gale districts to establish the feasibility and effectiveness of the program implementation using a pre-designed program implementation framework.

**METHODS:** The program effectiveness was evaluated using reach, acceptability and adoption indicators in the two districts using individual data abstracted from the program monitoring registrations.

**RESULTS:** The program acceptance rate by in-school girls was 88 % with 92.9% adherence. Better adherence was observed in those at later adolescent period (95%), in high school (94%) and in Damote Gale district (95%) ( $p<0.005$ ) compared to middle and early adolescence period, primary school and Chifera district respectively. Being absent from school was reported to be the predominant reason for didn't receive WIFAS from both districts, followed by drop out from school due to temporary migration. Both the program acceptance rate and adherence level among adolescents outside of schools was similar to those in school.

Higher adherence level was observed in the Damote Gale (93.4%) compared to those in the Chifera (88.5%) ( $P < 0.005$ ). Forgetfulness was the primary reason for non-adherence in both districts, consumption was also paused in cases of malaria in Chifera district, where they were advised not to take it.

**CONCLUSIONS:** The demonstration project provides evidence of reach, acceptability and adoption of program components and can be scaled up sub-nationally and nationally and confirmed the need for both in school and out of school delivery platforms.

**KEY WORDS:** Iron, folate, supplementation, adolescents, girls, Ethiopia

#### 127. VALIDATION OF MID UPPER ARM CIRCUMFERENCE AS A STAND-ALONE TOOL FOR ADMISSION, FOLLOW UP AND DISCHARGE OF MALNOURISHED CHILDREN 6 TO 59 MONTHS OF AGE.

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**INTRODUCTION AND OBJECTIVES:** Weight for height (WHZ) is considered the “gold standard” in nutritional assessment in children below 5 years of age. It is not clear whether mid-upper arm circumference (MUAC) would produce similar results as WHZ in admission, follow up and discharge of acutely malnourished children. This study aimed at validating MUAC as a stand-alone tool in the admission, follow up and discharge of malnourished children. The study also aimed at comparing accuracy of standardised measurers and Health Surveillance Assistants in taking measurements.

**METHODS:** A cross-sectional study design was used to collect data on the children's demographic characteristics and anthropometric measurements i.e MUAC, weight and height. Health Surveillance Assistants (HAS) and standardized data collectors took measurements at different stations on the same children. These measurements were repeated during follow-up to the point of discharge from therapeutic feeding programmes.

**RESULTS:** Out of 383 under-five children sampled, 15 were categorized as wasted using both tools. HSAs missed out four children who were later identified as wasted by the standardized data collectors using MUAC. Correlation results showed that MUAC

for age and weight for height have a strong positive linear correlation ( $r = 0.814$ ). Weight and MUAC alone also have a very strong positive linear correlation ( $r = 0.752$ ). These positive correlations were observed from the point of admission to the point of discharge from therapeutic feeding programmes.

**CONCLUSION:** This study concludes that MUAC for age produces similar results as weight for height (WHZ) in determination of wasting in children from 6 to 59 months of age. Therefore, MUAC might be used to admit, monitor and discharge children in therapeutic feeding programmes. However, training of routine measurers i.e HSAs should be intensified to ensure that measurements are correctly taken to come up with decisions that can be trusted.

**KEY WORDS:** Validation, nutritional assessment, cross-sectional study

#### 128. ADDING VALUE TO NUTRITION RESEARCH FOR EVIDENCE-BASED POLICIES IN AFRICA

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**INTRODUCTION/BACKGROUND:** Ineffective use of resources for biomedical research is an important concern internationally, in particular in low- and-middle income countries where needs are high and resources are constrained. Concerns regarding the quality of nutrition research were raised previously and a call for concerted actions by the nutrition research community. To date, a comprehensive overview of strategies to add value to nutrition research is unavailable.

**METHODS:** Narrative review of existing initiatives to enhance quality of nutrition research across the research cycle: from adequate formulation of research priorities and funding to better reporting of findings, sharing and re-use of data. Examples from output of research African and Ethiopia will be provided.

**RESULTS:** Most research has focused on technical aspects related to the design, implementation and analysis of nutrition research. Efforts to (i) define and fund research priorities according to priorities by African researchers, (ii) better reporting of findings and (iii) data handling are unexplored and deserve attention. Examples of relevant tools, reporting guidelines, and data sharing practices will be discussed.

**CONCLUSIONS:** Fostering of evidence-based nutrition policies will require attention and curriculum development of courses to integrate different parts of the research cycle: from adequate priority setting to reporting of findings. Most of the tools developed however, require application, testing and engagement of nutrition researchers in low- and middle-income countries to ensure adequate uptake into the best possible programs and policies.

**KEY WORDS:** Evidence based policies, nutrition research, research waste, nutrition epidemiology

### **129. POST-HOSPITAL DESTINATION OF THE PATIENT AGED 60 AND MORE IN THE PUBLIC HOSPITALS OF GREATER CASABLANCA ACCORDING TO THE NUTRITIONAL CRITERIA.**

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**BACKGROUND/OBJECTIVES:** Currently, the number of elderly in Morocco from 60 years and above is increasing which requires the multidisciplinary care as well in the medical environment as in the home. From 75 years, this group of age knows a strong degree of hospitalization which the post-hospital destination's is unknown. The objective of this study is to determine the post-hospital destinations of elderly patients in the Moroccan Public Hospital, from Casablanca region, in function of the nutrition parameters.

**METHODS:** A sample of 120 hospitalized subjects, of men and women, aged 60 and more, were included in this study from April 2015 to December 2016. A questionnaire has allows the screening of sociodemographic, hospital and nutritional data. This data base included the destination after the hospitalization, the nutritional geriatric index (GNRI) and the body mass index (BMI) for each subject.

**RESULTS:** The average age is  $80.9 \pm 6.7$  years. At the end of the hospitalization, 55.8% (67) of subjects are returned at home, 26.7% (32) is transferred to University Hospital Center (CHU) and 15.8% (19) have died. The variable of interest, the destination, is different in function of the GNRI ( $p < 0.01$ ), the age ( $p < 0.01$ ), the provenance ( $p < 0.01$ ) and the mobility ( $p < 0.01$ ). The linear regression model showed that the destination of subjects after hospitalization is associated with their age ( $p = 0.02$ ), place of provenance ( $p = 0.014$ ) and their mobility ( $p < 0.01$ ).

**CONCLUSIONS:** The destination of post-hospitable Moroccan elderly appears to be associated with age, the degree of mobility and the place of provenance of the subject.

**KEYWORDS:** Elderly, post-hospital destination, GNRI, Morocco.

### **130. STUDY OF BIOLOGICAL AND NUTRITIONAL PARAMETERS IN ELDERLY HOSPITALIZED PATIENTS IN THE PUBLIC HOSPITALS OF GREATER CASABLANCA, MOROCCO.**

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**BACKGROUND / OBJECTIVES:** Senescence is associated with changes in body composition and body mass index (BMI) that are considered essential indicators in the assessment of the nutritional status of hospitalized elderly persons (HEP). The objective of this study was to describe the biological and nutritional parameters in elderly hospitalized patients in the public hospitals of Greater Casablanca.

**METHODS:** A total of 120 persons aged 60 years and over hospitalized in public hospitals care services were studied. A questionnaire for the screening of sociodemographic characteristics, clinical indicators, biological, anthropometric, body composition, and finally indices of nutritional composites, namely, the Geriatric nutritional Risk Index (GNRI), and the Mini nutritional Assessment (MNA)

**RESULTS:** The mean age and BMI were respectively  $80.96 \pm 6.7$  and  $22.5 \pm 4.5$ . 46.7% ( $n = 56$ ). Significant differences were found between the two classes of BMI ( $< 21 \text{ kg / m}^2$  versus  $> 21 \text{ kg / m}^2$ ) and protein intake, fat mass and C reactive Protein. Negative correlations were found between BMI and age, duration of hospitalization ( $r = -0.5$ ,  $p < 0.001$ ) and CRP ( $r = -0.3$ ,  $p < 0.001$ ), and positive between BMI and a set of clinical and biological parameters.

**CONCLUSIONS:** At the end of this study, we highlighted the state of malnutrition in HEP (29.0%), this malnutrition was accompanied by an inflammatory syndrome and a disturbance of the body composition. Our study was also able to highlight the association between BMI and GNRI, energy, intracellular water, albumin and cholesterol levels.

**KEYWORDS:** Elderly, BMI, body composition, albumin, Morocco

### 131. STUNTING, WASTING AND BREASTFEEDING AS RELATED TO FAT-FREE MASS AND FAT MASS IN KENYAN CHILDREN AGED 6 AND 15 MONTHS

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**INTRODUCTION:** It is important to understand the linkage between nutritional status, growth, breastfeeding and body composition in order to design interventions to prevent growth faltering, but few data from low- and middle-income countries are available. The objective was to assess the role of nutritional status and other correlates of body composition in Kenyan children aged 6 and 15 months.

**METHODS:** Four hundred and forty nine infants were enrolled in an observational study embedded in a nutrition intervention trial conducted in rural Kenya. Infants were enrolled at 6 months of age. Anthropometric measurements were conducted, and fat-free mass (FFM) and fat mass (FM) were measured with the deuterium dilution technique when the children were 6 and 15 months of age, respectively. Linear regression was used to assess the association of sex, breastfeeding, stunting and wasting as correlates of fat-free mass index (FFMI), fat mass index (FMI) and body mass index (BMI).

**RESULTS:** At the age of 6 months, boys had a 0.45 (95% CI 0.10-0.80) kg/m<sup>2</sup> higher FFMI compared to girls. There was no difference in FMI. A similar pattern was seen when the children reached the age of 15 months. Those who stopped breastfeeding before the age of 15 months (11%) had a 0.10 (95% CI -0.60; 0.40) kg/m<sup>2</sup> lower FMI when they reached 15 months. At 6 months, stunted infants had a 0.28 (95% CI -0.85; 0.29) kg/m<sup>2</sup> lower BMI than infants with LAZ above 0, due to 0.66 (95% CI -1.08; -0.23) kg/m<sup>2</sup> lower FMI, but not FFMI. Stunting was not associated with body composition at 15

months of age. Wasted children had both lower FFMI and FMI at 6 and 15 months of age.

**CONCLUSION:** Further research is needed to establish the relation between these early changes in body composition and later body functions and the risk of infectious and chronic diseases.

**KEY WORDS:** Stunting, breastfeeding, body composition, wasting

### 132. THE STATE OF FOOD INSECURITY AND ITS DETERMINANTS AMONG ADOLESCENTS IN SUB-SAHARAN AFRICA

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**BACKGROUND:** Adolescents are susceptible to food insecurity (FI) and may be more vulnerable in sub-Saharan Africa (SSA). Studies have shown that FI is a significant predictor of undernutrition among adolescents. Despite widespread interest in improving food security and nutrition among adolescents, little is known about socio-economic, demographic and environmental determinants in this region. The objectives of the study were to assess the prevalence and determinants of FI among adolescents in SSA.

**METHODS:** Cross-sectional data of the Food Insecurity Experience Scale (FIES) came from the Voices of Hungry project by the Food and Agriculture Organization. We used Gallup World Poll data from 36 SSA countries for the year 2017 from 5369 respondents between 15-19 yr. FI was assessed in three levels mild, moderate and severe. For multivariate analyses, the RDA function from the vegan package in R software was used.

**RESULTS:** Finding showed that 43% of adolescents reported severe FI. This means they had not eaten for an entire day and were hungry in the last 12 months. Approximately 10% of the variance was explained by the model which was statistically significant based on a global permutation test using the *anova.cca* function (*p* < 0.001). Further, adolescents living in large households and with lower personal health index were associated with moderate and severe FI. Also, having income and education were negatively correlated with FI. Female adolescents were more likely to be associated with severe FI than males. Interestingly, being out of the workforce was negatively correlated with FI and, while younger teens were severely food insecure they became mild as they got older.



**CONCLUSION:** Our study is the first that uses FIES to study adolescents across SSA and our findings have important policy implications in relation to developing targeted interventions for improved nutritional health and well-being of adolescents.

**KEY WORDS:** Food Insecurity Experience Scale, food and nutrition security, adolescents, gender

### 133. PARTICIPATORY FARM DIVERSIFICATION AND NUTRITION EDUCATION INCREASES DIETARY QUALITY IN WESTERN KENYA: A CLUSTER RANDOMIZED CONTROLLED TRIAL

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**INTRODUCTION:** The suitability of a community-based participatory approach to increase dietary diversity of women and small children through agricultural activities and nutrition education in Vihiga County, Western Kenya, was assessed.

**METHODOLOGY:** A diagnostic survey collected data on agrobiodiversity and nutrition in 10 sub-locations of Vihiga County. The 10 sub-locations were pair-matched and split into five intervention and five control sub-locations. Within the intervention sub-locations 180 men and women participated in workshops to develop agricultural activities to improve nutrition. Before implementation of the activities, a baseline survey collected dietary intake data in all 10 sub-locations. To facilitate the activities, the communities received agricultural and nutritional training. Some nutrition education activities also targeted other community members in the intervention sub-locations. After one year of implementation an endline survey collected dietary intake data. Households were stratified as direct beneficiaries (developed and implemented activities; received agricultural and nutrition training), indirect beneficiaries (lived in intervention sub-locations; partly received nutritional training) and control. The causal impact was assessed using the difference-in-difference (DID) technique.

**RESULTS:** Communities decided to implement kitchen gardening and poultry raising. There was a significant positive impact of the intervention on mean dietary diversity score of children and women in the direct beneficiaries (DID=0.7, p=0.000; DID=0.5, p=0.041)

and on children in the indirect beneficiaries (DID=0.4, p=0.020). The improvements in dietary diversity can mainly be attributed to increased consumption of legumes, dairy, fruits and vegetables in the direct and partly indirect beneficiaries. As only availability of legumes and vegetables increased through the kitchen gardening activities, it can be assumed that nutrition education also contributed to dietary improvements, as the content focused on the importance of a diverse diet.

**CONCLUSION:** A community-based participatory approach that includes farm diversification and nutrition education significantly increased dietary diversity of women and small children in Western Kenya.

**KEYWORDS:** community-based participatory approach, dietary diversity, kitchen gardening, nutrition education, participatory action research

### 134. THE PREVALENCE OF METABOLIC SYNDROME AND PHYSICAL ACTIVITY IN SALE. MOROCCO

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**BACKGROUND AND OBJECTIVES:** Metabolic syndrome is a cluster of CVD risk factors where a lack of physical activity strongly favors many of its associated factors. The aim of this study was to determine the prevalence of metabolic syndrome compared to physical activity in a population of Sale, Morocco.

**METHODS:** This was a descriptive cross-sectional study, conducted from July to September 2015 taking place in the city of SALE North west of MOROCCO. 300 subjects participated in the study which 46.7 % male and 53.3 % female.

Data collection was done using a questionnaire developed and validated locally; including social demographic data, with the measures of anthropometric and biologic parameters. To determine the physical activity we used the IPAQ questionnaire short form (the International Physical Activity Questionnaire).

**RESULTS:** Twenty-six of the participants (8.6%) had a metabolic syndrome: 15 women (57.7%) and 11 men (42.3%). The omnipresent anomaly was the hyperglycemia found at 100% of them, followed by hypertriglyceridemia in 87% of the cases and

arterial hypertension in 77%. Low-HDL was found in 73 % of cases; high waist circumference was found in 65% of the cases. While 33 % of the studied population had low physical activity, 47% had moderate activity and only 20 % had high physical activity.

**CONCLUSIONS:** Metabolic syndrome is installing slowly but certainly in Morocco bringing a spectacular increase in cardiovascular disorders, of the diabetes of type 2 and their consequences, to implement strategies of prevention while acting early on its parameters. Physical activity is an important key to many health problems that is in relation with MS,

Encouraging Physical activities and healthy life styles will surely minimize serious public health problems in this country.

**KEYWORDS:** Cardiovascular disease, metabolic syndrome, physical activity

### 135. OVERWEIGHT AND OBESITY CONTROLLED BY CRP AND URICEMIA IN SALE, MOROCCO

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**BACKGROUND AND OBJECTIVES:** The evolution of food consumption and the change in lifestyle has made Morocco, as other developing countries, experiencing a large level of Obesity, which is the principal cause of non-communicable diseases, related to diet that has a high social cost. The main aim of this study was to determine the prevalence of overweight and obesity compared to inflammatory state and uric acid level in a population of SALE city.

**METHODS:** Data collection was done using a questionnaire developed and validated locally; including social demographic data, with the measures of anthropometric parameters, All the blood test was measured by Hitachi biochemistry of the PLC 904 using enzymatic methods, All statistical analyzes were performed using SPSS software, Quantitative variables were described using mean, standard deviation (SD) and limits.

**RESULTS:** Obesity and overweight were very common (11.6% and 35% respectively) especially in older people. Study also shows a significant association between High CRP level, Hyperuricemia and Obesity. A high frequency of inflammatory state found among obese (54%) in the second place overweight with 40%, and then only 6% with normal BMI have high CRP levels. Also obese suffers the most from the high level of Uric acid with a frequency of 44.8%.

**CONCLUSIONS:** The study shows that Obesity is significantly associated with Inflammation and Hyperuricemia. Considering the

growing incidence of obesity worldwide, more emphasis should be put on the evolving morbidity prevalence of hyperuricemia and Metabolic syndrome in our country.

**KEYWORDS:** Inflammation, Obesity, Overweight, Nutrition, Uric Acid.

### 136. EFFECT OF RESEARCHERS' TAILORED NUTRITION EDUCATION PROGRAMME ON NUTRITION KNOWLEDGE AND QUALITY OF DIETARY INTAKE OF ADULTS LIVING WITH HIV IN ABEOKUTA NIGERIA

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**BACKGROUND AND OBJECTIVE:** To examine the effects of a tailored nutrition education programme (NEP) on nutrition knowledge and quality of dietary intake of adults living with HIV (ALH) in Abeokuta, Nigeria.

**METHODS:** This study premised from a need assessment study for a nutrition education programme (NEP) for ALH in Abeokuta, Nigeria. The results were used to develop a trainers' manual, brochure, flipcharts and participants workbook. Participants (N = 200) were conveniently recruited, stratified for gender and duration on ART. Two hospitals were randomly assigned to intervention and control sites using a quasi-experimental design. Previously validated questionnaire was used to obtain nutrition knowledge of the participants at the baseline, week 12 and week 24. Dietary quality was assessed using individual dietary diversity scores (IDDS). GLS regression analyses were used for group comparisons and constructs of nutrition knowledge. The IDDS was calculated by counting the number of food groups that an individual consumed over the previous 24 hours out of 9 foods groups.

**RESULTS:** There was no significant difference between the intervention and control groups in the mean percentage scores on knowledge of meal planning (p = 0.19), food preparation (p = 0.14) and food purchase (p = 0.18) at baseline. Consumption of meat was higher among the intervention participants than the control group participants at baseline (intervention: 83%; control: 77%), week 12 (intervention: 83%; control: 76%) and week 24 (intervention: 87%; control: 73%).

**CONCLUSION:** This study showed that NE plays a significant role in improving the nutrition knowledge and IDDS of ALH.

**KEY WORDS:** HIV, Nutrition education, intervention, knowledge

### 137. DIETARY PATTERNS AND RISK OF CARDIOVASCULAR DISEASE AMONG GHANAIAN POPULATIONS IN EUROPE AND GHANA: THE RODAM STUDY

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**BACKGROUND AND OBJECTIVES:** There is limited evidence on the role of dietary patterns in relation to absolute cardiovascular (CVD) risk in Ghanaian populations and among sub-Saharan African populations in Africa and Europe more generally. We assessed the associations of dietary patterns with estimated 10-year CVD risk in Ghanaian adults, aged 40 – 70 years, of the multicenter RODAM (Research on Obesity and Diabetes Among African Migrants) study.

**METHODS:** Three dietary patterns (“mixed”; “rice, pasta, meat and fish”; and “roots, tubers and plantain”) were derived by use of principal component analysis based on intake frequencies obtained by a Ghana-specific Food Propensity Questionnaire. Ten-year risk of CVD was estimated using the Pooled Cohort Equations for 2976

subjects with risk  $\geq 7.5\%$  defined as high CVD risk. Logistic regression models were used to determine the association of dietary patterns with CVD risk.

**RESULTS:** Adherence to a ‘mixed’ dietary pattern was associated with a 44% lower odds of high 10-year CVD risk in the highest compared to the lowest quintile (OR [odds ratio], 95% CI [confidence interval]: 0.56, 0.34-0.92,  $p_{\text{trend}}=0.011$ ) after adjustment for socio-demographic characteristics; further adjustment for lifestyle and anthropometric factors attenuated the association (OR, 95% CI: 0.59, 0.35-1.00,  $p_{\text{trend}}=0.031$ ). The ‘rice, pasta, meat and fish’ dietary pattern was inversely associated with estimated 10-year risk of CVD, after adjusting for socio-demographic and lifestyle factors: OR for highest compared to the lowest quintile, 95% CI: 0.70, 0.49-0.99,  $p_{\text{trend}}=0.028$ ). A ‘roots, tubers and plantain’ dietary pattern was not significantly associated with 10-year risk of CVD.

**CONCLUSION:** Among Ghanaian adult populations, adherence to a ‘mixed’ and ‘rice, pasta, meat and fish’ dietary pattern is inversely associated with estimated absolute CVD risk. This finding suggests a need for further studies into these dietary patterns with regard to dietary recommendation for CVD prevention among this population.

**KEYWORDS:** Dietary patterns, Cardiovascular disease risk, Ghana, Migrants, sub-Saharan Africa.

### 138. BREASTFEEDING SELF-EFFICACY AND BREASTFEEDING PRACTICES AMONG LACTATING MOTHERS ATTENDING A MATERNITY TEACHING HOSPITAL. IBADAN. NIGERIA.

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**BACKGROUND:** Breastfeeding self-efficacy is the confidence a mother has in her ability to breastfeed her infant. Mothers with low breastfeeding self-efficacy have been observed not to start early initiation of breastfeeding and not to continue exclusive breastfeeding for six months. Few studies have examined the relationship between breastfeeding self-efficacy and breastfeeding practice among lactating mothers in Nigeria.

**OBJECTIVE:** The study assessed the relationship between breastfeeding self-efficacy and breastfeeding practices among lactating mothers in Ibadan.

**METHODOLOGY:** The study was descriptive cross-sectional in design. A total of 419 lactating mothers with infants aged 0-6 months were randomly selected from Adeoyo Maternity Teaching Hospital in Ibadan. A validated, semi-structured, interviewer-administered questionnaire was used to obtain information on socio-demographic characteristics, breastfeeding knowledge, attitude, self-efficacy and breastfeeding practices (measured using the breastfeeding performance index). Data were analyzed using frequencies, percentages, means, Chi square test and correlation with significance determined at  $P < 0.05$ .

**RESULTS:** The mean age of the mothers and infants was  $28.8 \pm 5.3$  years and  $2.1 \pm 1.5$  months respectively. Majority (76.4%) of mothers had high breastfeeding self-efficacy. Almost all (98.8%) of the mothers had breastfed during the previous 24 hours, but despite this, 78.3% of infants were still bottle-fed. The proportion of mothers who scored high on the breastfeeding performance index was 93.3%. There was good breastfeeding knowledge (82.8%) and positive breastfeeding attitude (23.2%) among the mothers. A significant positive correlation was observed between breastfeeding self-efficacy and breastfeeding practices; and between breastfeeding self-efficacy and breastfeeding knowledge.

**CONCLUSION:** Breastfeeding self-efficacy positively influence breastfeeding knowledge, which in turn was positively associated with optimal breastfeeding practices. Mothers should be properly informed on the importance of breastfeeding to boost their confidence to breastfeed their infants.

**KEYWORDS:** Breastfeeding, Self-efficacy, Lactating mothers.

### 139. ASSESSMENT OF ANALYTICAL CAPACITY FOR MANDATORY FOOD FORTIFICATION MONITORING IN NIGERIA

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**BACKGROUND AND OBJECTIVES:** Nigeria mandated salt iodization in 1992 and fortification of wheat and maize flour, sugar, edible oil, in 2002. Regulation of these national fortification programmes has reportedly been limited by challenges including inadequately equipped laboratories and limited personnel with required competencies for micronutrient analysis. We sought to

assess the capacity of selected laboratories in Nigeria, specifically the analytical capacity for food fortification, food quality and safety.

**METHODS:** We purposively selected ten laboratories (4 government-owned, 4 private, 2 research) to determine their capacity for vitamin and mineral (iodine, vitamin A, zinc, iron), as well as food quality and food safety parameter (aflatoxins, pesticides, heavy metals) assessment. Using semi-structured questionnaires from December 2017 to March 2018, we ascertained analytical capacity to determine compliance with Nigeria Industrial Standards for food fortification and examined quality management systems according to ISO 17025 criteria. We compared resulting data on quality control, reliability and comparability of produced test results, personnel capability, analytical instrumentation and infrastructural capacity.

**RESULTS:** There was no laboratory accredited according to ISO-17025:2005 for testing fortificants. Six laboratories have applied for accreditation from the Nigeria National Accreditation Service (NiNAS). Two laboratories in Lagos participated in inter-laboratory test for fortificant, four in 2016 proficiency test on nutritional components and contaminants in a fortified wheat flour sample, results showed varied competencies. Only one laboratory has commercial certified reference materials-CRM for fortified foods available. Other gaps identified include limited validation of analytical methods, and faulty/non-functional analytical instruments.

**CONCLUSIONS:** Capacity for testing levels of micronutrient in fortified foods needs to be strengthened across laboratories in Nigeria. Our findings highlight specific areas requiring strengthening to ensure delivery of adequately fortified foods.

**KEYWORDS:** micronutrient analysis, certified reference materials, proficiency test, mandatory fortification

### 140. AGRICULTURAL PRODUCTION DIVERSITY AND HOUSEHOLD DIETARY DIVERSITY AMONG SMALL SCALE FARMERS: A CASE STUDY OF CHOMA AND SINAZONGWE DISTRICTS, ZAMBIA.

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**INTRODUCTION/BACKGROUND:** Despite progress, undernutrition in Sub-Saharan Africa remains highly problematic. Small scale subsistence farming communities bear a huge burden

of food insecurity. In Zambia, many farmers engage solely in maize cultivation and/or other cash crops. Promoting agricultural diversification among small-scale farmers is key to boosting dietary diversity. However, information on links between agricultural production diversity and household dietary diversity in Zambia is limited. This study aimed to address this knowledge gap, by investigating small scale farmers from two agro-ecological regions in the Southern province of Zambia.

**METHODOLOGY:** A cross sectional research design was employed to study 390 households. Multi-stage sampling was used to identify the study population. A semi structured questionnaire was used to collect data on sociodemographic characteristics, food consumption and agricultural production; which included a 24 – hour dietary recall to assess household dietary diversity. The household dietary diversity score (HDDS) with a maximum score of 12 food groups was calculated.

**RESULTS:** Male-headed households constituted 70% of the population. The mean HDDS for the entire study population was 5.51 ( $\pm$  1.74); indicating a medium dietary diversity for both study areas. The mean dietary diversity scores for Choma and Sinazongwe districts were 6.34 ( $\pm$ 1.46) and 4.72 ( $\pm$  1.61) respectively; indicating a high dietary diversity for Choma and a medium dietary diversity for Sinazongwe. Pearson's correlation revealed a positive association of both agriculture production diversity and the crop diversification index (CDI) with household dietary diversity; [ $r$  = 0.22; ( $p$ <0.01);  $r$  = 0.502, ( $p$ <0.01) respectively]. The mean CDI for the whole study population was low (0.45 $\pm$ 0.25). Choma had a CDI of 0.56 $\pm$ 0.21, whereas Sinazongwe had a CDI of 0.34 $\pm$ 0.24. ANOVA indicated that the two districts differ significantly in crop diversification ( $p$ <0.01) and dietary diversity ( $p$ <0.01).

**CONCLUSION:** Overall, household dietary diversity in both districts can be scaled up through agricultural diversification; including both crops and livestock production. Government and other stakeholders should initiate, support and monitor the existing programs that sensitize farmers on nutrition-sensitive and climate-smart agriculture.

**KEYWORDS:** Agricultural diversification, dietary diversity, undernutrition, dietary monotony

#### 141. Low Vitamin D and Vitamin B12 Levels in otherwise healthy active-duty male firefighters in Qatar: Are there any clinical implications?

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**Background:** Many studies in firefighters have focused on body composition, cardio-respiratory fitness, psychosocial and stress-related risk factors, bone health, musculo-skeletal and neurological issues. However not much has been reported specifically on their micronutrient status. In particular vitamin D deficiency is widely reported in Arab Gulf countries and linked to a number of diseases but not among frontline emergency personnel.

**Objectives:** Our focus was to assess the levels of vitamins D and B12 and to relate these to clinical risks amongst male firefighters in Qatar.

**Methods:** Triplicate blood measurements of biochemical indices including Vitamins D and B12 were undertaken in the fasting state in a random sample of 30 apparently healthy male career firefighters, average age (SD) 28.67 (4.25) yrs using the multi-functional *Dimension Xpand Plus/RxL Max* (Siemens<sup>®</sup>) integrated chemistry system. Data was collated in *Excel* and further statistical analyses done in *Stata*.

**Results:** Mean (SD) Vitamin D was 14.62 (6.84) (ng/ml) (95% CI 1.2; 28.0) (reference range 30 – 80). Mean (SD) Vitamin B12 was 326.38 (116.27) pmol/L (95% CI 98.5; 554.3) (reference range 138 – 652) but with a wide range including very low levels. Vitamin D was positively correlated with age ( $r$ =0.518;  $p$ =0.004); body weight ( $r$ =0.442;  $p$ =0.016), BMI ( $r$ =0.384;  $p$ =0.040), FBG ( $r$ =0.411;  $p$ =0.027), TG ( $r$ =0.431;  $p$ =0.018). Vitamin B12 was positively correlated with age ( $r$ =0.518;  $p$ =0.004), creatinine ( $r$ =0.497;  $p$ =0.006), WBC ( $r$ =0.380;  $p$ =0.042), MCV ( $r$ =0.450;  $p$ =0.014) and MCH ( $r$ =0.546;  $p$ =0.023) but negatively correlated with % BF ( $r$ = -0.383;  $p$ =0.040), Alb-Cr ratio ( $r$ = -0.384;  $p$ =0.040) and uric acid ( $r$ = -0.379;  $p$ =0.043).

**Conclusions and recommendations:** The extremely low levels of vitamin D did not reflect any significant clinical signs of deficiency among subjects but merits further in-depth investigation. Similarly the low vitamin B12 levels were not accompanied by observable clinical signs. The biochemical correlations in both cases also merit further consideration.

**Key words:** Vitamin D, vitamin B12, Deficiency, firefighters, male, Qatar

**142. Risk factors analysis for overweight, obesity and non-communicable diseases in professional male firefighters in Qatar: A case for first-responder health screening?**

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**Background:** Injuries and sudden on-duty cardiovascular incidents and deaths are reportedly common among firefighters. Direct attributable causes have included pre-existing cardiovascular disease and poor cardio-respiratory fitness. Overweight and obesity have been implicated as contributory factors. In Qatar, to date there has been no study examining health, fitness and non-communicable disease risk factors among firefighters.

**Aims:** to screen and identify risk factors for obesity and NCDs among young male career firefighters in Qatar.

**Methods:** a sub-sample of 30 male firefighters were randomly selected from 150 firefighters in a health and wellbeing study. Subjects completed a structured health screening questionnaire and anthropometric, biochemical, physiological and body composition measurements. Data were collated in Excel and further analysed in Stata.

**Results:** Mean age (SD) was 28.67 (4.25) (95% CI 20.3; 37.0). Weight was 80.04 (11.55) kg. Height was 176.80 (6.14) cm. BMI (kgm<sup>-2</sup>) was 25.64 (3.60), WC and WHR were 82.08 (6.15) cm respectively. FBS and resting pulse at baseline were 5.69 (0.77) mMol/L and 82.87 (0.78) bpm respectively. Systolic and diastolic BP were 122.43 (7.58) (95% CI 107.57; 137.29) and 74.86 (10.31) mmHg (95% CI 54.66; 95.08) respectively. Mean (SD) % BF was 20.27 (6.62) (95% CI 7.3; 33.2). WHR was 0.91 (0.07) (95% CI 0.8; 1.0) and RMR kCal/d was 1670.27 (175.45).

There were significant correlations between Body weight and BMI ( $p<0.0001$ ) and % BF ( $p=0.027$ ). BMI was strongly correlated with % BF ( $p=0.048$ ) FBG ( $p=0.015$ ), TG ( $p=0.022$ ). Diastolic BP was negatively correlated with height ( $p=0.059$ ). % BF was also positively correlated with total cholesterol ( $p=0.028$ ) and LDL-cholesterol ( $p=0.039$ ). FBG showed positive correlations with age ( $p=0.008$ ), BMI ( $p=0.015$ ), HbA1c ( $p=0.004$ ), HDL-cholesterol ( $p=0.018$ ) and TG ( $p<0.0001$ ). HDL-cholesterol was negatively correlated with FBG ( $p=0.018$ ) and TG ( $p<0.0001$ ).

**Conclusions and recommendations:** Subjects were young and relatively healthy but overweight with evidence of strong correlation between age, weight, BMI and NCD risk factors. We recommend an active annual health screening and a work-based fitness programme to improve health and firefighter and other first responders' wellbeing.

**Key words:** Firefighters, male, obesity, NCDs, risk, Qatar

**141. DIETARY INTAKE, NUTRITIONAL STATUS AND MENSTRUAL IRREGULARITIES AMONG ADOLESCENTS IN AFE BABALOLA UNIVERSITY, SOUTH-WEST, NIGERIA**  
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Menstrual irregularities in adolescent girls may affect normal life of adolescent and young adult women. This study determined the relationship between dietary intake, nutritional status and menstrual irregularities in Adolescents. The study was a descriptive cross-sectional. A total of 283 adolescents girls ranging from 15-18 years of age were selected for the study using a probability sampling technique. A self-administered semi-structured questionnaire which had been pre tested was used to collect the data. Information on socio-demographic, lifestyle behaviors, menstrual irregularities and anthropometric indices were obtained. Food frequency questionnaire (FFQ) was used to obtain information on dietary pattern, while 24-hour dietary recall was used to collect information on nutrient intake. Results were presented using descriptive statistics,  $\chi^2$  tests was performed on the data at 5% level of significance. The mean age of menarche was  $11.00 \pm 1.00$ . Less than half (45.9%) of the students had

normal weight. Adolescent girls who were underweight, overweight and obese were 6.7, 31.1 and 16.3% respectively. The most common menstrual problem was dysmenorrhea (84.1%). There was an association between the BMI and premenstrual syndrome. There was no association between the BMI and abnormal uterine bleeding, dysmenorrhea, regular menstrual cycle, oligomenorrhea, polymenorrhea. The nutrient intake was compared with the RDA. Most respondents (92.0%) had calcium intake fall short of RDA for their age. About 44.8% of the respondents had protein intake lower than the RDA. Association between protein intake and BMI was significant ( $P < 0.05$ ). Dietary intake and BMI may influenced menstrual irregularities in Adolescents.

**Key Words:** Body Mass Index, Menstrual irregularities, Adolescents, Menarche.

#### **142. FOOD COMPOSITION DATA GENERATION, COMPILATION AND DISSEMINATION IN AFRICA: CURRENT STATUS, CHALLENGES AND THE NEED FOR OWNERSHIP AND MULTI-SECTORAL INVESTMENT.**

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**BACKGROUND:** Africa is still plagued with the problem of food insecurity, hunger, malnutrition and disease. To combat these problems, production and consumption of nutritious and safe foods need to be promoted. These cannot be achieved without accurate data on the quantity and quality of nutrients and other components provided through foods-food composition data (FCD). FCD are compiled in food composition tables (FCTs) or food composition databases (FCDBs) for use by several professionals for a variety of purposes: therapeutic diet formulations, food product and recipe development, nutrition counseling/consumer education, establishing diet-disease relationships, public health promotion, labeling, safety, food production and policy

as well as nutrition monitoring and surveillance. FCD generation, compilation and dissemination are highly technical activities that require appropriate training in order to obtain good quality tables/databases. Poor quality FCD has serious consequences on the health of the population, and provide wrong evidences for nutrition and health related policies.

**OBJECTIVE:** This paper reviews the history and current status of FCD generation, compilation and dissemination in Africa, successes, challenges and strategies that can address the problems.

**METHODS:** Information were collected through reviews of literature, technical reports of meetings, conferences, and training workshops as well as discussion sessions within the African Network of Food Data Systems (AFROFOODS) network.

**KEY FINDINGS:** This review gives a brief history of FCTs/FCDBs in Africa, coordination of food composition activities by the AFROFOODS, status of FCTs/FCDBs in African; successes, the human and material capacity challenges and emerging issues requiring FCD. The paper makes a strong case for ownership and collaboration of multi-stakeholders in investing and pushing the food composition agenda forward.

**CONCLUSION/PROGRAMME IMPLICATION:** the information provided will facilitate the identification of gaps and prioritization of future efforts in FCD generation, compilation and dissemination in Africa and subsequent alleviation of the food and nutrition problems in Africa.

**Keywords:** Food composition data, food composition tables/databases, generation, compilation, dissemination, current status, AFROFOODS, Africa.

#### **143. Chromium, manganese, iron, copper and zinc contents of selected Nigerian foods**

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**INTRODUCTION AND OBJECTIVES:** Trace elements including chromium, manganese, iron, copper and zinc are essential micronutrients with a variety of biochemical functions in all living organisms. However, the benefits of these micronutrients may be completely reversed if present

at high levels. This study was designed to determine the levels of chromium, manganese, iron, copper and zinc in 35 Nigerian foods sampled from markets in Lagos city, south-west Nigeria.

**MATERIALS AND METHODS:** The foods included fruits, vegetables, tubers, legumes, spices and condiments, canned foods and fish. They were obtained freshly from the markets, cleaned thoroughly, dried, pooled together accordingly, and their edible portions were dry-ashed and the metal contents determined by atomic absorption spectrometry (AAS).

**MAIN FINDINGS:** The levels (in mg/kg wet weight) of these microminerals ranged from non-detectable (in cassava, garri, sweet potatoes, beans, plantain, seasoning cube, okra and onion) to 7.18 (in potash), 0.364 (in orange) to 44.4 (in curry), 2.77 (in onion) to 173 (in thyme), 0.234 (in cabbage) to 44.5 (in cowpea) and 0.545 (in apple) to 43.6 (in stock fish) for Cr, Mn, Fe, Cu and Zn, respectively. The levels of the five metals varied widely among the food groups. The concentrations of these minerals in most of the studied foods are quite similar to levels reported for similar foods from various parts of the world. However, some of these foods have higher levels of Mn, Fe and Cu.

**CONCLUSION AND RECOMMENDATIONS:** This calls for caution in the large consumption of such foods with high elemental contents, especially the vegetables and spices, to prevent bioaccumulation and eventual toxicity. The data from this study are very useful for future dietary intake assessments and can be easily adapted into the Nigerian Food Composition Database.

**KEYWORDS:** Microminerals, Food analysis, FAAS, concentration data, Nigeria, Food Composition Database

#### 144. THE ROLE OF SPATIAL MODELISATION IN THE EXPLORATION OF HOUSEHOLD PREDICTORS OF STUNTING: CASE OF POPOKABAKA, DR CONGO

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**BACKGROUND:** Over decades, Stunting remains high prevalent worldwide and in the DR Congo. One child in two are stunted and at risk of future cognitive development. To date, Analytical epidemiology uses regular logistic regression

to assess associated factors to stunting that are mainly used in many action frameworks. however, this commonly used statistical models may miss to capture the spatial variation of stunting and its associated factors. We conducted this analysis in order to establish the spatial distribution of stunting and its Household related risk factors at a local scale in Popokabaka.

**METHODS:** Data from a cross sectional study in 2017 with a multistage random sample of 341 household having at least one child under 5 years were analyzed. Household factors were Food consumption score, food diversity score, food insecurity access, Parenting feeding style, household size, water scarcity. Response variable was stunting and geo coordinates. Logistic regression was calculated before. Then, Score moran'i index were used to test the spatial dependency of stunting and getis-ord gi model to determine the hotspots. semiparametric geographically weighted gaussian regression (s-gwgr) fitted with an adaptive bi-square kernel function were used to model and analyse the spatial distribution of stunting in relation to specific factors.

**RESULTS:** While model by using regular logistic regression did not show any association, micro geographical special model significant variation of stunting in Popokabaka. the moran'i test under randomisation indicated that stunting is spatially dependent at 5% significant level (p-value = 0.01). s-gwgr performance was low (aic = 451) s-gwgr indicates that only the coefficient of water scarcity and food access score vary across the landscape thereby determine the variation of stunting intensity. the influence of water scarcity was more pronounced in the north and spatially associated with the coefficient of determination of the model, while the food access index is more pronounced in the south of.

**CONCLUSION:** This evidence may provide more practical policy implications to control and manage stunting at the micro level scale. however, there is a need for further research into more factors and large scale that may improve the performance of s-gwgr in determining the local variation of stunting.

**KEY WORDS:**

#### 145. DETERMINANTS OF HOUSEHOLD FOOD INSECURITY IN POPOKABAKA, DR CONGO: A CROSS SECTIONAL STUDY

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**BACKGROUND:** The Democratic Republic of Congo (DRC) is among the countries most affected by food insecurity with the worst global hunger index. Yet the national demographic survey reported 54% of food insecurity in rural areas of the DRC, the situation could be severe and specific in some region that need specific and adapted actions. In order to develop locally-based sensitive nutrition interventions, we aimed to assess the extent of food insecurity (access) in Popokabaka and identify its determinants.

**METHODS:** A cross sectional study was carried out in Popokabaka in 2017 with 495 household selected by using multistage clustered sampling technique. This region is almost inaccessible by road with limited food importation and availability. We collected socio demographic variables, household characteristics and food consumption pattern. Household Food insecurity was assessed by using Household Food Insecurity Access questionnaire and scale (HFIAS) of FANTA. Multivariate Logistic regression analysis was performed to determine the factors associated with food insecurity and adjusted Odds ratios were reported

**RESULTS:** Results from this study showed a high prevalence (81.6%) of severe food insecurity in Popokabaka Zone. FCS score was significantly greater in food secure sub-group than food insecure group (Pvalue < 0.01). Household determinants of food inaccessibility were the possession of agriculture farm 0.35 [0.11-0.52], source of agriculture materials (recycling) 0.19 [0.05-0.90] and employment status of mother 0.25 [0.78 - 0.90].

**CONCLUSIONS:** The promotion of agriculture may significantly reduce food insecurity in Popokabaka. Actions should focus on creating an open, viable and dynamic rural agriculture by focusing on ownership, gender and the role of woman for a sustainable empowerment of families in Popokabaka.

**KEY WORDS:**

#### 146. BARRIERS AND FACILITATORS TO INFANT AND YOUNG CHILD FEEDING PRACTICES IN POPOKABAKA, DR CONGO: A THEMATIC ANALYSIS

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**BACKGROUND:** Infant and young child feeding (IYCF) is a key area to improve child nutrition and survival, and promote healthy growth and development. It has the single greatest potential impact on child survival. In the DRC, IYCF practices remain a concern and indicators IYCF practices are not up to standard in Popokabaka regardless ongoing specific nutrition strategies. This study aimed at exploring potential barriers and facilitators to appropriate IYCF practices in Popokabaka Health Zone (HZ).

**METHODS:** A qualitative approach using 7 Focus Group Discussion (FGD) and 8 in-depth interviews (IDI) was done in two settlements of Popokabaka Health Zone, Imbaluma Village and Popo City. Participants of FGD in each settlement were mothers, grandmothers, fathers, and nurses. IDI were conducted with key informants identified in the community and health facilities. Interviews were conducted in local language and tape recorded. Knowledge and Practices statements were assessed according to IYCF WHO recommendations. Thematic analysis was used to report emerging themes about barriers and facilitators.

**RESULTS:** While participant narratives have reflected acceptable level of knowledge concerning breastfeeding principles, recommendations about complementary feeding were almost unknown. Practices of IYCF recommendations were suboptimal and mainly characterized by grounded cultural food prohibitions. Analysis showed that the main barriers to IYCF included the following: family influence, lack of knowledge, customary beliefs and misconceptions, perception of milk insufficiency/maternal nutrition, mother's work land, poverty/food insecurity, unintended/enclosed pregnancies. Factors that promoted good practices included access to healthcare facilities, awareness and strong authority of the husband and their own previous experience.

**CONCLUSIONS:** Results from this study provide direction towards the development of a framework for IYCF practices in the area under study. Interventions to address child nutrition and improve IYCF practices should consider these local factors.

**KEY WORDS:** IYCF, Barriers, Facilitators, Popokabaka

#### 147. WASTING AND STUNTING CAUSAL MECHANISMS: WHY MULTISECTORAL INTERVENTIONS ARE ESSENTIAL TO END UNDERNUTRITION. LESSONS FROM SEKOTA AND DEHANA WOREDAS OF WAG HIMRA ZONE (AMHARA REGIONAL STATE, ETHIOPIA)

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**INTRODUCTION:** Over the course of the past year (July 2017 – July 2018) Action Against Hunger conducted a nutritional causal analysis Link NCA in Wag Himra zone, in order to deepen its understanding on the underlying causes of undernutrition. The ultimate objective of the study, was to help partners develop a comprehensive operational plan to address major causes of wasting and stunting and hence improve the nutritional security in the area.

**METHOD:** Apart from a review of existing scientific literature and secondary data, the study included qualitative and quantitative data collections, as well as a calculation of statistical associations between individual risk factors and wasting/stunting.

**KEY FINDINGS:** Among the major risk factors of undernutrition, three were identified in the sector of water, sanitation and hygiene (WaSH), namely poor access to water, poor hygiene and sanitation practices and unhygienic playing area for children, while the last major risk factor, poor complementary feeding, was identified in the sector of health and nutrition.

The statistical association further allowed to differentiate between wasting and stunting causal mechanisms. Wasting was associated with poor hygiene and sanitation practices due to the limited access to water and contaminated play area for children via animal or their faeces. While a WaSH-related mechanism remains mostly applicable for stunting as well, the study further revealed a link between stunting and a household composition and decision-making powers. In other words, women's restricted decision-making power particularly regarding the food purchases may result in a higher likelihood for the children to be stunted.

**CONCLUSION:** Causes of undernutrition are complex and multi-sectoral. Hence, the relevance to address them through integrated multi-sectoral longer-term responses. Existing interventions such as Reset II prove their significant value. However, there is need and room for improvements.

**KEY WORDS:** Nutrition causal analysis, stunting, wasting, multi-sectoral interventions

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**BACKGROUND AND OBJECTIVES:** People's perception of food products during food choice is a very complex phenomenon that is influenced by a wide range of characteristics that an individuals, groups and local communities make. This study investigated nutritional status and associated motives of food choice among lactating women.

**METHODS:** Anthropometric measurements and questionnaires were used to collect the required data among 423 randomly selected lactating women using cross-sectional study. Data was analyzed via SPSS version 20, and associated motives of food choice to nutritional status of women were identified by logistic regression analysis; p-value < 0.05 was taken as statistically significant.

**RESULTS:** Prevalence of chronic energy deficiency, underweight and stunting was identified as 21.7%, 26.5% and 5% respectively. In a multivariate regression model, all food choice questionnaire motivations, the strongest motivations specifically affecting were healthy meal, price and mood. Accordingly, healthy meal eating motivation, price and mood concern were the most significant determinant with AOR (95% CI) of 2.1 (1.21-3.62), 3.01(1.32-6.9) and 0.5(0.30-0.95) respectively.

**CONCLUSION:** Nutritional status of lactating mothers was assessed using anthropometric measurement. In this particular group of women the most important motivating factors of food choice for nutritional status were health meal, price and mood. Focus on supporting people's motivations to attain their good health by addressing issues of dietary self-control and self-regulation through nutrition education about healthy food choice is recommended. Since awareness creation is an important to inspire women, their families and communities to increase food intake, proper dietary practices and dietary diversification during lactation in order to successful in improving the livelihood of lactating women.

**KEY WORDS:** Nutritional status, Motives, Food choice, Lactating women

**148. NUTRITIONAL STATUS AND ASSOCIATED DRIVERS OF FOOD CHOICE AMONG LACTATING WOMEN IN DEBEBIRHAN TOWN, NORTH SHOA ZONE, AMHARA REGION, ETHIOPIA**

**149. BREAKFAST CONSUMPTION HABITS OF ADOLESCENTS IN PUBLIC DAY SECONDARY SCHOOLS IN KENYA FROM A 7-DAY FOOD DIARY**

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**INTRODUCTION:** Breakfast is the first meal and typically the most important meal of the day. It helps to kick-start the body's metabolism for the day and thus acts as the pacesetter for the day. The benefits of consuming breakfast to a healthy lifestyle and increased intake of micronutrients, more regular meal habits, healthy food choices, regular exercise pattern and consistency in energy intake that eventually results to a normal body mass index. Unfortunately, breakfast is often skipped.

**METHODOLOGY:** Studies on breakfast have mainly used a 24-hour recall, yet, this cannot be used for generalization of a habit. This study aimed at establishing the breakfast consumption patterns of adolescent based on a 7-day food diary. The study was conducted in public day secondary schools in Thika sub-county, Kiambu county Kenya.

**FINDINGS:** The study consisted of 212 adolescents aged between 14-17 years. Breakfast consumption was assessed using a 7-day food diary with visual aids to help estimate food portions. 14.6% of the adolescents skipped breakfast and more girls (22.3%) compared to boys (7.3) skipped breakfast. In terms of age there was no statistical pattern on breakfast consumption habits. Tea was the most commonly consumed food items accompanied by bread while fruits were least consumed breakfast foods.

**CONCLUSIONS:** Breakfast contributed to 14.6% of the total nutrient intake, and contributed significantly to total vitamin A, Zinc and calcium.

**KEYWORDS:** Breakfast, adolescents, secondary schools, Seven-day-food diary

**151. INADEQUACY OF VITAMINS AND MINERALS AMONG THE ELDERLY IN TAMALLALT, MOROCCO.**

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**BACKGROUND:** Around the world, the number of people aged 60 years and over is increasing, and Morocco is no exception. Yet little is known about the energy and micronutrient intake of Morocco's older population.

**METHODS:** A dietary study was conducted between March 2016 and March 2017 in a random sample of 299 elderly people aged 60 to 105 years. Subjects were recruited randomly from the Princess Lalla Khadija local hospital in the Tamallalt municipality. Dietary intakes were estimated using a 24-hour dietary recall. Energy and micronutrient intakes were estimated using the DIAL software, adapted to include foods commonly eaten in Morocco. Inadequate micronutrient intakes were defined using the Estimated Average Requirement (EAR) method as a cutoff point. The percentage of subjects with intakes below the recommended values for their gender and age group was estimated.

**RESULTS:** After exclusion of under and over-reporters, 221 subjects (68 years  $\pm$  8.3) remained (106 women and 115 men) for analysis. The mean daily energy intake was 2006 kcal (8.4 MJ) in men and 1698 kcal (7.1 MJ) in women. Of the twenty four micronutrients analyzed, a prevalence of inadequacy greater than or equal to 95% was found for iodine, vitamin D and biotin in women and men. A prevalence of inadequacy between 65% and 89% was observed for potassium, vitamin B<sub>5</sub>, calcium, riboflavin, vitamin B<sub>12</sub>, vitamin E and magnesium for both genders and for zinc in men only. Over 70% of elderly had intakes above the adequate intake level for sodium whereas chloride intake was below.

**CONCLUSIONS:** Our findings indicate a risk of deficiency of several nutrients in this elderly Moroccan population. It is important now to examine these deficiencies along with other factors determining their health and to propose interventions.

**KEYWORDS:** dietary intake; inadequacies; elderly, Morocco.

**152. MATERNAL KNOWLEDGE AND CHILD NUTRITIONAL STATUS<sup>1</sup>Moses Kwashie Klevor ; <sup>1</sup>Jacob Setorglo; <sup>2</sup>Ye Avorgbedor; <sup>3</sup>Phillip N. Gorleku; <sup>4</sup>Kingsley K.A. Pereko; <sup>5</sup>Matilda Steiner-Asiedu**

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**BACKGROUND AND OBJECTIVES:** Malnutrition in children adversely impacts their growth and development. This study assessed the nutritional status of children 6- 59 months in rural communities in the Lower Manya Krobo Municipality (LMKM) of the Eastern Region of Ghana.

**METHODS:** A cross sectional study design that employed quantitative methods was chosen. The study sampled 285 caregivers/mothers and their children aged of 6 and 59 months from four hard-to-reach communities and two peri-urban communities within three sub-municipalities, who lived in and accessed child welfare services at LMKM during the period of study. Structured questionnaires were used to collect the data from the respondents. Anthropometric measurements (height/length, weight and MUAC) were carried out on the children. Data entry was done using Microsoft Excel 2010 and analyzed using WHO Anthro version 3.2.2 and STATA version 14 softwares.

**RESULTS:** The average age of the children was 32 months and that of the caregivers/mothers was 29 years. About 40% of the children were under-nourished (either stunted, wasted or underweight). About 5% of children were stunted, a similar percentage were wasted and 7% were underweight. Chi square and Fisher's exact tests indicated that, mother's age ( $p<0.001$ ), family structure ( $p=0.010$ ) and access to media information ( $p<0.001$ ) were significantly associated with mother's nutritional knowledge. Multiple logistic regression analysis showed that the odds of having higher nutritional knowledge were less for caregivers/mothers caregivers with high educational attainment.

**CONCLUSION:** Under-nutrition exists in peri-urban community in the LMKM. Education on infant and young child feeding should be encouraged since it is clear from this study that it is one key factor the predicted the nutritional status of the children. The municipal health directorate should be tasked to improve advocacy in the hard-to-reach areas in the metropolis.

**KEY WORDS:** Nutritional status, child feeding, caregivers, under-nutrition.

### 153. IMPACT OF NUTRITIONAL STATUS ON FUNCTIONAL STATUS OF PATIENTS ADMITTED AT THE

### STROKE UNIT OF KORLE-BU TEACHING HOSPITAL IN ACCRA, GHANA: A PROSPECTIVE COHORT STUDY

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**BACKGROUND:** Malnutrition is common among stroke in-patients and tends to worsen with prolonged hospital stay. Very few studies in Ghana have looked at the effect of nutritional status on clinical outcome in stroke patients. The objective of this study was to assess impact of nutritional status on functional status of stroke patients on admission at the Stroke Unit of Korle-Bu Teaching Hospital (KBTH).

**METHODS:** This is a prospective cohort study on 86 consecutive patients admitted at the Stroke Unit, KBTH. Nutritional status was assessed using serum albumin, Mid Upper Arm Circumference (MUAC) and Subjective global assessment (SGA) at admission and discharge while the Barthel Index (BI) was used to assess functional status.

**RESULTS:** About 35% of patients had mild to severe malnutrition by SGA at baseline and this increased to 53.2% at discharge. Forty percent of patients were however identified by MUAC as likely to be obese both at admission and on discharge while 30% of patients had hypoalbuminemia. Most patients (95.3%) had moderate to severe disability at baseline and at discharge (89.9%). Admission MUAC correlated with BI at admission ( $p=0.005$ ) and discharge ( $p=0.013$ ); discharge SGA had a significant relationship with BI at baseline ( $p=0.002$ ) and discharge ( $p=0.001$ ).

**CONCLUSION:** Undernutrition was high among the stroke patients at admission and this increased at discharge. Disability was also high in the patients at both admission and at discharge. Functional status was influenced by nutritional status at admission and at discharge. Timely nutrition assessment and intervention for the stroke patients is critical. This could improve the nutritional status, functional status and prognosis in the patients.

**KEY WORDS:** Undernutrition, Nutritional status, Functional status, Stroke patients, Cerebrovascular accident

#### 154. ASSESSING THE IMPACT OF NUTRITION AND PHYSICAL ACTIVITY EDUCATION ON PHYSICAL FITNESS AND COGNITION AMONG SCHOOL-AGED CHILDREN IN SELECTED PUBLIC SCHOOLS IN KUMASI METROPOLIS, GHANA

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**INTRODUCTION:** Healthy diets and physical fitness in children are associated with improved nutrient intake, optimal brain development and cognition. This longitudinal school-based intervention study investigated the effectiveness of nutrition and physical activity (PA) education on nutrition knowledge, physical fitness and cognition of school-aged children in the Kumasi Metropolis.

**METHODS:** The study included 433 school-aged children. Physical fitness was done using forward jump, forward flexing of the trunk, sit ups, right and left handgrip and 50 metre run. Cognition was assessed using a 36-question Raven Non Verbal Progressive Matrix (RVPM). Nutrition and physical activity Knowledge, Attitude and Practice (KAP) were assessed using a 25-question adapted from Food and Agriculture Organisation (FAO) nutrition and physical activity (KAP). Ten primary government schools were randomly selected and allocated into 3 different intervention groups: nutrition (N) education (3 schools), physical activity (PA) education (3 schools), both interventions (NPA) (2 schools), and control (C) (2 schools). The interventions were carried out for 6 months followed by post intervention assessment.

**RESULTS:** Mean age of participants was 11.1 years with 51.5% being girls. Overall RVPM score improved after the intervention (from mean=17.98 to 22.04,  $p<0.001$ ) but within the intervention groups, the strongest improvement was observed in the N group (mean difference 4.8,  $p<0.001$ ). With regards to physical fitness, significant improvement was observed among the nutrition intervention group (mean difference =1.3,  $p=0.009$ ). The group that received PA

intervention and both interventions did not improve significantly, while the control group reduced in physical fitness score significantly (mean difference=-1.5,  $p=0.010$ ). A positive association was observed between fitness levels and cognitive scores at baseline ( $r=0.126$ ,  $p=0.009$ ) but not at post.

**CONCLUSION:** Nutrition and physical activity education improved knowledge and cognition in Ghanaian school-aged children. Nutrition education alone significantly improved physical fitness and had the strongest effect on cognition.

**KEY WORDS:** nutrition, physical activity, physical fitness, cognition

#### 155. ASSESSING THE READINESS OF LOCAL KEY INFORMANTS TO ADDRESS THE CONSUMPTION OF UNHEALTHY FOODS AND BEVERAGES AMONGST ADOLESCENT GIRLS AND WOMEN IN GHANA: A DFC DIETARY TRANSITIONS IN GHANA STUDY

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**BACKGROUND AND OBJECTIVES:** Ghana has reached an advanced stage of nutrition transition, contributing to an increase in nutrition-related non-communicable diseases, particularly among women. It is therefore essential to identify interventions to enhance healthy dietary practices. This study assessed community readiness to reduce unhealthy food and beverage consumption in women of reproductive age in urban Ghana.

**METHODS:** The Community Readiness Model (CRM) assessed the stage of readiness of communities within Accra (Ga Mashie) and Ho (Ho Central) to address the consumption of unhealthy foods and beverages. In-depth individual interviews were conducted with 24 key informants across the two cities. The CRM consists of 36 open questions addressing five readiness dimensions (community knowledge of efforts; leadership; community climate; knowledge of the

issue and resources). The interviews were quantitatively scored using the CRM protocol, and qualitative thematic analysis was undertaken.

**RESULTS:** The mean community readiness scores were  $3.35 \pm 0.54$  (Ga Mashie) and  $3.94 \pm 0.41$  (Ho central). These scores correspond to the “vague awareness stage”. In the Ga Mashie community, the mean readiness score for knowledge of the issue was the highest of all the dimensions ( $4.10 \pm 1.61$ ), followed by leadership ( $3.50 \pm 1.34$ ). In Ho central, the highest scores were displayed for knowledge of the issue ( $4.38 \pm 1.81$ ) and community climate ( $4.29 \pm 1.32$ ). In both communities, the lowest scores were found for resources. The thematic analysis currently underway will provide contextual information to explain the scores.

**CONCLUSIONS:** Communities in Accra and Ho have limited knowledge of the causes and consequences of unhealthy dietary practices. Despite recognising that the consumption of unhealthy foods and beverages was an issue, the leadership and community members showed no immediate motivation to act. The overall low community readiness for both study sites highlights the need to increase awareness of the issue prior to implementing initiatives to improve diets.

**KEY WORDS:** Community readiness, interventions, unhealthy diet, Ghana, women

#### 156. ASSESSING THE IMPLEMENTATION FIDELITY OF A MULTISECTORAL INTEGRATED NUTRITION PROJECT IN KOLDA AND KEDOUGOU REGIONS

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**BACKGROUND-** Kolda and Kedougou are among the less privileged regions in Senegal with more than 70% of the population living below the poverty line and four out of ten people suffering from food insecurity. The prevalence of chronic malnutrition in children is 24% for Kolda and 28% for Kedougou compared to a national level of 19%. This alarming situation led the Senegal Canadian Cooperation desk to support the implementation of a five years (2015-2020) integrated nutrition project through Nutrition International (NI).

**OBJECTIVES-** PINKK sought to improve nutritional security of the population, especially young children and women of Kolda and Kedougou regions. We assessed adherence to the

implementation design as a means of assessing implementation fidelity.

**METHODS-** The implementation components were identified through a situation assessment and participatory approach involving multiple stakeholders. An in-depth situation assessment in both regions identified key gaps and bottlenecks critical to be addressed to improve the nutritional status of the most vulnerable population. Further participatory analysis of identified gaps and bottlenecks resulted in the identification of critical needs to be addressed to improve the nutritional status of the most vulnerable population. NI in collaboration with CLM, World Vision, and Development International Desjardins designed a multi-sectoral integrated approach following the UNICEF conceptual framework for malnutrition. The main components of the project include nutrition, food security and governance. Gender issues were identified to be cross cutting. Monitoring data were analyzed to assess program fidelity.

**RESULTS-** There is strong adherence to the implementation design across the three components. Nutrition: Over half (55%) of all pregnant women have received iron folic acid supplements at the first antenatal care visit. 80% of children 0-23 months have received monthly Growth Monitoring Promotion; and there were improvements in the percentage of children 6-59 months screened for malnutrition from 20% to 35% in Kedougou and 36% to 51% in Kolda. Food Security: 70% of vulnerable households have benefited from the food security package. 218 new Village Savings and Loan Associations (AVECs) were initiated reaching 5,769 beneficiaries including 3,045 women and 3,741 children under 5 years old through increase of availability of micronutrient rich-food for this last group. At least 90 % of AVECs members are women optimizing women empowerment gender component. Governance: A harmonized guide was developed and implemented in 17 out of 19 local governments in Kedougou region to improve the capacity of local government's agencies to plan, implement and monitor nutrition interventions within their local development plans.

**CONCLUSIONS-** There is evidence of strong fidelity in delivery of the nutrition, food security, and governance and gender components of the program that have the potential to maximize nutrition outcomes.

**KEY WORDS:** Integrated, Nutrition, Multi-sectoral, Implementation fidelity

## 157. COLLABORATE – A NOVEL METHOD TO FOSTER INTERDISCIPLINARY WORKING

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**INTRODUCTION/BACKGROUND:** Many challenges are best solved through team work. For example, the development of food system policies requires expertise in nutrition, agriculture, economics, trade, etc. and experience in policy and project implementation, financial management and stakeholder engagement. There are, however, barriers to multi-disciplinary and multi-skill working: individuals lack opportunities to meet others with different skill sets or expertise; they might not realise the value that a variety of perspectives brings; and they might find it challenging to adopt shared methods and ways of working. Here, we present “Collaborate”, an innovative tool to foster interdisciplinary working.

**METHODS:** *Collaborate* is a live, social game in which players work together as teams to tackle complex challenges. The game aims to motivate players to collaborate across disciplines and professions. There are three stages:

1. The market place: Players meet each other and form multi-disciplinary and multi-skill teams.
2. Brainstorming: Teams work to develop solutions to the challenge.
3. The ‘battle stage’: Teams pitch their solutions to one another. Opposing teams offer constructive critiques. The battle stage is overseen by judges who award points for strong project ideas and constructive criticism.

**RESULTS:** *Collaborate* has been played around the world at international research conferences, policy workshops and graduate student programmes. The game provides valuable experience of developing food system projects and policies in multi-skill and multi-discipline team. At an academic conference in Kathmandu, Nepal, 100% of participants reported that playing *Collaborate* encouraged them to think about food systems from a multi-disciplinary perspective, while at the 2017 SUN Global Gathering, players noted the benefit of learning from other country programmes.

**CONCLUSIONS:** Multi-discipline and multi-skill team work is required to tackle complex food system challenges.

*Collaborate* provides an effective tool to encourage collaborative working, and may be usefully applied in conferences, workshops and other learning environments.

**KEY WORDS:** Food systems; Interdisciplinary; Learning; Pedagogy

## 158. EFFECT OF ORANGE FLESHED SWEET POTATO (OFSP) AND ANIMAL SOURCE FOOD (ASF)- FORTIFIED INFANT COMPLEMENTARY FOOD BLENDS ON THE ANTHROPOMETRIC INDICES AND MICRONUTRIENT STATUS OF INFANTS 6-24 MONTHS IN AKPABUYO, CROSS RIVER STATE, NIGERIA.

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**BACKGROUND:** Poor complementary food is a major cause of underweight and micronutrients deficiencies in infants 6-24 months.

**OBJECTIVE:** To evaluate the effect of OFSP and ASF-fortified infant complementary blends on anthropometric indices and micronutrient status of infants 6-24 months. .

**METHODS:** Sixty malnourished infants identified during a baseline study in Akpabuyo were used. Ethical approval was obtained from MoH and informed consent from the parents/caretakers. Food materials: OFSP, Bonga fish (*Ethmalosa fimbriata*), cowpea, maize, and red palm oil (RPO)) were purchased, processed and chemically analyzed using standard methods. Two complementary foods were formulated at the ratio 40:30:25:5[Potato (P), Beans (B), Fish (F), RPO (O)]-PBFO and 10:30:30:25:5[Corn (C), Potato, Beans, Fish, RPO]-CPBFO; Nutrend served as control. The infants were assigned to the two test diets and the control and fed for six weeks. Total food intake was recorded and nutrient intake calculated using food composition tables. Venous blood samples were collected into plain and EDTA bottles. Pre- and post-anthropometric and biochemical assessments were conducted using standard procedures. Descriptive and inferential statistics were used to analyze data collected and significance accepted at  $p < 0.05$ .

**RESULTS:** Identified malnourished children were moderately/severely stunted; 33.3% underweight and 5.7%

wasted; 93% had low serum retinol concentration (<0.7mol/L), 73% low zinc (<65µg/dL) and 70% low iron (<54µg/dL). After the feeding trial, underweight prevalence reduced to 1.7%, moderate/severe stunting changed slightly; and no wasting recorded. Moderate underweight (1.7%), low serum retinol (1.7%) were observed only in infants fed CPBFO, while iron deficiency (<54µg/dL) reduced to 5%, 10% and 10% for infants fed Nutrend, PBFO and CPBFO. No zinc deficiency was recorded. Significant positive correlations were observed at  $p < 0.05$  between nutrient intake, weight gain, serum retinol and zinc status.

**CONCLUSION:** OFSP and ASF-fortified complementary foods improved underweight and micronutrient status of infants; their use should be exploited and promoted.

**KEYWORDS:** Orange fleshed sweet potato, animal source food, complementary food, serum retinol, iron and zinc status, anthropometric indices.

#### 159. ORIENTIN ISOLATED FROM *BOMBAX COSTATUM* CALYXES SERUM ELECTROLYTES ELEVATING POTENTIALS IN HYPERCHOLESTEROLEMIC ALBINO RATS

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**INTRODUCTION/BACKGROUND:** Hypercholesterolemia often occurs in conjunction with glucose intolerance, obesity, diabetes and metabolic syndrome. Orientin has several medicinal properties including antioxidant, antiaging, antiviral, antibacterial, antiinflammation, vasodilatation and cardioprotective effects. We examined the effect of orientin administration on body weight, fasting blood glucose and serum electrolytes profile of poloxamer-407 induced hypercholesterolemic rats.

**METHODS:** Thirty albino rats were divided into 6 groups of 5 rats based on body weight and followed for 21 days. The

normal diet of all the rats was constituted of chow (purchased) and water. Poloxamer-407 dissolved in saline (1g/ml of NaCl, 40°C) was administered to the rats at a dose of 1g/kg body weight/day on day 1 and 3, to induce hypercholesterolemia. Rats in group 1 acted as control and were not induced. On induction of hypercholesterolemia, rats in group 2 were orally given 20mg atorvastatin while groups 4, 5 & 6 received 50, 100 and 200mg orientin, respectively. Blood samples were obtained from rats by cardiac puncture at start and end of the experiment, to determine fasting blood glucose (FBG), serum calcium (Ca), potassium (K), sodium (Na) and phosphorus (P) contents.

**RESULTS:** Orientin considerably decreased body weight and FBG while increasing serum Ca, K, Na and P levels. The 100mg orientin group had highest decrease in body weight relative to atorvastatin group. The 200mg orientin group had the highest decrease in fasting blood glucose compared to atorvastatin group. The 50mg orientin group had the highest increase in serum Ca relative to atorvastatin treated group. The 100mg orientin group had the highest increase in serum K, Na and P compared to 20mg atorvastatin group.

**CONCLUSION:** Orientin has the ability to reduce body weight and FBG while elevating serum macro-mineral levels in hypercholesterolemic rats.

**KEYWORDS:** Orientin, *Bombax costatum*, hypercholesterolemia, electrolytes, poloxamer-407

#### 160. NUTRIENT AND PHYTOCHEMICAL COMPOSITION OF JACKFRUIT (*Artocarpus heterophyllus*) PULP, SEEDS AND LEAVES

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**BACKGROUND:** Jackfruit an underutilized crop in Eastern Nigeria. Evaluation of its nutrient and phytochemical content would enhance cultivation and consumption of jackfruit and other value addition in food production.

**OBJECTIVES:** The study aimed to evaluate the nutrient and phytochemical composition of jackfruit pulp, seed and leaves. **METHODOLOGY:** The jackfruit was harvested from a local farm located at Obiangwu, Ngor Okpala Local Government Area, Imo State, Nigeria. It was identified by the crop science Head of Department, Faculty of Agriculture, Imo



State University. Nutrient and phytochemical compositions was evaluated using standard methods. Means and standard deviation was computed using statistical product for service solution (SPSS) version 22.0. One-way analysis of variance (ANOVA) and Turkey test was used in computing and separating the means. Statistical significance was set at  $P < 0.05$ . **RESULTS:** The moisture content ( $86.93 \pm 0.03$ ) of the jackfruit pulp was significantly ( $p < 0.05$ ) higher than the seed and leaves. Crude protein ( $10.09 \pm 0.11$ ), fat ( $4.29 \pm 0.12$ ) and carbohydrate ( $7.89 \pm 0.13$ ) were significantly higher in the jackfruit seed while crude fiber ( $4.91 \pm 0.06$ ) and ash ( $2.53 \pm 0.06$ ) were significantly ( $p < 0.05$ ) higher in the jackfruit leaves than the pulp and seed. The micronutrient composition shows that jackfruit pulp was significantly ( $p < 0.05$ ) higher in potassium ( $0.33 \pm 0.01$ ) and vitamin C ( $2.10 \pm 0.01$ ), zinc ( $9.28 \pm 0.11$ ) while the leaves was significantly ( $p < 0.05$ ) higher in calcium ( $0.52 \pm 0.01$ ), manganese ( $12.75 \pm 0.35$ ) and iron ( $59.50 \pm 0.71$ ). The phytochemical composition shows that jackfruit pulp was lowest in phytic acid, oxalate, alkaloids, tannin and flavonoid (6.14, 3.69, 7.88, 0.03, and 3.91). Jackfruit seed was higher in phytic acid ( $8.11 \pm 0.06$ ) and oxalate ( $5.53 \pm 0.13$ ) while the leaves was higher in alkaloid ( $7.88 \pm 0.06$ ), tannin ( $0.06 \pm 0.01$ ) and flavonoid ( $2.03 \pm 0.06$ ).

**CONCLUSION:** The study revealed that jackfruit pulp, seed and leaves are rich in nutrients studied. Processing techniques would be required to reduce antinutrients found in the seed and leaves. Phytochemicals in the jackfruit pulp, seed, and leaves would enhance health especially in the fight against non-communicable diseases.

**KEYWORDS:** Nutrient, phytochemical, Evaluation Jackfruit.

This study among others, explored household level enablers and barriers to EBF.

**METHODS:** A cross sectional study using both quantitative and qualitative methods was employed. Structured questionnaires were administered to mothers while in depth interviews were conducted for spouses and grandmothers. A Multi-stage sampling method was employed in the selection of facilities and participants for the quantitative aspect. Maximum variation sampling was employed to identify spouses and grandmothers for the in-depth-interview. Quantitative data was analyzed using Stata and qualitative data done using Nvivo (version 9)

**RESULTS:** Early initiation of breastfeeding - within the first hour of birth was high (64.9%), the rate of EBF was low (30.8%). A significant association was observed between religion [AOR=0.336, 95% CI, 0.147 - 0.767], family support [AOR=0.489, 95% CI, 0.246 - 0.974] and the practice of EBF. While respondents stated that they had comfortable home environments to support EBF, household level actors showed a lukewarm acceptance to EBF. Concerns of hygiene and a quest to quench the thirst of the babies were raised. Almost all of the participants were willing to accept home visits by trained health professionals to support EBF.

**CONCLUSION:** The proportion of mothers who practiced EBF was found to be much lower as compared to the national figure of 52%. A comfortable home with support from the household level actors (spouse and grandmother) was found to be encouraging to mothers to practice exclusive breastfeeding.

**KEYWORDS:** exclusive breastfeeding, home support, spouses and grandmother

#### 161. HOME SUPPORT AND EXCLUSIVE BREASTFEEDING: PERSPECTIVES OF HOUSEHOLD LEVEL ACTORS

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**BACKGROUND:** Exclusive breastfeeding (EBF) is established as a healthy means of feeding an infant. It is recommended for the first six months of a child's life. According to WHO, 37 % of children are exclusively breastfed up to six months globally. The practice of EBF in Ghana is estimated at 52% and 32% at Ga South Municipality, where the current study was conducted.

#### 162. NUTRITIONAL STATUS AND ASSOCIATED DRIVERS OF FOOD CHOICE AMONG LACTATING WOMEN IN DEBREBIRHAN TOWN, NORTH SHOA ZONE, AMHARA REGION, ETHIOPIA

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**BACKGROUND AND OBJECTIVES:** People's perception of food products during food choice is a very complex

phenomenon that is influenced by a wide range of characteristics that an individuals, groups and local communities make. This study investigated nutritional status and associated motives of food choice among lactating women.

**METHODS:** Anthropometric measurements and questionnaires were used to collect the required data among 423 randomly selected lactating women using cross-sectional study. Data was analyzed via SPSS version 20, and associated motives of food choice to nutritional status of women were identified by logistic regression analysis; p-value < 0.05 was taken as statistically significant.

**RESULTS:** Prevalence of chronic energy deficiency, underweight and stunting was identified as 21.7%, 26.5% and 5% respectively. In a multivariate regression model, all food choice questionnaire motivations, the strongest motivations specifically affecting were healthy meal, price and mood. Accordingly, healthy meal eating motivation, price and mood concern were the most significant determinant with AOR (95% CI) of 2.1 (1.21-3.62), 3.01(1.32-6.9) and 0.5(0.30-0.95) respectively.

**CONCLUSION:** Nutritional status of lactating mothers was assessed using anthropometric measurement. In this particular group of women the most important motivating factors of food choice for nutritional status were health meal, price and mood. Focus on supporting people's motivations to attain their good health by addressing issues of dietary self-control and self-regulation through nutrition education about healthy food choice is recommended. Since awareness creation is an important to inspire women, their families and communities to increase food intake, proper dietary practices and dietary diversification during lactation in order to successful in improving the livelihood of lactating women.

**KEY WORDS:** Nutritional status, Motives, Food choice, Lactating women

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**Background:** The values and norms of a community play a significant role on the attitudes and behaviours that foster community growth and development. One common practice valued by the communities in Ghana is honoring her heroes. The Well-done Mother intervention research was aimed at promoting child feeding and care practices among children under age two years as a community development agenda.

**Methods:** A pre and post- intervention study design was adopted in this study following the recruitment and training of community volunteers who delivered varied child care massages and monitored the performance of care givers and publicly acknowledging the performance of care givers in two communities (intervention and control communities). The research also focused on engaging the community stakeholders on the importance of child nutrition to the development of the community over a one year period (May, 2016 to May 2018). Data was collected at baseline on child feeding practices and care practices.

**Results:** The study involved 104 (58 intervention and 42 controls) children under age two years. Attrition at endline was 24%. The result shows the rate of parents attending child nutrition and health services increased from 74.1% at baseline to 97.7 % at endline for intervention group compared to 85.7% at baseline to 94.4% at endline for the control group although not statistically significant. Diarrhoea rate among intervention group significantly reduced at endline for intervention group from 16.7% to 2.5% compared to the controls who had an increase from 16.7% to 20.0% at endline. Paired sample t-test show a significant increase in MUAC of children in the intervention group while the control had no significant increase in MUAC. The number of times children were breastfed in the day significantly increased for the control group. The number of times children were breast feed at night and number of times children were fed solid foods did not change significantly for both groups.

### 163. DRIVING THE IMPORTANCE OF EARLY CHILD NUTRITION AS A COMMUNITY DEVELOPMENT AGENDA. A COMMUNITY BASED INTERVENTION STUDY

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**Conclusion:** Drawing community's attention to the importance of nutrition to their development have some impact on child care practices and nutrition.

**Keywords:** Early child nutrition, community development, feeding practices, care practices

#### 164. MULTI-SECTORAL NUTRITION ACTIONS: TANZANIA EXPERIENCE

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**BACKGROUND AND OBJECTIVES:** Tanzania like many other countries is facing the double burden on malnutrition. The causes of malnutrition are multisectoral in nature hence require multisectoral approaches to address them. Bringing all sectors together to address malnutrition has been a challenge to many countries. The Government of Tanzania developed the National Multisectoral Nutrition Action Plan (NMNAP 2016-21) to guide implementation of multisectoral nutrition interventions

**METHODS:** Tanzania NMNAP was developed using three ONES principles – one plan, one coordinating mechanism and one monitoring and evaluation framework. Using the theory of change model, seven key result areas and the common results, resources and accountability framework were developed.

**RESULTS:** During the 18 months of implementation, compared to 2016, number of councils holding quarterly nutrition coordinating meetings increased from 10 to 17%, nutrition spending at council level increased by 15% from TZS 128 to 147 million, government allocation doubled to TZS 11 billion for nutrition activities in 2017/18, regions and councils producing multi-sectoral nutrition scorecard reports increased to 60% from 12 %. Overall good progress against set indicators, with almost half (48%) of the targets met.

**PROGRAM LESSONS:** Through NMNAP, it has been possible to integrate nutrition services and collaborate with private sector and large scale nutrition programs like WASH and Cash Transfer. Annual joint multisectoral nutrition review of planned activities and public expenditure have been key in

setting new targets and improving sectoral accountability. The NMNAP has been instrumental in guiding annual regional nutrition planning and budgeting sessions, compact agreement on nutrition between the Vice President through the Minister responsible for Regional Administration and Local Government Authority (LGA) and Regional Commissioners and LGAs commitment and funding increase for nutrition interventions. The contribution of nutrition sensitive sectors need thorough review.

**KEY WORDS:** Multi-sectoral, National Multi-Sectoral Nutrition Action Plan, Malnutrition

#### 165. EFFICACY OF AN IRON FORTIFIED WHEAT-BASED INFANT CEREAL IN PREVENTING AND CORRECTING IRON-DEFICIENCY ANEMIA IN CHILDREN AGED 18-59 MONTHS IN SALAPOUMBÉ (EAST CAMEROON): A CLUSTER RANDOMIZED, CONTROLLED, DOUBLE-BLIND TRIAL

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**BACKGROUND AND OBJECTIVES:** Anemia affects >60% of children aged 0-5 years in Cameroon, with iron deficiency as the most common cause. The consequences of anemia include poor growth, impaired cognitive development and academic performance, and reduced immune function. Fortified infant cereal is an important source of dietary iron for young children and may promote a more favorable iron status in this age group. The objective of this study was to assess the efficacy of iron-fortified wheat-based infant cereal in the correction and prevention of iron deficiency anemia in children aged 18-59 months in Salapoumbé, Cameroon.

**METHODS:** This was a cluster randomized, controlled, double-blind clinical trial conducted in 205 anemic (hemoglobin 7-11g/dL) but otherwise healthy children, randomized to consume for 6-mo two 50g servings/day of a standard, micronutrient-fortified infant cereal (providing 3.75mg iron fumarate/serving; n=106) or the same cereal without iron (n=99). Other aspects of the diet were not monitored or controlled. Height and weight were measured monthly, and hemoglobin, serum ferritin adjusted for C-reactive protein (CRP), serum iron, and transferrin saturation were assessed at baseline, 3-, and 6-mo. Differences between groups were analyzed using ANCOVA on ranks and adjusted for the baseline value of the analyzed parameter.

**RESULTS:** Compared to the control group, children consuming the iron-fortified cereal had significantly higher mean hemoglobin level ( $10.0 \pm 1.8$  vs.  $9.7 \pm 1.4$ g/dL, respectively;  $p=.023$ ), ferritin adjusted for CRP ( $16.1 \pm 8.3$  vs.  $9.5 \pm 7.5$ µg/L,  $p<.001$ ), serum iron ( $14.5 \pm 3.9$  vs.  $11.2 \pm 4.4$ µg/dL;  $p<.001$ ), and transferrin saturation ( $19.0 \pm 17.4$  vs.  $10.7 \pm 12.5$ %;  $p<.001$ ) at 6-mo. The prevalence of anemia, iron deficiency, and iron deficiency anemia also decreased to a significantly larger extent in the iron-fortified vs. control group (all  $p<.001$ ).

**CONCLUSIONS:** Fortified wheat-based infant cereal providing 7.5mg/d of iron fumarate for 6 months improved iron status and decreased the prevalence of iron deficiency anemia in children aged 18-59 months in Salapoumbé, Cameroon.

**KEY WORDS:** iron deficiency, anemia, infant, cereal

#### **166. CONSUMING FORTIFIED PEANUT BASED SNACK IMPROVES NUTRITIONAL STATUS OF CHILDREN**

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**BACKGROUND:** Undernutrition among children remains a challenge worldwide especially in developing countries. This is associated with impaired growth and poor cognitive function. We evaluated the effect of a fortified groundnut based snack on the nutritional status and academic performance of school children (6-17years) in the Ashanti region.

**METHODS:** This was a quasi-experimental design involving 254 and 220 participants in the intervention (IG) and control groups (CG) respectively. Each IG participant received a 20g sachet of the fortified snack 5 days/week for 4 months except holidays and weekends whilst the CG received no treatment. Background characteristics, dietary intakes, anthropometric and haemoglobin indices were measured at baseline (Month 0), at end of month 2 and 4 months. Data were analysed using paired and independent T test for within and between groups respectively.

**RESULTS:** The mean age of all participants was  $10.7 \pm 2.0$  years and both groups had comparable parameters at baseline. Mean change in height was significantly higher among participants in the IG than those in CG ( $2.11 \pm 0.87$  vs.  $1.82 \pm 0.92$ ;  $p<0.01$ ) at months 4. There was no significant difference in the mean change in weight between both groups (IG;  $1.13 \pm 1.07$  vs. CG;  $1.08 \pm 1.06$ ,  $p=0.68$ ). Mean haemoglobin concentration among the IG improved from  $13.64 \pm 1.79$ g/dl to  $14.16 \pm 1.37$ g/dl by months 4 ( $p<0.01$ ). No significant improvement was seen in the haemoglobin concentrations among the CG by month 4 ( $14.07 \pm 1.43$  to  $13.78 \pm 1.27$ ,  $p=0.33$ ). Also, the average subject score of participants in the IG improved (IG;  $0.72 \pm 10.03$  vs. CG;  $-1.75 \pm 10.41$ ,  $p=0.01$ ). 99.53% of the participants met EARs for carbohydrates, protein (94.16%) and iron (97.66%). However, no participant met EARs for iodine and folate.

**CONCLUSIONS:** Linear growth, haemoglobin concentration and school performance improved in the IG group. The snack has potential to improve nutritional status of school children and could be considered as a vehicle to complement school feeding programmes.

**KEYWORDS:** Haemoglobin, Malnutrition, Infant and young child feeding.

**Conflicts of Interest / Disclosure:** Authors declare no conflict of interest with respect to the conduction of this research.

**Acknowledgement:** This study was funded by the Hershey Company, USA.

### 167. THE EFFECT OF DEWORMING SCHOOL CHILDREN ON ANEMIA PREVALENCE: A SYSTEMATIC REVIEW AND META-ANALYSIS

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**INTRODUCTION:** High prevalence of anemia attributable to intestinal parasite infection occurs among children in developing countries. As a result mass treatment of all children with anti-helminthic drugs particularly in school setting is being implemented. There are few studies conducted to assess impact of deworming on anemia prevalence among school children with inconclusive finding. Therefore we aimed to conduct a systematic review on impact assessment of deworming on anemia prevalence or hemoglobin level of school children so that policy makers and other stake holders could have pooled evidence on the direction to make decision.

**METHODS:** The review was conducted through a systematic literature search of articles published between 1998 and 2015. Five bibliographic databases and libraries: PubMed/Medline, Global Health Database, Embase, the Cochrane Library, and African Index Medicus were used. After cleaning and sorting, analysis was performed using STATA version 11. The pooled estimate was through a fixed-effects model. Heterogeneity was assessed by the  $I^2$  and publication bias through funnel plot.

**RESULTS:** Eight studies were retained for final analysis which enrolled a total of 1,005,239 school children. The overall change in the hemoglobin level after deworming was 1.62(95%CI=1.01-2.25) gram/deciliter. There was no difference between the random effect model and the fixed effect model. The prevalence of anemia was markedly changed after the program, particularly in the studies which implemented deworming with hygiene program, co-administration of iron and retinol.

**CONCLUSION AND RECOMMENDATION:** School based deworming program decreases prevalence of anemia and will contribute to reduction of anemia in the community.

Therefore the program should be expanded in all areas and integrated with other child care programs.

**KEY WORDS:** deworming, albendazole, anemia, haemoglobin, school health

### 168. FACTORS INFLUENCING THE UPTAKE OF VITAMIN A SUPPLEMENTATION AMONG CHILDREN UNDER FIVE YEARS IN THE KETA MUNICIPALITY.

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**Background:** Globally, it is known that enough intake of vitamin A provides an effective solution to its deficiency. Vitamin A supplementation is one of the best-proven and most cost-effective interventions to improve vitamin A status and save children's lives. Many developing countries have adopted the recommended strategy of supplementation to reduce vitamin A deficiency. This research was conducted to determine the uptake and completeness of Vitamin A supplementation in Keta municipality.

**Method:** A cross-sectional quantitative survey was adopted and data collected was entered into EpiData version 3.1 and then exported to Stata version 14 for data analysis. Data was summarized using descriptive and analytic. Descriptive includes; frequency, mean and standard deviation whiles analytic include performing chi-square test to assess associations.

**Results:** A total of 390 respondents were contacted for the study, about 99% compliance level among the required respondents. The findings revealed that, 94.6% had an uptake of Vitamin A supplementation and this was associated with Child's age, marital status and status of caregiver ( $\chi^2=9.736$ ;  $p\text{-value}=0.045$ ,  $\chi^2=17.466$ ;  $p\text{-value}<0.001$  and  $\chi^2=22.95$ ;  $p\text{-value}=0.013$  respectively). The study also revealed that proportion of under 5 years children completeness of Vitamin A was associated to child's age ( $\chi^2=117.911$ ;  $p\text{-value}<0.00$ ) age of caregiver ( $\chi^2=127.769$ ;  $p\text{-value}<0.00$ ), marital status ( $\chi^2=23.155$ ;  $p\text{-value}<0.00$ ), parity level ( $\chi^2=6.818$ ;  $p\text{-value}=0.033$ ) educational level ( $\chi^2=13.37$ ;  $p\text{-value}<0.001$ ) and occupation ( $\chi^2=12.14$ ;  $p\text{-value}=0.014$ ). Notwithstanding, the completeness



association with marital status and parity level of caregivers ( $\chi^2=23.155$ ;  $p$ -value< 0.00 and  $\chi^2=6.818$ ;  $p$ -value=0.033 respectively). The uptake of Vitamin A supplementation in Keta Municipality was quite encouraging however, there was a disparity with the completeness level among children under 5 years.

**Conclusion:** In order to increase and maintain the uptake level, health promotion activities must be implemented in the Keta Municipality among caregivers since only 15% of the Caregivers with children under-5 years had a good knowledge of Vitamin A supplementation.

**KEYWORDS:** Vitamin A supplementation, Keta Municipality, Children under 5 years, Uptake of Vitamin A, Completeness of Vitamin A

#### 169. Low Vitamin D and Vitamin B12 Levels in otherwise healthy active-duty male firefighters in Qatar: Are there any clinical implications?

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**Background:** Many studies in firefighters have focused on body composition, cardio-respiratory fitness, psychosocial and stress-related risk factors, bone health, musculo-skeletal and neurological issues. However not much has been reported specifically on their micronutrient status. In particular vitamin D deficiency is widely reported in Arab Gulf countries and linked to a number of diseases but not among frontline emergency personnel.

**Objectives:** Our focus was to assess the levels of vitamins D and B12 and to relate these to clinical risks amongst male firefighters in Qatar.

**Methods:** Triplicate blood measurements of biochemical indices including Vitamins D and B12 were undertaken in the

fasting state in a random sample of 30 apparently healthy male career firefighters, average age (SD) 28.67 (4.25) yrs using the multi-functional Dimension Xpand Plus/RxL Max (Siemens<sup>R</sup>) integrated chemistry system. Data was collated in Excel and further statistical analyses done in Stata.

**Results:** Mean (SD) Vitamin D was 14.62 (6.84) (ng/ml) (95% CI 1.2; 28.0) (reference range 30 – 80). Mean (SD) Vitamin B12 was 326.38 (116.27) pmol/L (95% CI 98.5; 554.3) (reference range 138 – 652) but with a wide range including very low levels. Vitamin D was positively correlated with age ( $r=0.518$ ;  $p=0.004$ ); body weight ( $r=0.442$ ;  $p=0.016$ ), BMI ( $r=0.384$ ;  $p=0.040$ ), FBG ( $r=0.411$ ;  $p=0.027$ ), TG ( $r=0.431$ ;  $p=0.018$ ). Vitamin B12 was positively correlated with age ( $r=0.518$ ;  $p=0.004$ ), creatinine ( $r=0.497$ ;  $p=0.006$ ), WBC ( $r=0.380$ ;  $p=0.042$ ), MCV ( $r=0.450$ ;  $p=0.014$ ) and MCH ( $r=0.546$ ;  $p=0.023$ ) but negatively correlated with % BF ( $r=-0.383$ ;  $p=0.040$ ), Alb-Cr ratio ( $r=-0.384$ ;  $p=0.040$ ) and uric acid ( $r=-0.379$ ;  $p=0.043$ ).

**Conclusions and recommendations:** The extremely low levels of vitamin D did not reflect any significant clinical signs of deficiency among subjects but merits further in-depth investigation. Similarly the low vitamin B12 levels were not accompanied by observable clinical signs. The biochemical correlations in both cases also merit further consideration.

**Key words:** Vitamin D, vitamin B12, Deficiency, firefighters, male, Qatar

#### 170. Risk factors analysis for overweight, obesity and non-communicable diseases in professional male firefighters in Qatar: A case for first-responder health screening?

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**Background:** Injuries and sudden on-duty cardiovascular incidents and deaths are reportedly common among firefighters. Direct attributable causes have included pre-

existing cardiovascular disease and poor cardio-respiratory fitness. Overweight and obesity have been implicated as contributory factors. In Qatar, to date there has been no study examining health, fitness and non-communicable disease risk factors among firefighters.

**Aims:** to screen and identify risk factors for obesity and NCDs among young male career firefighters in Qatar.

**Methods:** a sub-sample of 30 male firefighters were randomly selected from 150 firefighters in a health and wellbeing study. Subjects completed a structured health screening questionnaire and anthropometric, biochemical, physiological and body composition measurements. Data were collated in Excel and further analysed in Stata.

**Results:** Mean age (SD) was 28.67 (4.25) (95% CI 20.3; 37.0). Weight was 80.04 (11.55) kg. Height was 176.80 (6.14) cm. BMI ( $\text{kgm}^{-2}$ ) was 25.64 (3.60), WC and WHR were 82.08 (6.15) cm respectively. FBS and resting pulse at baseline were 5.69 (0.77) mMol/L and 82.87 (0.78) bpm respectively. Systolic and diastolic BP were 122.43 (7.58) (95% CI 107.57; 137.29) and 74.86 (10.31) mmHg (95% CI 54.66; 95.08) respectively. Mean (SD) % BF was 20.27 (6.62) (95% CI 7.3; 33.2). WHR was 0.91 (0.07) (95% CI 0.8; 1.0) and RMR kCal/d was 1670.27 (175.45).

There were significant correlations between Body weight and BMI ( $p < 0.0001$ ) and % BF ( $p = 0.027$ ). BMI was strongly correlated with % BF ( $p = 0.048$ ) FBG ( $p = 0.015$ ), TG ( $p = 0.022$ ). Diastolic BP was negatively correlated with height ( $p = 0.059$ ). % BF was also positively correlated with total cholesterol ( $p = 0.028$ ) and LDL-cholesterol ( $p = 0.039$ ). FBG showed positive correlations with age ( $p = 0.008$ ), BMI ( $p = 0.015$ ), HbA1c ( $p = 0.004$ ), HDL-cholesterol ( $p = 0.018$ ) and TG ( $p < 0.0001$ ). HDL-cholesterol was negatively correlated with FBG ( $p = 0.018$ ) and TG ( $p < 0.0001$ ).

**Conclusions and recommendations:** Subjects were young and relatively healthy but overweight with evidence of strong correlation between age, weight, BMI and NCD risk factors. We recommend an active annual health screening and a work-based fitness programme to improve health and firefighter and other first responders' wellbeing.

**Key words:** Firefighters, male, obesity, NCDs, risk, Qatar

## **171. ASSESSMENT OF THE EFFECT OF WAIST- TO- HIP RATIO ON CARDIOVASCULAR RISK AMONG MARKET WOMEN IN ABEOKUTA SOUTH LOCAL GOVERNMENT OGUN STATE, NIGERIA.**

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**BACKGROUND AND OBJECTIVE:** This research study was carried out to assess the effect of waist- to- hip ratio on cardiovascular risk among market women in Abeokuta South Local Government.

**METHODOLOGY:** A total of one thousand and six hundred structured questionnaires were administered to market women in the area using a simple random sampling technique. Data were analysed using, excel, Total Diet assessment (TDA) and descriptive statistics (frequency count, mean and mode of Statistical Package for Social Science (SPSS, version 21.0).

**RESULT:** The results of the socio-economic characteristics showed that (36.1%) of the women surveyed were between 31-40 years, Also, 53.4% were Christians, 69.5% were married and 46.9% had secondary level of education. Majority of the women (61.6%) claimed not to have medical problem, family history of cardiovascular diseases but have knowledge about the health issues (43.6%) mainly through media (40.2%). More than half of the women (60.3%) do not skip meal and ate mainly at home (94.7%). Significant percentage (39%) of the women had normal body mass index while 8.3% of them had obesity grade II. Also majority (78.3%) of the respondents had normal waist –to-hip ratio, systolic (52.9%) and diastolic blood pressure (61.6%). Results of nutrient intake of the women showed that the food the women consumed contained calorie (2068.957C), carbohydrate (116.59g), protein (38.33g) and fat (55.39). Also, Calcium (10.34mg), vitamin A (145.82mg), vitamin C (50.77mg), zinc (7.95mg), iron (10.88mg), magnesium (58.23mg), sodium (527.46mg) and potassium (391.09mg) were present in the food the women ate. Results of physical activity pattern among the market women showed that morning chores (83.1%) was the major activity the market women did while eating (6.7%) was the least physical activity they did. Majority of the market women (57.7%) displayed wares in the afternoon as well as cooking (69.1%) at night.

**CONCLUSION:** There is significant relationship between the waist to hip ratio and cardiovascular diseases.

## 172. NUTRITIONAL STATUS OF CHILDREN BELOW FIVE YEARS AND ITS ASSOCIATION WITH INTESTINAL PARASITES IN ADADLE WOREDA, SOMALI REGION OF ETHIOPIA

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**Background:** Children of pastoralist and sedentary communities in the Ethiopian Somali Regional State (ESRS) are at high risk for undernutrition and intestinal parasitic infections (IPIs), but specific up-to-date data is not available. Therefore, we aimed to assess the association between nutritional status and IPIs in children 1 to 5 years of age living in the ESRS.

**Methods:** A clustered cross-sectional study was carried out in the Adadle district of ESRS including 492 children. Stool samples were examined using single Kato-Katz and sodium acetate-acetic acid-formalin methods. Anthropometrics, hemoglobin, plasma ferritin, soluble transferrin receptor, C-reactive protein, alpha-1-acid glycoprotein and retinol binding protein were measured. Demographics, socioeconomic factors, duration of exclusive breastfeeding, and food variety score (FVS) were determined using a questionnaire.

**Results:** The median Z-scores (IQR) of height for age, weight for age and weight for height were -1.5 (-2.2, -1.0), -1.8 (-2.7, -1.0) and -1.2 (-2.5, 0.0), respectively. Low middle upper arm circumference (MUAC<12.5 cm) was found in 16% of the children. Anemia, iron deficiency (ID) and vitamin A deficiency (VAD) were 75%, 91% and 30% respectively. At least one IPI was found in 47% of the children. The most prevalent IPIs were *Giardia lamblia* (22%) followed by *Ascaris lumbricoides* (15%) and *Entamoeba histolytica* (4%). The median FVS was 2 (IQR 2-4). Exclusive breastfeeding up to six months was associated with a lower risk of anemia (odds ratio [OR]: 0.75, 95% CI: 0.68-0.82). Low FVS was associated with an elevated risk of anemia (OR: 0.69, 95% CI: 0.63-0.75) and the risk of MUAC<12.5 cm was higher in *Giardia lamblia* infected children (OR: 1.22, 95% CI: 1.11-1.33).

**Conclusion:** The prevalence of anemia, ID, VAD, and IPIs is alarmingly high in young children living in ESRS. Appropriate interventions addressing the low dietary diversity are urgently needed in this region.

**Key Words:** Children <5 years, undernutrition, Ethiopian Somali Regional State, micronutrient deficiencies, intestinal parasitic infections

## 173. The dietary knowledge and practices of pregnant women in Popokabaka Health area, Kwango Province, DRC: A Qualitative study

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**BACKGROUND:** Adequate and healthy diet during pregnancy is essential for the health of both mother and baby. Poor dietary intake during pregnancy contributes to maternal malnutrition, particularly in less developed countries. In Kwango Province, in DR Congo malnutrition, including macro and micronutrient deficiencies in pregnant women remains a serious public health problem. The aim of this study was to explore dietary knowledge and practices of pregnant woman in this area.

**METHODS:** This study adopted a qualitative approach. Pregnant women attending antenatal care were selected to participate. Nine in-depth interviews with pregnant women, six key informant interviews with health workers and community health workers were conducted. Women custodians and husbands participated in four focus group discussions. Triangulation method and thematic analyses were used.

**RESULTS:** Overall, women had limited knowledge about diet during pregnancy. Hospital, health centers and the community were their main sources of information. Womens feeding practices were characterized by a very low animal proteins, maize, corn and fruits consumption. Cassava was the most common daily food. Food taboos, lack of interest in antenatal care and quality of nutritional education via care facilitators were identified as factors influencing dietary practices. According key informants, education level, level of poverty and scarcity of crops also contribute to poor dietary knowledge and practices

**CONCLUSIONS:** Socio-environmental factors play an important role in pregnant women dietary practices. Strengthening antenatal care and community health workers programs, farmers' livelihoods support and promoting variety of crops could improve women knowledge and dietary practices.



**KEY-WORDS:** Diet, Knowledge, Practices, Pregnant woman

#### 174. THE DIRECT AND INDIRECT EFFECTS OF AGRICULTURAL POLICIES ON HEALTH AND NUTRITION OUTCOMES: A REVIEW

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Today, agricultural policies play a crucial role in determining food and nutritional security at individual, household, and national levels although multiple other sectors also contribute towards better nutrition. Various policies on agricultural production, agricultural education, agricultural improvement, and agricultural marketing, aimed at enhancing food and nutrition security, have been implemented by many countries. The existence of both low agricultural diversity, limited knowledge of nutritional matters among certain households, diet diversity, along with the increased nutrient demand for growth among infants and young children are some of the underlying causes of the problem in low and middle income countries such as Ethiopia. Globally, there is interest and potential to include nutrition sensitive agriculture objectives in agriculture, food and nutrition security programs. Many countries implemented such as Asia, Western Africa, used agriculture-nutrition knowledge as a key strategy and found it as potential to diversify diets by promoting production of diverse crops, and access to, a wider variety of food in the market. Agriculture is an important determinant of income growth, food and nutrition security for most of Africa. Agricultural policy and production conditions influence local diets in rural areas, particularly when imperfect markets constrain vibrant regional and international trade. The change in policy at grass root level will change the final goals on nutritional and health statues of users. That is, agricultures role in terms of generating wage, goods, and self-consumption and as a source of rural livelihoods is clearly an important pathway to nutrition. In this review, the knowledge of nutrition sensitive agriculture and it improvement on diet quality, access to quality food, nutrition and health outcomes will be presented. Also the abstract provide scientific evidence about the need for nutrition sensitive agriculture approach and to improve malnutrition as a policy priority.

**Key words:** agricultural policies, malnutrition and nutrition sensitive agriculture

#### 175. Transitioning Prudently and Efficiently from VA Supplementation to Longer-Term Strategies to Achieve Adequate VA Intake for Children: Model-based Options for Cameroon

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**Background and Objectives:** Meeting vitamin A (VA) needs of children 6-59 mo is a policy priority. Benchmarks for VA dietary intake exist; meeting them efficiently is a fiscal imperative. We sought to identify cost-effective combinations of VA intervention programs over a 10-year planning time horizon in three macro-regions (North, South, Cities) in Cameroon, while confirming adequate VA status by one or two post-intervention VA status surveys, as recommended by the Global Association for VA (GAVA).

**Methods:** We used national dietary intake data to predict the nutritional benefits of alternative combinations of VA intervention programs in terms of effective coverage (achieving dietary VA adequacy) and deaths averted. Costs of programs were estimated. An economic optimization model identified the least-cost VA strategy for each macro-region, and a sequence of policy choices leading from the business-as-usual (BAU) to a more efficient strategy, confirming through VA status surveys that children at risk of VAD continue to be protected during policy transition periods.

**Results:** BAU programs (VA supplementation {VAS} and oil fortification) effectively cover 11.9m child years and cost \$29.8m over 10 years, or \$2.49 per child-year effectively covered. A more efficient scenario involves investments in the national edible oil (\$4.9m over 10 years) and VA-fortified bouillon cube programs (\$2.9m over 10 years), after which the fortification programs are predicted to eliminate inadequate VA intake, and thus VA-related mortality, in the South and Cities macro regions. The same is not true for the

North macro-region, where VAS will need to continue until additional delivery platforms can be identified and implemented. For the South macro-region, ascertainment of program impact on one or two occasions would cost \$1.75m or \$3.0m, respectively, to conduct the survey(s) and to maintain the VAS programs until adequate status is confirmed.

**Conclusions:** Current VA intervention programs in Cameroon are effective but inefficient. Modelling identifies more cost-effective programs; cost savings can be large. The chosen approach to confirm adequate VA status (i.e., one versus two surveys in non-consecutive years) will greatly affect cost savings. During programmatic transitions, at-risk children need continual twice-annual VAS.

**Keywords:** VA supplementation, VA fortification, economic optimization model, children, Cameroon

#### 176. A SYSTEMATIC REVIEW OF DIETARY AND MICRONUTRIENT INTAKE OF WOMEN OF REPRODUCTIVE AGE AND PREGNANT WOMEN IN KEY SUB-SAHARAN COUNTRIES

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**BACKGROUND AND OBJECTIVES:** Over 220 million people in Sub Saharan Africa are undernourished and one third have micronutrient deficiencies, with women being the most affected. Nutrition action is to be intensified if the Sustainable Development Goals are to be achieved, to end all forms of malnutrition by 2030 and address the nutritional needs of adolescent girls, pregnant and lactating women by 2025. However, there is scarcity of dietary intake data at a national level.

**METHODS:** This systematic review demonstrates the dietary intake of iron, vitamin A, iodine, zinc and folate for women of reproductive age (WRA) and pregnant women (PW), between 15-49 years old, in Kenya, Ethiopia, Tanzania, Zimbabwe, Angola and Democratic Republic of Congo and the availability of data. Data was searched using Scopus, PubMed and national public health websites for articles published between 2008 and 2018.

**RESULTS:** Thirty-six studies were included in this review; 12 national and 24 sub national; 16 from Ethiopia, 13 from Kenya, 4 from Tanzania and 2 from Zimbabwe, 1 from Angola and nil from the Democratic Republic of Congo. The mean intake of iron, vitamin A, zinc and folate was below the nutritional reference values (NRV) for Ethiopian, Kenyan, Tanzanian and Zimbabwean women. Excluding the mean iron intake of Ethiopian women and mean vitamin A intake of Ethiopian and Kenyan PW where the NRV was met. Recent Demographic Health Surveys in all countries showed high household iodised salt coverage. Diet diversity studies showed between 31- 56% of Kenyan WRA consumed <5 food groups, 2% of Kenyan PW consumed ≤3 food groups and between 35- 51% of PW in Ethiopia consumed ≤3 food groups.

**CONCLUSIONS:** There is limited dietary intake data available for women in the selected Sub Saharan African countries. Where data is available, there is inadequate intake of key micronutrients and a lack of diet diversity.

**Keywords:** Micronutrient Intake; Diet Diversity; Women; Sub Saharan Africa

#### 177. USE OF VITAMIN A MONITOR CHART AND TALLY SHEETS TO IMPROVE UNDER FIVE VITAMIN A SUPPLEMENTATION AT AMUZUDEVE CHPS IN ADAKLU DISTRICT OF THE VOLTA REGION OF GHANA

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**Background:** Vitamin A Supplementation (VAS) remains one of the key cost effective interventions implemented to reduce child mortality. Achieving high coverage of this intervention is key not only to eliminate Vitamin A deficiency but to also reduce under five mortality. However, for some years the coverage of this indicator in children between 12-59 months has been low. There was therefore the need to test change ideas to improve this indicator.

**Intervention:** The study tested and implemented the use of Vitamin A Monitor Chart (VAMC) and tally sheets capable of improving the coverage of VAS in children between 12-59 months at Amuzudeve CHPS zone in Adaklu District using Quality improvement approaches.

**Methods:** The change idea tested was the use of VAMC to track the uptake of VAS among children. Each child tracked was supposed to receive one dose of the Vitamin A six monthly. Tally sheets to track these children on a monthly basis were introduced. Data on VAS uptake during the study period (June 2016 to April 2018) was analyzed and described using percentages.

**Results:** VAS coverage showed a significant increase from a median of 50% as at June 2016 to 80% by April 2018, which represents 60% increase. The monthly median coverage also saw an appreciable increase from 42% in 2014 to 86% in 2018, representing 105% rise in coverage.

**Lessons:** The study revealed that VAMC and tally sheets are useful tools that can be used to improve the uptake of VAS in children between 12-59 months in challenging situations where children default from attending Child Welfare Clinics after the completion of their immunization schedule. The use of tally sheets makes the tracking of children due for supplementation easier and for that matter most children are able to get two doses of this supplement in a year.

**Keywords:** Vitamin A monitor chart, Tally sheets, Vitamin A supplementation, Quality Improvement, Change ideas, Child Welfare Clinic, Ghana

#### 178. Iron status of Kenyan pregnant women after adjusting for inflammation using BRINDA internal regression analysis and other correction methods

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**Background:** Serum ferritin concentration is the preferred biomarker to assess population iron status in the absence of inflammation. Interpretation of this biomarker is complicated in populations with a high burden of infection, however, because inflammation increases serum ferritin concentration independently of iron status.

**Objective:** We aimed to compare estimates of iron status of Kenyan pregnant women, with circulating ferritin concentrations adjusted for inflammation using newly proposed methods by the BRINDA project, or using previously proposed adjustment methods.

**Design:** We re-analyzed data from pregnant Kenyan women living in a rural area where malaria is highly endemic (n=470) or in an urban area (n=402). As proposed by the BRINDA group, we adjusted individual ferritin concentration by internal regression for circulating concentrations of C-reactive protein (CRP) and  $\alpha$ 1-acid glycoprotein (AGP). Other adjustment methods comprised: a) arithmetic correction factors based on CRP and/or AGP; b) exclusion of subjects with inflammation (CRP >5 mg/L and/or AGP >1 g/L); c) higher ferritin cut-off value (<30 g/L). We additionally adjusted for Plasmodium infection as appropriate. Lastly, we assessed iron status without adjustment for inflammation.

**Results:** All correction methods increased prevalence of iron deficiency compared to the unadjusted estimates. This increase was more pronounced with the internal regression correction method. The iron deficiency prevalence estimate increased from 53% to 73% in rural Kisumu study and from 30% to 41% in the urban Nairobi study after adjusting for inflammation (CRP and AGP) using the BRINDA internal regression method. When we corrected for both inflammation and Plasmodium infection using the regression correction, it resulted in lower prevalence estimates compared to uninfected women.

**Conclusions:** The internal regression correction method as proposed by the BRINDA group has been applied for the first time to pregnant women and appears to be a reliable way to correct for inflammation in this population. We concur with other observations that the prevalence of iron deficiency may be underestimated if it is not adjusted for inflammation, particularly among pregnant women in areas with a high prevalence of infections.

**Keywords:** C-reactive protein,  $\alpha$ 1-acid glycoprotein, ferritin; inflammation; pregnant women.

### **179. Prevalence and factors associated with overweight and obesity among adults in Hawassa city, Southern Ethiopia: A community based cross-sectional study**

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**Background:** In Ethiopia limited information is available regarding the Epidemiology of over-nutrition. This study assessed the prevalence of, and factors associated with overweight and obesity among adults in Hawassa city, Southern Ethiopia.

**Methods:** A community-based survey was conducted in August 2015 in the city. A total of 531 adults 18-64 years of age were selected using multistage sampling approach. Interviewer administered qualitative food frequency questionnaire was used to assess the pattern of consumption of 12 foods groups. The level of physical exercise was measured via the General Physical Activity Questionnaire (GPAQ). Based on anthropometric measurements, Body Mass Index (BMI) was computed and overweight including obesity (BMI of 25 or above) was defined using a standard threshold. For identifying predictors of over-nutrition, multivariable binary logistic regression model was fitted and the outputs are presented using adjusted Odds Ratio (OR) with 95% Confidence Intervals (CI).

**Results:** The prevalence of overweight including obesity was 28.2% (95% CI: 24.2-32.2). Significant proportions of adults had moderate (37.6%) or low (21.6%) physical activity level.

As compared to men, women had 2.56 (95% CI: 1.85-4.76) times increased odds of overweight/obesity. With reference to adults 18-24 years of age, the odds were three times raised among adults 45-54 (3.06, 95% CI: 1.29-7.20) and 55-64 (2.88, 95% CI: 1.06-7.84) years. Those from the highest income tercile were 3.16 times (95% CI: 1.88-5.30) more likely to be overweight/obesity as compared to adults from the lowest tercile. Having moderate (3.10, 95% CI: 1.72-5.60) or low (4.80 95% CI: 2.50-9.23) physical activity was also a significant predictor of the outcome. Further, daily intake of alcohol and, frequent consumption of sweets, meat and eggs were associated with overweight/obesity. Conversely, no significant associations were evident for meal frequency, practices of skipping breakfast, behavior of eating away from home, frequency of consumption of fast foods and pattern of consumption of fruits and vegetables.

**Conclusions:** Prompting active lifestyle, limiting intakes of sweets, advocating optimum consumption of alcohol and calorie dense animal source foods, especially amongst the better-off segment of the population, may reduce the magnitude of over-nutrition.

**Keywords:** Overweight and obesity, physical exercise, body mass index, food frequency questionnaire, risk factors, Hawassa, Ethiopia.

### **180. Recovery, relapse, and episodes of default in the management of acute malnutrition in children in humanitarian emergencies: A systematic review.**

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**Background and objectives:** This systematic review, commissioned by the Humanitarian Evidence Programme (HEP) and carried out by a research team from the University of Sheffield, represents the first attempt to apply systematic review methodology to establish the relationships between recovery and relapse and between default rates and repeated episodes of default or relapse in the management of acute malnutrition in children in humanitarian emergencies in low- and middle-income countries.

**Methods:** Quantitative, qualitative, mixed methods academic literature and grey published programme reports were identified and reviewed. Peer-reviewed literature search was conducted in 14 academic databases. Grey literature,

including programme reports, were searched in Google Scholar and 36 websites of relevant organisations, and by engaging with stakeholders in the nutrition field. Studies published prior to 1980 were excluded, as were any papers not published in English.

**Results:** A total of 9,574 articles, studies and programme reports relating to acute malnutrition were retrieved from the searches conducted. Following the removal of duplicates, screening and quality appraisal, 24 articles and reports were eligible for review. 23 of these focused on sub-Saharan Africa: eight were conducted in Malawi, 5 in Ethiopia, 3 in Niger, 3 in Sudan and the remaining 4 in Angola, Chad, Kenya and Sierra Leone. One study was conducted in Afghanistan. Most studies and programme reports reported on quantitative outcomes and only two contained both quantitative and qualitative outcomes. The 22 quantitative studies included 8 clinical efficacy and effectiveness trials using randomized controlled designs, 7 observational cohort studies and 7 programme evaluation reports. Only 6 of the 24 studies included in this review addressed the issue of relapse and/or reported relapse rates. None of the studies addressed the relationship between relapse and default or return default, and little evidence was found on the long-term impact of programmes implemented to manage MAM and SAM in emergencies.

**Conclusion:** This review provides further confirmation that RUTF used in an outpatient setting is effective at promoting recovery from SAM and reducing mortality. It could not be established whether default rates reported were lower according to the WHO 2013 protocol. Data relating to relapse is limited, therefore, we could not establish the relationship between recovery and relapse, or recovery and default or their episodes. More research on default and relapse post-intervention is needed.

**Key word:** Acute malnutrition, Children, Humanitarian, Emergency, Systematic Review.

## Poster Abstracts

### **P001. OPTIMAL IODINE STATUS OF SCHOOL AGE CHILDREN AFTER UNIVERSAL SALT IODIZATION PROGRAM IN ETHIOPIA: A CROSS-SECTIONAL STUDY AT DABAT DISTRICT**

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**BACKGROUND:** Iodine deficiency is one of a major nutritional problem and its control is a global public health triumph. Existence of iodine deficiency disorders reported in Ethiopia despite the country launched universal salt iodization program. Therefore, the study aimed to assess the prevalence of iodine deficiency disorders in Dabat district in school age children aged 6-12 years.

**METHODS:** A cross sectional survey was conducted in Dabat district on May 2016. MBI international Rapid Test Kit was used to determine the level of salt iodine content. The urinary iodine concentration (UIC) was analyzed by using the Sandell-Kolthoff reaction method. One-way ANOVA was used to compare mean of log transformed UIC values among different categories for independent variables.

**RESULTS:** A total of 358 school age children enrolled to the study. The mean age of children was 10.8(SD= 1.45) and 56.7% were males. The median urinary iodine concentration was 234.99µg/l [IQR: 161.3, 320.2]. Nearly one-third of school age children had excessive iodine intake. Thirty-four percent of school age children had goiter. The prevalence of grade 1 and grade 2 goiter was 26.5 and 7.5%, respectively. The coverage and adequacy of household iodised salt was 97.5% and 30.7%, respectively. Median urinary iodine concentration was correlated with place of residence and household iodine level ( $P<0.05$ ).

**CONCLUSION:** The study population is currently iodine sufficient by median urinary iodine concentration in school

age children but total goitre rate showed severe iodine deficiency. Regular monitoring of the level of household iodised salt and median urinary iodine concentration in school age children and other vulnerable groups of iodine deficiency is warranted.

**KEY WORDS:** Optimal iodine status, school age children, Dabat District, Ethiopia.

### **P002. INCIDENCE AND DETERMINANTS OF TIME TO DIABETIC RETINOPATHY OCCURRENCE AT TIKUR ANBESSA SPECIALIZED HOSPITAL IN ETHIOPIA**

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**BACKGROUND:** Diabetic retinopathy is highly prevalent disease in the world. Recent studies showed a 2.6% of blindness cases in the world and 21% to 38% retinopathy cases in Ethiopia due to diabetes. However, there is limited evidence about incidence and determinants of time to diabetic retinopathy in Ethiopia. Therefore, the aim of this study was to estimate incidence and identify determinants of time to diabetic retinopathy at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia.

**METHODS:** A retrospective follow up study was conducted from February 01, 2017 to June 30, 2017. A total of 377 diabetes mellitus (DM) patients were included in the study selected by simple random sampling technique. Descriptive statistics including Kaplan Meier estimation and Log rank test was applied. Weibull Proportional hazard model was done to identify determinant factors of time to diabetic retinopathy. Hazard ratio and it's 95% confidence interval (CI) were used to declare statistical significance. All statistical analysis was done using STATA 12.

**RESULTS:** Out of the total DM patients, 70(18.6%) were developed diabetic retinopathy. The mean and median follow up time were 70.4 and 74.4 months (with IQR=35.9) respectively. Male sex (HR=1.94, 95% CI = 1.10-3.39), type-II DM (HR=4, 95% CI= 1.34 -12.00), creatinine (HR=2.59, 95% CI= 1.91-3.52), borderline high triglyceride (HR=2.87,

95% CI 1.33-6.21) and high (HR=2.59, 95% CI=1.31-4.97) triglyceride levels were significant factors of time to diabetic retinopathy occurrence.

**CONCLUSION:** The incidence rate of diabetic retinopathy was relatively high and the average time to diabetic retinopathy occurrence was short. Diagnosing patients by considering type of DM and sex of patients, good control of triglyceride and creatinine level, helps to leave without DR for longer time after diagnosis of DM.

**KEY WORDS:** Complication of Diabetes Mellitus, Diabetic retinopathy, Incidence, Ethiopia.

### **P003. BETTER EDUCATED PREGNANT WOMEN COMPLY LESS WITH IRON-FOLIC ACID SUPPLEMENTATION IN SOUTHERN ETHIOPIA**

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**BACKGROUND:** Globally, half a billion women of reproductive age are affected by anemia, which is the most prevalent single nutrient deficiency in resource limited countries. Daily iron supplementation, with or without folic acid, is a proven public health intervention. Though maintaining compliance is crucial for the success of the intervention, very limited evidence is available in countries like Ethiopia on compliance and its predictors. The aim of this study was to estimate the Iron-Folic Acid (IFA) supplementation compliance rate and its predictors among pregnant women in Wolaita Zone, Southern Ethiopia.

**METHODS:** A cross-sectional study was conducted in eight randomly selected health centers in Wolaita Zone, Southern Ethiopia. Six-hundred-forty-seven pregnant women were included using multistage sampling procedure. Data were entered to EpiInfo and exported to SPSS for analysis. Descriptive statistics were obtained. A multiple linear regression model was constructed to estimate the variability coefficient of the compliance rate due to selected factors.

**RESULTS:** Of 647 pregnant women, only 18 (2.8%) had received the supplement for three months and more but 273 (42.2%) and 255 (39.4%) were given for one and two months, respectively. Overall, the compliance rate was 73.2% (95% CI: 70.72, 75.79). Experiencing heartburn and vomiting significantly reduced the compliance rate. Moreover, unintended pregnancy, a year change in age and women with primary, secondary and college education were less likely to comply compared with their counterparts. In contrast, acceptability of IFA supplement, number of ANC visits and being ever married were positive predictors of IFA supplement compliance.

**CONCLUSION:** Pregnant women are taking less than three-fourth of IFA supplement within a given period of time. During ANC visits, addressing the issues of side-effects, unintended pregnancy, and acceptability of the supplement is very important to improve compliance rate. Furthermore, educated, older and unmarried women need additional attention for successful compliance.

**KEY WORDS:** Iron-folate, compliance, pregnant, Ethiopia

### **P004. THE EFFECT OF SOYA MILK ON CHILDREN'S NUTRITIONAL STATUS IN GASWORE COMMUNITY, RURAL BURUNDI: A CASE- CONTROL STUDY**

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**BACKGROUND:** Poor complementary feeding is a major contributor to malnutrition among children in Burundi. Caregivers lack adequate knowledge on how to diversify foods even if the foods are available locally. In this regard, World Vision uses a behaviour change approach called, "Positive Deviance/Hearth" (PDH) to promote locally available and affordable food as a sustainable and cost-effective strategy to prevent malnutrition. To improve the quality of diet, World Vision introduced soya milk as an addition to the complementary foods of children in communities where stunting prevalence is high.

**METHODS:** Children ages 6 to 36 months whose weight-for-age z-scores were less than minus two standard deviations were admitted to the program for underweight rehabilitation. Caregivers of underweight children in the intervention group were trained on food preparation techniques of nutritious meals and were educated on soya milk, caring, hygiene and health seeking practices. A control group of caregivers were trained in the same practices with the exclusion of soya milk.

**RESULTS:** 58 children were enrolled in the intervention group and 68 in the control group. Mean weight, height and sex ratio was normally distributed at the start of the study among the two groups. By the end of 12 days the mean weight gain among the intervention group was 553.5gm while the control group gained 390.3gm. By the Day 30 follow-up underweight status among children in the intervention group had no significant difference compared with the intervention group ( $p=0.081$ ).

**CONCLUSION:** When caregivers are educated in the appropriate use of locally available foods, children can be rehabilitated easily with cost-effective means. Incorporation of such approaches is a sustainable means in resource limited settings.

**KEY WORDS:** Positive Deviance, behavior change, soya milk, Burundi

#### **P005. DRIVERS OF MATERNAL FOOD CHOICES FOR CHILDREN UNDER 5 YEARS IN AKUAPIM NORTH DISTRICT, EASTERN REGION, GHANA.**

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**BACKGROUND:** Good nutrition in the early years of life is very crucial for the growth and development of children. That which is fed to a child during the early years of life is determined by caregivers, particularly mothers. This research aimed to answer the question of what drives

mothers' food choices for their children aged 5 years or younger in a typical Ghanaian health district.

**METHODS:** We deployed a community-based cross-section study using a mixed-method design. Focus group discussions (FGDs) and quantitative surveys involving mothers of children under five years were conducted. The Quantitative data was collected using a questionnaire and analyzed using SPSS version 20. Bivariate Chi-squared analysis and logistic regression were used to determine associations between the study outcome and predictor variables. Qualitative data was transcribed verbatim and analyzed manually.

**RESULTS:** Among children aged 0-6 months, 67.1% were exclusively breastfed. Of children aged 6-59 months, 78.9 % were fed from at least four food groups. Exclusive breastfeeding was associated with mother's educational level (aOR = 1.861; 95% CI, 1.040-3.330), but not employment status (aOR = 1.378; 95% CI, 0.125-15.193). Feeding from at least four food groups was associated with child's food preference (aOR = 0.587; 95% CI, 0.276-1.247), perceived nutritional value (aOR = 0.094; 95% CI, 0.009-0.971) and smell (aOR = 0.377; 95% CI, 0.197-0.723), but not food availability (aOR = 0.856; 95% CI, 0.399-1.835), value for money (aOR = 0.648; 95% CI, 0.317-1.324) or family influence (aOR = 0.612; 95% CI, 0.282-1.330). The qualitative FGDs identified child's preference, perceived health or nutritional benefit of the food as important drivers of their choices. Participants admitted that the strong influences of parents and in-laws impact their choices of foods for children.

**CONCLUSION:** The study has determined factors that drive maternal food choices for children under five years to include maternal educational level, child's food preference, perceived health/nutritional value, and food smell.

**KEY WORDS:** Food choices, drivers, children under 5 years, exclusive breastfeeding.



**P06. INDIVIDUAL AND CONTEXTUAL LEVEL FACTORS HAVE A SIGNIFICANT ROLE IN DETERMINING CHILD HEIGHT-FOR-AGE Z SCORE IN EAST GOJJAM ZONE, AMHARA, AND REGIONAL STATE, ETHIOPIA: A MULTILEVEL ANALYSIS**

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**BACKGROUND:** In Ethiopia, child undernutrition remains a major public health challenge and contributing factor to child mortality and morbidity. To reduce the problem, it is apparent to identify determinants of child undernutrition in specific contexts to deliver appropriate, targeted, effective and sustainable solutions. This study aimed to identify individual and community level determinants of child height for age Z score in East Gojjam Zone, Amhara Regional State, Ethiopia.

**METHODS:** An Agroecosystem linked cross-sectional survey was conducted among 3108 children aged 6-59 months. Multistage cluster sampling technique was used to select study participants. Data were collected on socio-demographic characteristics, child anthropometry and on potential individual and community level determinants of child undernutrition. Data analysis was done using STATA 13 and important variables were selected using simple linear regression and multiple multilevel linear mixed effects modeling was used to identify individual and community level determinants of child height-for-age Z score. P values less than 0.05 were considered as level of significance.

**RESULTS:** From individual level factors, child age in months, child sex, number of under five children, immunization status, breast feeding initiation time, mother nutritional status, diarrheal morbidity, household level water treatment and household dietary diversity were significant determinants of child height for age Z score. Also, from community level determinants, Agroecosystem type, liquid

waste disposal practice and latrine utilization were significantly associated with child height-for-age Z score.

**CONCLUSION:** Both individual and community level factors have a significant role in determining child height-for-age Z score. In addition to the existing efforts at the individual level, agroecosystem and community WASH related interventions should get more attention to improve child nutritional status.

**KEY WORDS:** Stunting, children, multilevel, Ethiopia

**P07. RECOVERY, RELAPSE, AND EPISODES OF DEFAULT IN THE MANAGEMENT OF ACUTE MALNUTRITION IN CHILDREN IN HUMANITARIAN EMERGENCIES: A SYSTEMATIC REVIEW**

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**BACKGROUND:** This systematic review, commissioned by the Humanitarian Evidence Programme (HEP) and carried out by a research team from the University of Sheffield, represents the first attempt to apply systematic review methodology to establish the relationships between recovery and relapse and between default rates and repeated episodes of default or relapse in the management of acute malnutrition in children in humanitarian emergencies in low- and middle-income countries.

**METHODS:** Quantitative, qualitative, mixed methods academic literature and grey published programme reports were identified and reviewed. Peer-reviewed literature search was conducted in 14 academic databases. Grey literature, including programme reports, were searched in Google Scholar and 36 websites of relevant organisations, and by engaging with stakeholders in the nutrition field. Studies published prior to 1980 were excluded, as were any papers not published in English.

**RESULTS:** A total of 9,574 articles, studies and programme reports relating to acute malnutrition were retrieved from the searches conducted. Following the removal of duplicates,

screening and quality appraisal, 24 articles and reports were eligible for review. 23 of these focused on sub-Saharan Africa: eight were conducted in Malawi, 5 in Ethiopia, 3 in Niger, 3 in Sudan and the remaining 4 in Angola, Chad, Kenya and Sierra Leone. One study was conducted in Afghanistan. Most studies and programme reports reported on quantitative outcomes and only two contained both quantitative and qualitative outcomes. The 22 quantitative studies included 8 clinical efficacy and effectiveness trials using randomized controlled designs, 7 observational cohort studies and 7 programme evaluation reports. Only 6 of the 24 studies included in this review addressed the issue of relapse and/or reported relapse rates. None of the studies addressed the relationship between relapse and default or return default, and little evidence was found on the long-term impact of programmes implemented to manage MAM and SAM in emergencies.

**CONCLUSION:** This review provides further confirmation that RUTF used in an outpatient setting is effective at promoting recovery from SAM and reducing mortality. It could not be established whether default rates reported were lower according to the WHO 2013 protocol. Data relating to relapse is limited, therefore, we could not establish the relationship between recovery and relapse, or recovery and default or their episodes. More research on default and relapse post-intervention is needed.

**KEY WORDS:** Acute malnutrition, Children, Humanitarian, Emergency, Systematic Review.

#### **P08. INDIVIDUAL AND CONTEXTUAL FACTORS ARE ASSOCIATED WITH HOUSEHOLD FOOD INSECURITY IN EAST GOJJAM ZONE, ETHIOPIA: A MULTILEVEL ANALYSIS.**

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Food insecurity, as a public health problem, increases malnutrition, burden of communicable and non-communicable disease, decreases health service utilization, affects education system and mental health status negatively in the community. Different individual and community factors have importance to in determining food insecurity. So, this study aimed to identify the role of individual and community level determinant factors of food insecurity, using multilevel analysis in East Gojjam Zone, Ethiopia. An Agroecosystem linked community based cross sectional survey was conducted among 3108 households. Households were selected using multistage cluster sampling. Using an interviewer administered questionnaire, data were collected on household food access, individual and community level factor variables. The analysis was done in four steps using a two level mixed effect ordinal regression analysis. The results of fixed effect were shown as Adjusted Odd Ratio (AORs), with 95% confidence intervals (CIs), and the result of random effect was presented as a variance partition coefficient and percentage change in variance. A p-value less than 0.05 was considered significant. In this study, heterogeneity of household food insecurity was observed among clusters. After adjusting for both individual and community level factors, 1.5% ( $p < 0.001$ ) of the variance were attributable to cluster level. From level one factors in the final model, household head being male, marital status being in a union, higher parental education, women's participation in decisions, having additional income sources, better crop production in the survey year and application of chemical fertilizer reduced the level of household food insecurity. From level two factors, households being from hilly and mountainous highlands and lowlands of the Abay Valley compared to midland areas and with farmland size  $< 1.13$  hectare per household worsen household food insecurity. Heterogeneity of household food insecurity was observed among clusters. Both community and individual level factors play significant role in determining household food insecurity. Agroecosystem characteristic is one of the community level factors affecting household food insecurity. For better understanding of the relationship between Agroecosystem and food insecurity, prospective epidemiological study designs are recommended.

**KEY WORDS:** Household, Food Insecurity, Multilevel, Ordinal, Determinants, Ethiopia

**P09. SPATIAL VARIATIONS OF HOUSEHOLD FOOD INSECURITY IN EAST GOJJAM ZONE, AMHARA REGION, ETHIOPIA: IMPLICATIONS FOR AGROECOSYSTEM BASED INTERVENTIONS.**

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In Ethiopia, food insecurity is a public health challenge that varies by agroecosystems. This study was designed to determine the spatial patterns of household food insecurity across different Agroecosystems in East Gojjam Zone. Agroecosystem linked cross sectional survey, among 3108 study participants. The study area is divided into five Agroecosystems: namely hilly and mountainous highlands, midland plains with black soil, midland plains with brown soil, midland plains with red soil and lowlands of Abay valley. Data were collected using interviewer administered questionnaire on socio demographic variables, food access and geographical location after five days training and pre testing of the tool to maintain data quality. Data were entered using EPI Info version 3.5 and exported to SaTScan and SPSS 20 for further analysis. To identify the most likely clusters using SaTScan software, the Log Likelihood Ratio (LLR) at 95% Confidence Interval (CI) and P value less than 0.05 as the level of significance were considered. The overall prevalence of household food insecurity was found to be 65.3% (95% CI: 63.5, 67.00). The lowlands of Abay Valley (70.6%, 95% CI: 66.9, 74.2) and hilly and mountainous highlands (69.8%, 95% CI: 65.9, 73.3) showed significantly higher household food insecurity prevalence compared to midland plains with black soil (61.7%, 95% CI: 58.1, 65.6), midland plains with red soil (63.5%, 95% CI: 59.9, 65.0) and midland plains with brown soil (61.5%, 95% CI: 57.4, 65.3). Similarly, the SaTScan spatial analysis identified clusters from hilly and mountainous highlands

(LLR: 11.64; P: 0.0088) and lowlands of Abay valley (LLR: 8.23; P: 0.025) as the most likely primary and secondary clusters for food insecurity, respectively. Higher prevalence of household food insecurity was observed with significant micro level geographical variations. The lowlands of Abay valley and hilly and mountainous highlands were the most vulnerable areas to food insecurity. Intervention strategies and plans shall consider Agroecosystem based micro level food insecurity inequalities in planning interventions. Further research is needed to determine the temporal variation of household food insecurity. Also it is very important to validate the spatial analysis results applicability to design geographically targeted interventions.

**KEY WORDS:** Household, food insecurity, spatial analysis, SaTScan, Agroecosystem, Ethiopia.

**P10. PREVALENCE AND ASSOCIATED FACTORS OF ANEMIA AMONG ADOLESCENT GIRLS ATTENDING HIGH SCHOOLS IN DEMBIA DISTRICT, NORTHWEST ETHIOPIA, 2017**

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**BACKGROUND:** Anaemia is a global public health problem affecting both developing and developed countries. Adolescent girls are more vulnerable to anaemia because of increased iron requirements related to their rapid growth and menstrual loss. However, adolescents are ignored and there is a scarcity of evidence in Ethiopia. Therefore, this study assessed the prevalence and associated factors of anaemia among late adolescent girls attending High schools in Dembia District, Northwest Ethiopia.

**METHODS:** School based cross-sectional study was conducted in Dembia District from March 1 to April 30/ 2017. From randomly selected three high schools, 462 adolescents were included using simple random sampling techniques. The Standardized and structured questionnaire was used to collect data. Capillary blood samples were taken from adolescents using the portable Hb201+

instrument to measure hemoglobin. A bivariate and multivariable binary logistic regression analyses were employed to identify factors associated with anemia. Adjusted Odds Ratio (AOR) with corresponding 95% Confidence Interval (CI) was computed to show the strength of association.

**RESULTS:** The overall prevalence of anaemia among adolescent girls was 25.5%, (95%CI, 21.4, and 29.2). Of the total anemic adolescents, 109(92.4%) had mild anaemia, while 7(5.9%) and 2(1.7%) were found with moderate and severe anaemia, respectively. Dietary diversity score ((AOR=4.2(95% CI;1.7, 10.5)), Household food security status ((AOR= 4.1(95% CI; 1.3, 13.2)), living status of the adolescents with either of the two family ((AOR=2;(95%CI;1.14,3.6)) and with the Guardians ((AOR=2.4;(95%CI;1.02,5.6)) showed statistically significant association with anaemia.

**CONCLUSION:** Anemia is a moderate public health in Dembia District. Dietary diversity score, household food security status and living status of adolescents were the key determinants of anemia. Therefore, improving dietary diversification and household food security are vital to reduce the burden of anemia.

**KEY WORD:** Anemia, Adolescent girls, Ethiopia

#### **P11. DIETARY DIVERSITY PRACTICE AND ASSOCIATED FACTORS AMONG ADOLESCENT GIRLS IN DEMBIA DISTRICT, NORTHWEST ETHIOPIA, 2017: INSTITUTION BASED CROSS-SECTIONAL STUDY**

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**BACKGROUND:** Dietary diversity is defined as the number food groups or items consumed over a reference period of time and usually it is a problem in developing countries including Ethiopia. Inadequate dietary diversity is one of a major public health problem and can result in physical, emotional, psychological, and chemical changes among

adolescents. However, studies on dietary diversity among school children were very limited. Hence, this study aimed at determining dietary practice and determinants among adolescents in Dembia district.

**METHODS:** A school-based cross-sectional study was conducted from March 1 to April 15, 2017, at Dembia district, northwest Ethiopia. A total of 474 subjects were selected using the multi-stage sampling technique. Structured and pre-tested questioner was used to collect data. Food and Nutrition Technical Assistant (FANTA) 2016, one day (using 24 hour recall methods) was employed to assess the dietary diversity practice. Bi-variable logistic regression model was used for variable selection and p-values less than 0.2 were included in the multi-variable logistic regression model. In the multi-variable analysis, Adjusted Odds Ratio (AOR) with the 95% corresponding 95% Confidence Interval (CI) were used to show the strength of associations and variables with p-values of <0.05 were considered statistically significant.

**RESULTS:** In this study, 32.25% (95% CI: 27.9-36.8) of the adolescents had adequate dietary diversity practice. According to the multivariable analysis, Muslim religion followers (AOR=0.29; 95% CI :( 0.11-0.74), private workers (AOR=0.34; 95%CI :( 0.14-0.87), middle wealth index (AOR=0.47; 95%CI :( 0.28-0.82), rich wealth index (AOR=0.33; 95%CI :( 0.18-0.59), and thinness (AOR=3.49; 95%CI :( 1.28-9.5) were markedly associated with dietary diversity practice.

**CONCLUSION:** The findings of this study showed that only one-third of adolescent girls have adequate dietary diversity and husband occupation, religion, wealth index or economic status and nutritional status of the adolescent were significantly associated with dietary diversity practice. For improving the dietary diversity of the adolescent, School based nutrition education with the content of dietary diversity must be given.

**KEY WORDS:** Dietary practice, Dietary diversity, adolescent, Dembia district, Ethiopia

#### **P12. FOOD HYGIENE CONDITIONS AND MICROBIAL CONTAMINATION OF MINIMALLY PROCESSED FRUITS IN CENTRAL WARD, NAIROBI COUNTY**

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**BACKGROUND:** Minimally processed fruits (MPF) vended as street foods, despite numerous benefits, can cause food-borne illnesses due to poor hygiene practices and unsanitary conditions. This study sought to assess food hygiene condition in minimally processed fruit vending businesses in Nairobi Central Ward.

**METHODS:** The method used was cross sectional with analytical component through convenient sampling of 76 street food vending environment (FVs). Observational checklist prepared using codex food hygiene and safety principles captured data. Inferential statistics established variable relationships at 95% confidence interval. Food Hygiene Condition (FHC) was ranked according to Bloom cut off points on calculated percentage scores.

**RESULTS:** Results show that the vending places were washable and cleanable but the environmental surrounding was not very clean as 68% of the stalls had garbage and waste nearby. Most (75%) of the FVs had no houseflies, 89% had adequate water, and 30% had drainage system. Therefore, FHC was generally poor in 57.9% of the cases. Fruit salad samples had the highest bacterial load (log<sub>10</sub> 4.65cfu/g) and coliforms (log<sub>10</sub> 0.78cfu/g) while pineapples (mean log<sub>10</sub> 3.50cfu/g) had the highest mould and yeast count. Hence fruit salad samples were highly contaminated while pineapple and pawpaw samples were least contaminated. However there was no significant association between FHC and microbial contamination of MPF.

**CONCLUSION:** In conclusion FHC were poor and MPF were not microbiologically safe. Periodic hygiene training and policy on ready-to-eat food vending should be implemented.

**KEY WORDS:** minimally processed fruits, food hygiene, street food, microorganisms

### **P13. FOOD HYGIENE KNOWLEDGE AND PRACTICES AMONG MINIMALLY PROCESSED FRUITS STREET VENDORS IN CENTRAL WARD, NAIROBI COUNTY**

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**BACKGROUND:** Minimally processed fruits (MPF) vended as street foods, despite numerous benefits, can cause food-borne illnesses due to poor hygiene practices and unsanitary conditions. This study sought to assess food hygiene knowledge and practices in minimally processed fruit vending businesses in Nairobi Central Ward.

**METHODS:** The method used was cross sectional with analytical component through convenient sampling of 323 street food vendors (FVs). Observational checklist and structured questionnaires, were prepared using codex food hygiene and safety principles captured data. Inferential statistics established variable relationships at 95% confidence interval. Food Hygiene Knowledge (FHK) and Food Hygiene Practice (FHP) levels were ranked according to Bloom cut off points on calculated percentage scores.

**RESULTS:** Most vendors (62.8%) had low FHK and poor FHP (98.7%). FHK and FHP significantly varied in the clusters ( $p>0.05$ ). Majority (76.6%) had knowledge on preparation of fruits and ensured general standards of hygiene (86.1%). Food safety standards and regulations were mainly acquired by observation (58.6%). Only 16.6% had been trained on food hygiene and knowledgeable on medical certificates (27.4%). Prepared fruits were handled properly, stored and covered (90%). Dustbins were present (90%), 96% were uncovered and 38% filled up. Poor waste

disposal (40%); dirty (67%) and cracked (87.0%) work surfaces; unwashed fruits (18%); unwashed hands (52.6%); no aprons (53.9%); present jewellery (73.7%); handling of money (40.0%) and fruits with bare hands (18.4%); and no utensils drying racks (44%) were observed.

**CONCLUSION:** FHK was low and FHPs were poor. FHK and FHP significantly varied in the clusters ( $p > 0.05$ ). Periodic hygiene training and policy on ready-to-eat food vending should be implemented.

**KEY WORDS:** minimally processed fruits, food hygiene, street foods, microorganisms

#### **P14. IN SILICO SIMULATION OF BACTERIOPHAGES AND SALMONELLA TYPHI POPULATION DYNAMICS**

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**BACKGROUND:** *Salmonella typhi* is a causative agent of food poisoning and enteric fever. The Simulation of bacteriophages' efficiency in bacteria treatment is the integration of their lytic cycle in destroying bacteria with those found in the disciplines of mathematics, statistics and computational systems in order to find the exact numbers of phages that can totally lysate bacteria. This work was conducted to create a simulative model for the development of dynamic interactions between phages and their bacterial host (*Salmonella typhi*).

**METHODS:** The model was developed from calculations of bacteriophage replication to solve the distinct mechanisms of their efficiency including changes in lifecycles, therapeutic dose and mortality rates. Simulated data are compared with data obtained *in vitro* to assess the suitability of the model for multiplicity of infection.

**RESULTS:** *In vitro* observations showed that the strength and mechanisms of bacteriophage can alter the determination of *Salmonella typhi* as antimicrobial therapy. The exponential growth curves solved the interactions of bacteriophage with their host in certain time decay, the

changes in concentrations over time was solved by differential equations used to determine the therapeutic outcome.

**CONCLUSION:** *In silico* predicting of the potentiality of phages in lysing *Salmonella typhi* was estimated by using this model due the experiments conditions (*in vitro*). For more accurate estimations the model was programmed MS Excel sheet and simulated as a simple computer program. The predicting of the potentiality of lytic phages in lysing *Salmonella typhi* can be estimated by using this mathematical model due the experiments environment conditions.

**KEY WORDS:** *Salmonella*, food poisoning

#### **P15. PREVALENCE OF STUNTING AND ASSOCIATED FACTORS AMONG PRESCHOOL CHILDREN: A COMMUNITY BASED COMPARATIVE CROSS SECTIONAL STUDY IN ETHIOPIA**

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**BACKGROUND:** Stunting, a measure and indicator of chronic undernutrition, is the most prevalent form of child undernutrition in developing countries. The vast majority of stunted children live in Asia (87 million) and Africa (59 million). Hence, the aim of the current study was to assess the prevalence and associated factors of stunting among preschool children from food secure and food insecure households.

**METHODS:** A community based comparative cross sectional study was conducted among preschool children in Albuko district from March to April 2017. A multistage and systematic sampling techniques were utilized to recruit study

participants. According to WHO Child Growth Standards 2006, children with height for age (HAZ < -2 standard deviation (SD) were considered as stunted. In order to assess the strength of the association, adjusted odds ratio (AOR) with a 95 % confidence interval (CI) was computed. In the multivariable analysis, variables with a P-value of <0.05 were considered statistically significant.

**RESULTS:** The overall combined prevalence of stunting among preschool children in the study area was 39.3% [95%CI; 36.3, 42.3%]. A higher stunting prevalence was observed among preschool children from food insecure households [42.8%, 95%CI; 38.4, 47.2%] than food secure ones [35.9%, 95%CI; 31.7, 40.1%]. Having uneducated mothers, large family size, and male sex were common factors significantly associated with stunting in both food secure and insecure households. While child birth order and the amount of water (<40 liters) for use were significantly associated with stunting among preschool children living in food secure households, and lesser child age, lack of extra food during pregnancy/lactation, and low dietary diversity score were significantly associated with stunting among preschool children from food insecure households.

**CONCLUSION:** The present study showed that stunting is an important public health problem among preschool children from both food secure and insecure households. Though PSNP is a proven strategy in reducing the burden of childhood stunting, this study showed that there is no significant variation in the magnitude of stunting. However, it does not mean that PSNP interventions are not important in reducing the prevalence of stunting. Therefore, strengthening maternal nutrition, family planning utilization, and maternal education and enhancing dietary diversity, water sanitation and hygiene are critical interventions to reduce the level of stunting among under five children.

**KEY WORDS:** Stunting, children, associated factors, Ethiopia

#### **P16. PREVALENCE AND RISK FACTORS OF RAISED BLOOD PRESSURE LEVEL AMONG ADOLESCENTS (10-19 YEARS): A COMMUNITY-BASED STUDY**

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**BACKGROUND:** Raised blood pressure is cardiovascular disease risk factor. Its control hinges on early identification. This study assessed blood pressure (BP) and body mass index (BMI) in adolescents (10-19 years) in three rural communities of Igbo-Etiti local government area, Enugu State, Nigeria.

**METHODS:** Multi-stage random sampling technique was used to select 408 adolescents from Ukehe, Idoha and Ikolo communities. Questionnaire, measurements of weight, height, and BP were taken using standard methods. Hypertension was defined as systolic BP (SBP) and/ or diastolic BP (DBP) greater than the 95th percentile for age, gender and height on three separate readings. BP greater than 90th percentile but less than the 95th percentile for age, gender and height defines pre-hypertension. Bivariate analysis using Pearson correlation and Chi square with Cochran's statistics were used to identify risk factors of raised blood pressure. Significance was accepted at P<0.05.

**RESULTS:** There were 46.9% boys and 53.1% girls. Most (90.3%) were students. Some (10.2%) had ever smoked cigarette and 52.9% had ever consumed alcohol. About 26% had >7-hours sleep daily. Mean SBP percentile (P<0.01) and DBP percentile (P<0.001) were significantly higher in boys but BMI was significantly higher in girls (P<0.001). Only 3.5% were overweight; none was obese and 14.5% were underweight. Systolic (6.5%) and diastolic (5.5%) hypertension was prevalent; 2.0% had both systolic and diastolic hypertension. Overall prevalence of hypertension was 14.0%; males (OR=2.960, 95% C.I.=1.608-5.450, P<0.001), ever consumed alcohol (OR=0.410, 95% C.I.=0.221-0.762, P<0.01), daily hours of sleep (OR = 1.829, 95% C.I.=0.960-3.483, P<0.05) and BMI (OR = 0.233, 95% C.I.=0.073-0.747, P<0.05) were significant risk factors. There was a strong positive correlation between SBP and DBP (r = 0.212, P=0.000).

**CONCLUSION:** Hypertension was prevalent among the adolescents. Alcohol consumption, sex, hours of sleep and BMI was risk factors and should be targets for intervention.

**KEY WORDS:** Adolescents, blood pressure, risk factors, rural, Nigeria

#### **P17. THE PREDOMINANCE OF FOOD ASSISTANCE OVER LIVESTOCK AND CROP PRODUCTION IN THE LIVELIHOODS OF RURAL MABUTSANE COMMUNITIES IN BOTSWANA**

Maria.S. Nnyepi

**BACKGROUND:** Frequent droughts and over-reliance on livestock production and rain-fed crop production predispose rural communities to poverty. Given this fragile livelihood situation that undermines access to adequate food and cash income social benefit programs are often availed to assist food insecure households. However, the contribution of social benefit programs is seldom compared to household's own production. A balance between household own production and social support that may not undermine household's own production remains unknown.

**METHODS:** Household survey (n=245), focused groups and secondary data were used to examine the contribution of livelihoods factors to energy intake and the uptake and contribution of social protection services in Mabutsane district Botswana.

**RESULTS:** Using livestock to define wealth, 87% of households were categorized as poor, while 11% and 2% were in the middle and high wealth categories respectively. Fewer households (13%) were above the poverty-threshold of US 1.25 per day. Household accessed food through market-purchase, food assistance, payment-in-kind, gifts and livestock and crop production. The middle and better-off households met their energy needs through these access options, but the very-poor and the poor had a 6% and 2% energy deficit respectively. Food assistance provided 20-30% of the food needs for the poor and very poor and 10-15% for the better-off and middle households respectively. Crop production and livestock contributed only 2% and 7% of the very-poor and the poor's food energy needs, while the middle and the better-off obtained 14% and 19% of energy needs respectively. Livestock products contributed <1% of energy needs for the very poor, and 4%, 20% and 42% for the poor, middle and better-off households respectively.

Purchases and payments-in-kind contributed 40-70% and 7-20% to very poor and the poor's energy intake.

**CONCLUSION:** Considering seasonal dips food aid contribution to energy is the most significant and reliable factor across wealth groups.

**KEY WORDS:** livestock, crops, Botswana

#### **P18. THE POTENTIAL OF SMART AQUACULTURE ON IMPROVING FISH PRODUCTION IN THE FACE OF CLIMATE CHANGE IN MALAWI**

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The effects of climate change have not only affected crop production in Malawi but also aquaculture. Aquaculture in Malawi begun in 1906 with culture of rainbow trout whereas indigenous species in 1956/1957. However, most of wetlands, rivers and streams that were perennial and could be diverted for the purpose of fish farming are becoming annual. This scenario has made fish farming increasingly becoming a challenge in areas that were once suitable for the enterprise, as fish ponds are drying up annually due to lack of water. This is defeating potential of fish farming in successfully supplementing declining fish catches from capture fisheries on the market. Rain water harvest can be adopted for fish farming to do away with a problem of water availability throughout the year. Plastic sheets can be used to align the bed and sided of a pond to reduce seepage and conserve enough water throughout the year. This technology can also be used to take fish farming to areas deemed not suitable for aquaculture hence improving animal protein supply and food security in those areas. Cage culture is another technology that enables fish farmers to overcome the problem of ponds drying up by culturing the fish in perennial water bodies such as lakes, dams and river in confinements.



**KEY WORDS:** cage culture, rain water harvest, food security, Malawi.

**P19. FOOD VALUES AND BELIEF PRACTICES, FOOD AND NUTRITION SECURITY, AND HEALTH STATUS OF HOUSEHOLDS FROM RURAL COMMUNITIES IN LIMPOPO PROVINCE, SOUTH AFRICA**

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**BACKGROUND:** This paper reports on the investigation of food value and belief practices of adults in Limpopo province in relation to health. The study that aims to develop models for improving food security and nutritional status of households using indigenous foods among rural communities.

**METHODS:** A qualitative design employing an oral history approach was used. Ten focus group discussion were conducted using a guide by research assistants and fieldworkers using Xitsonga language, one hour long and digitally recorded, and translated into English prior to thematic analysis.

**RESULTS:** *Indigenous foods and benefits:* They mentioned: protection of people from getting sick due to low

consumption of fats/oil; build their bodies and some dishes good for healthy skin; make people live longer, keep them stronger and prevent them from getting sick from diseases such as hypertension and diabetes. *Food taboos:* A child was not supposed to eat salt. Pregnant women were: not allowed to drink beer for the reason that when the baby is born he/she will be mentally disturbed; not allowed to eat sugarcane because the baby will get sick; and were not allowed to drink tea because it is believed that the baby will be born with burnt marks. *Responsibility for food procurement and distribution in the household:* Both parents were responsible, with the father the only one responsible for allocating money to buy food, purchase food in some families, and for dishing meat and determining which piece of meat should be eaten by children in some families. *Food values attached to cultural practices:* They reported that in the olden days when they had ceremonies they will slaughter a goat, prepare traditional beer, cook *tihove* and dried leafy vegetables with crushed groundnuts, and *xirhidzane*.

**CONCLUSION:** The participants are knowledgeable about food values and cultural practices associated with indigenous foods and health.

**KEY WORDS:** Indigenous Food; Cultural Values; Food and Nutrition Security; Food Values and Belief Practices; Health Status.

**P20. DIETARY INTAKES, NUTRITIONAL ADEQUACY AND ASSOCIATED FACTORS AMONG PASTORAL CHILDREN IN SOUTHERN ETHIOPIA**

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**BACKGROUND:** Dairy products have been a major source of energy, protein, and several micronutrients for pastoral children. Presently, however, the system is experiencing various climatic, ecological and socio-economic changes that would result in livelihood shifts and dietary transitions. This study assessed the dietary intakes and nutritional adequacy among children in Borana, Ethiopia.

**METHODS:** Dietary diversity score (DDS), milk and meal frequencies, nutrient adequacy ratios (NAR) and mean adequacy ratio (MAR) were recorded for 538 children under the age of five. Factors that affect MAR of children were analyzed using general linear model.

**RESULTS:** Results showed that children had low level of DDS (2.67 out of 7 food groups) and minimum acceptable. The overall mean adequacy ratio was found to be 66.3% and majority of the children (72%) had MAR below 75%. The required nutrient adequacy ratios (NAR) were attained for vitamins B2 and B6, and calcium while vitamins C, B1 and folic acid intakes were lowest. Various predictors including autonomy of mothers in decision making, non-pastoral incomes, crop cultivation, livestock species diversity and availability of toilet and mobile at household level had significantly increased mean adequacy ratio. Children living with their mothers, those from Borana households and from villages closer to markets had better MAR. Likewise, the shorter the travel time (hours) to market places the better the MAR of the children while increased distance to health institutions was positively associated MAR.

**CONCLUSION:** Generally, diets of the study children were less diverse and much below the minimum WHO standards. The diets of study children were generally rich in vitamins B2 and B6, and calcium, but deficient in vitamins B1 and C, and iron.

**KEY WORDS:** Children, Dairy intake, Dietary diversity, Determinants, Nutritional Adequacy, Borana

## **P21. COMPARATIVE ANALYSIS OF THE SURVIVAL STATUS AND TREATMENT OUTCOME OF UNDER FIVE CHILDREN ADMITTED WITH SEVERE ACUTE MALNUTRITION AMONG HOSPITAL BASED AND**

## **HEALTH CENTER BASED STABILIZATION CENTERS, SOUTH ETHIOPIA**

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**BACKGROUND:** Severe acute malnutrition has been managed at hospital stabilization centers until more recently where it is managed at health center based stabilization centers. However, the treatment outcome was not assessed in relation to the existing hospital based management. This study comparatively assessed the treatment outcome and survival status of severe acute malnutrition among health center based and hospital based stabilization centers.

**METHODS:** 400 records of under five children admitted to five stabilization centers (2 hospitals and 3 health centers) in Gedeo Zone were randomly selected for inclusion. Data was entered by Epi Info (version 7) and analyzed by STATA version 11. Survival difference was checked by life table and Kaplan-Mier with Log-Rank test. Cox proportional hazards model was built by forward step wise procedure; compared by likely hood ratio test and Harrell's concordance and fitness checked by cox-snell residual plot.

**RESULTS:** The study showed that the cumulative probability of Survival is significantly different at Hospital stabilization center and health center stabilization centers (p.value <0.001) with shorter survival at hospitals. During the follow up period 28 (13.86%) children from hospital and 5 (2.5%) children from health center died. While 155 (76.73%) children from hospital and 145 (73.23%) children from health center recovered. Also Eighteen (4.5%) of children were defaulted. Death is significantly higher at hospital, while default rate and cure rate are not significantly different. Altered pulse rate [AHR=2.44, 95 % CI =1.47-4, p<0.001], NG tube insertion [AHR=1.8, 95 % CI =1.04-3.1, p=0.038], Anemia [AHR=1.53, 95 % CI =1.02-2.3, p<0.041] and Hypoglycemia [AHR=2.78, 95 % CI =1.8-4.3, p<0.001] were found to be independent predictors of death.

**CONCLUSIONS:** The survival of children in hospital is shorter and mortality is higher. An overall treatment outcome was in acceptable ranges. Intervention to further reduce deaths at hospitals has to focus on children with comorbidities and altered general conditions and early detection.

**KEYWORDS:** Severe acute malnutrition, comparative analysis, survival status, Under-five children, treatment outcome

## **P22. DIETARY ADEQUACY OF DIFFERENT MENUS SERVED IN FIVE VOCATIONAL TRAINING COLLEGES IN MATABELELAND SOUTH PROVINCE IN ZIMBABWE**

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**BACKGROUND:** A considerable number of youths in Zimbabwe are in vocational institutes and a considerable number are boarders in those institutes. Adequate diet is vital during this stage because youths require fuel to perform physical and cognitive functions. The purpose of this study was to evaluate the adequacy of meals served to boarding students at five vocational institutes in Matabeleland South in Zimbabwe.

**METHODS:** Menus for five Vocational Training Colleges (VTC) were used to assess food variety score (FVS) and dietary diversity score (DDS). The FVS was calculated by counting the number of food items consumed in a week in each VTC. The DDS was estimated by classifying these food items into nine food groups namely starchy staples, whole grains, legumes, dairy, meats (beef, poultry, fish, eggs), vegetables, fruits, oils/fats/butter and sugary foods. A questionnaire and an interview were also used to assess factors related to food production management.

**RESULTS:** The age of students ranged from 16 to 40 years. Low food variety was found. The overall mean FVS for all

the five colleges was thirteen (13). The overall mean DDS for all the five colleges was seven (7). The food groups which had the highest frequency of consumption were starchy staples, oils/fats/butter, sugary foods and animal protein (>5 times a week) followed by vegetables, legumes and dairy, (four times weekly, three times weekly and once per week respectively). Fruits and whole grains were not served in all the five colleges. The interview revealed that two colleges had agro-based projects while three did not have.

**CONCLUSION:** A limited number of foods were served. The typical diets of the college students had high energy-based foods and animal protein. Fruits and whole grains were not served at all. Agro based projects were limited.

**KEY WORDS:** Vocational College Students, Menus, Food Variety Score, Dietary Diversity

## **P23. DEVELOPMENT AND TESTING OF NUTRITION EDUCATION AIDS FOR PREVENTION OF HIDDEN HUNGER AMONG ADOLESCENTS (13-17 YEARS) IN A SUBURB OF ENUGU STATE, NIGERIA**

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**BACKGROUND:** Understanding the nature, magnitude and range of problems and solutions (using nutrition education) of micronutrient deficiency (hidden hunger) has come a long way. Nutrition education (NE) is a combination of educational strategies which facilitate voluntary adoption of food choices and food/nutrition-related behaviours conducive for health and well-being. This study developed and tested NE aids for prevention of hidden hunger among adolescents in public secondary schools in a suburb of Enugu state, Nigeria.

**METHODS:** A total of 1,645 students participated in the study. The NE aids were developed with literature facts, pictures of staple micronutrients-rich foods, instructional materials development guidelines and computer graphics. A structured questionnaire used, collected data on socio-economic status, lifestyle activities, nutrition knowledge and consumption pattern micronutrient-rich foods of the students. A baseline knowledge of micronutrients (pretest)

was determined before the students' exposure to the NE aids and retested (post-test) after 6 months. Data were analyzed using SPSS version 21, results presented as means, frequencies and percentages and T-test used measured the effect of aids at  $p < 0.05$  significance.

**RESULTS:** About 41% of the respondents were males, 58.9% females and most (53.60%) aged 16-17years; 68.12% lived with parents and 79.05% partly produced their foods, 64.79% skipped meals and mostly breakfast (73.18%). More than 50% had good knowledge of nutrients in common foods except pasta and noodles (47.53%), soursop (43.04%), tigernut (14.27%), avocado pear (45.11%), pigeon pea (39.82%) and green beans (42.81%). There were significant ( $p < 0.05$ ) differences in the respondents' knowledge of micronutrients at both tests. The increased knowledge at post-test affected their consumption of micronutrients-rich foods positively. Consumption of leafy vegetables (24.42%), orange (15.21%), avocado pear (16.08%), watermelon (22.25%), guava (22.76%) and carrot (10.83%) were affected mostly positively.

**CONCLUSION:** The students' exposure to the NE aids improved their overall knowledge of micronutrients, education aids, hidden hunger

**KEY WORDS:** Adolescents, nutrition

## **P24. FOOD SECURITY AND ASSOCIATED FACTORS AMONG UNIVERSITY STUDENTS**

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**BACKGROUND:** Food security is a basic human right and an important determinant of health. There is paucity of data regarding food security status of university students in Nigeria. This study therefore aimed to assess the prevalence of food security and associated factors among university students, South East Nigeria.

**METHODS:** A cross sectional survey of 398 randomly selected students recruited from two universities, South East Nigeria was conducted. Food security status was assessed using the 10- item United States Department of Agriculture (USDA) survey. Anthropometric measurements and socio demographic data were collected. Multivariate logistic regression was used to identify factors associated with food security.

**RESULTS:** Overall prevalence of food security was 19.3%, with 80.7% experiencing food insecurity. The odds of being food secure was significantly higher for students who reside off-campus compared to those who stay on-campus (odds ratio [OR]:2.223, 95% confidence interval [CI]:1.1-4.4;  $p=0.026$ ). Food security was associated with less skipping of meals (OR=0.248; 95%CI: 0.1-0.4;  $p=0.000$ ).

**CONCLUSION:** Prevalence of food security was low. Staying off-campus and skipping of meals were the factors associated with food security in this study. Studies focusing on different urban and rural campuses in Nigeria is warranted in order to understand the magnitude and contributing factors among this population group.

**KEY WORDS:** Food Security, University Students, Nigeria

## **P25. BUILDING CAPACITY TO IMPROVE NUTRITION-RELATED KNOWLEDGE AND DELIVERY OF SERVICES BY PROVIDERS IN EASTERN GHANA**

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**BACKGROUND:** Efforts to alleviate under-nutrition are hampered by shortage of nutrition-related skilled staff in the workforce. In Upper Manya Krobo District (UMKD) an under-served rural district, priorities identified by the District Health Management Team (DHMT) included expanding staff training in nutrition, enhancing data collection, monitoring and supportive supervision. NUTRITION LINKS, a 5-year integrated project aimed at meeting identified needs through capacity building workshops and supportive supervision.

**METHODS:** In collaboration with certified trainers and DHMT, health staff and community volunteers' workshops on Community-Based Growth Promotion (CPGP), Community-infant and Young Child Feeding (C-IYCF), and Mother-to-Mother Support Group (MtMSG) formation. A pre-post-test of knowledge gained was conducted after each training while two monitoring, mentoring and supportive supervision (MMSS) sessions were conducted three months apart. Utilization of knowledge and skills gained were assessed using an observational checklist while interviews conducted with health staff and volunteers were rated, with a total score awarded for each participant. In addition, mentoring and feedback was provided to enhance service delivery. Descriptive analysis and t-test were conducted to determine changes in knowledge and skills.

**RESULTS:** There was a substantial improvement in knowledge and skills gained from the workshops. For health staff trained in CIYCF and volunteers trained in CPGP the pre-to-post-test scores almost doubled ( $54.4 \pm 18.4\%$  to  $98.4 \pm 3.8\%$ ;  $42.45 \pm 17.29\%$  to  $82.02 \pm 18.38\%$   $p < 0.001$  for both). From the first to the second MMSS, percentage of health staff who can counsel mothers appropriately in IYCF practices almost doubled ( $55.9\%$  to  $88.2\%$ ), while volunteers who can conduct CBGP appropriately more than tripled ( $20.0\%$  to  $76.1\%$ ).

**CONCLUSION:** In-service training improved knowledge tremendously, however MMSS helped close the gap between head knowledge and application of skills in service delivery. MMSS should therefore be included in capacity building activities to ensure effective utilisation of nutrition skills in the workforce.

**KEY WORDS:** Under-nutrition, capacity building, monitoring, mentoring, supportive supervision

## **P26. NUTRITIONAL STATUS OF OLDER PERSONS (60YRS+) IN NANGABO SUB COUNTY, WAKISO DISTRICT, UGANDA**

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**BACKGROUND:** Older persons are among the more vulnerable groups under the chronically poor people. In most communities, a high proportion of the poorest are elderly people who have been abandoned, those who have become physically weak or suffer ill health and those who are destitute. The overall objective of this study was to assess the nutrition status among older persons in Nangabo Sub County, Wakiso District.

**METHODS:** The study was a cross sectional survey. Multi stage Cluster sampling was used to choose the respondents. The data was collected from older persons (60 years and beyond). A total of 304 older persons were interviewed with 112 being males and 192 females. Questionnaires were used to obtain information which included demographic and socioeconomic data, anthropometric measurements, dietary diversity and the availability and accessibility of health services and the state of hygiene and sanitation facilities. Data collected was analyzed using SPSS Software

**RESULTS:** Results indicated that 81% respondents had mean individual dietary diversity score of 4 out of 10 food groups that were considered (cereals, legumes, fruits, vegetables, meats, roots & tubers, eggs, fish, milk products and oils & fats). 12.5% of the respondents were undernourished and sanitation and hygiene facilities were generally not easily accessible to everyone.

**CONCLUSION:** A big proportion of older persons was undernourished. The government needs to put in place mechanisms to ensure the nutrition of older persons is given attention

**KEY WORDS:** Older persons, nutritional status, cross sectional survey

## **P27. STUDY OF LACTOSE INTOLERANCE IN AFRICA: CASE OF THE MOROCCAN AND SUB-SAHARAN POPULATION**

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**BACKGROUND:** Less known in Africa, yet very widespread in the world, Lactose intolerance is a digestive problem that testifies a deficit of lactose digesting enzyme, lactase, which leads to uncomfortable digestive symptoms. The prevalence of lactose intolerance varied from one region to another with an undeniable north-south gradient ranging from 5% in North Europe to 100% in some Asian countries. The purpose of this article is to highlight the difference in the prevalence of adult type hypolactasia according to geographical space and ethnicity.

**METHODS:** The survey was conducted in the city of Kenitra representing the North of Morocco and the city of Agadir representing the south of Morocco on the adult population and also among the sub-Saharan adults residing in Morocco. Lactose intolerance was assessed by the rate of glucose in blood before and 30 minutes after administration of an overload taking of lactose and also taking account of the subsequent digestive symptoms. Subjects were also asked to answer some questions about their milk consumption and their knowledge about lactose intolerance.

**RESULTS:** The prevalence of adult-type primary hypolactasia was 75% in Kenitra, 80% in Agadir and 85% in the Sub-Saharan population, it was higher in the sub-Saharan population than in the Moroccan population, it varies significantly with age and may be influenced by milk consumption in adulthood but less by its consumption after weaning.

**CONCLUSION:** Lactose intolerance increases as we go towards the south, several genetic and environmental factors influence this divergence. The prevalence of lactose intolerance is very high among the studied population which requires the participation of the health authorities to raise awareness of the existence of lactose intolerance in order to improve their quality of life.

**KEY WORDS:** Lactose, Intolerance, Lactase, Milk, Africa.

## **P28. REHABILITATING MODERATELY MALNOURISHED CHILDREN USING POSITIVE DEVIANCE HEARTH MODEL IN BUKOBA RURAL AND MULEBA DISTRICTS, KAGERA REGION, TANZANIA**

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**BACKGROUND:** Positive deviance Hearth empowers communities to take responsibility for addressing the causes of malnutrition by helping to identify local solutions to overcome malnutrition. World Vision Tanzania has been implementing positive deviance hearth for rehabilitation of moderately malnourished children in Bukoba rural and Muleba districts since 2015. This paper looks at the period of January 2015 to December 2015.

**METHODS:** Community mobilization, identification and selection of volunteers was done. Positive deviance enquiry, interpretation in addition to community feedback sessions was done. Baseline was done on day 1 and appropriate referrals done. Thereafter, the trained volunteers formed and implemented hearth sessions for 12 days. Monitoring and follow up took place on day 12, 30, 3 months, 6 months and 1 year after the hearth sessions.

**RESULTS:** At baseline, underweight status for Muleba district stood at 19.1%, (Ruhita), 20.3% (Mbuka) and 17.4% (Izigo). Bukoba rural reported 16.4% (Ibwera) and 23.9% (Rukoma). 702 and 430 children participated in hearth sessions in Muleba and Bukoba rural respectively. Follow up at days 12 and 30, 3 months, 6 months and 1 year showed the following: 499 of 702 -71% (Muleba) and 279 of 430 -

64.9% (Bukoba rural) children graduated with a relapse rate of 29% (Muleba) and 35.1 (Bukoba rural).

**CONCLUSION:** Positive deviance Hearth has empowered communities to take responsibility for addressing the causes of malnutrition by helping to identify local solutions to overcome malnutrition in the target areas of study.

**KEY WORDS:** Muleba, Bukoba rural, Positive deviance/hearth, hearth, rehabilitating

#### **P29. CARE GROUPS ENHANCE TASK SHARING ON MUAC SCREENING - FROM VILLAGE HEALTH WORKERS TO MOTHERS: A CASE OF ZIMBABWE**

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**BACKGROUND:** Achieving High coverage of active screening for acute malnutrition among the 0- 59 months old using the Mid-Upper Arm Circumference (MUAC) by Community Health Workers (CHWS) as recommended by WHO has often prove difficult due to the overwhelming tasks and competing priorities on the CHWs. To overcome this issue, task sharing of community level- active screening using MUAC from CHWs to mothers was piloted. Vitamin A was delivered through the care group model as an entry point and converging delivery of several nutrition specific interventions: Infant and Young Child Feeding (IYCF), Micro Nutrient Powders (MNPs) for children 6- 24 months and cooking demonstrations for improved complementary.

**METHODS:** An exploratory study was conducted in 8 pilot districts, where MUAC screening was performed bi-weekly by mothers participating in care-groups, under the leadership of lead mothers and oversight of CHWs. National and subnational cadres were trained on the integrated MUAC approach; baseline assessments of caregivers on malnutrition, lead mothers and VHWS on 3 simple steps to screen for MUAC and IYCF was conducted.

**RESULTS:** All the mothers trained successfully assessed their children's MUAC during the bi-weekly care group meetings, resulting to early treatment seeking for acute

malnutrition. MUAC verification was undertaken by Community based nutrition workers and onsite training performed if discordant were identified. Peer to peer support provided a platform for enhancing the acceptance of the MNPS, ownership of nutrition interventions and cooking demonstrations provided an opportunity for dietary diversification through cooking a 4-star diet.

**CONCLUSION:** Not only do mothers understand MUAC and can do it, therefore lessening the burden of nutrition screening on the VHWS, but the use of care groups saturated the community with peer to peer support enhancing coverage of community nutrition interventions.

**KEY WORDS:** Acute Malnutrition, MUAC, Task sharing, Care groups, Micro Nutrient Powders

#### **P30. DETERMINANTS OF PRE-SCHOOL CHILDREN'S EATING HABITS AND ITS MEDIATED INFLUENCE ON THEIR ACADEMIC PERFORMANCE IN ABEOKUTA, OGUN STATE, NIGERIA.**

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**BACKGROUND:** Preschool age is the active growing phase of childhood. It is a dynamic period of physical growth as well as of mental development of the child. This study was designed to assess determinants of pre-school children's eating -habits and its mediated influence on their academic performance in Abeokuta, Ogun State, Nigeria. One hundred and twenty five pre-school parents and pupils were randomly selected from the schools.

**METHODS:** A pretested structured questionnaire was used to obtain information on socioeconomic factors, feeding habits, academic performance and frequency of food consumption. Weight for age, height for age and Mid Upper Arm Circumference (MUAC) were calculated from anthropometric measurements and used to classify subjects' nutritional status of the pupils. The academic

performance of the pupils was assessed using Pre-school assessment guide developed by National Institute of Early Education Research and data were collected from the teachers and parents of the pupils according to the Ogun State Ministry of Education Standard. Data collected were analysed using Statistical package for social science version 21.

**RESULTS:** Results showed that thirty nine percentages (39%) of the parents earned between N58, 500-98,000, twenty five percentages (25%) earned between N18500-58,000, few parents (6%) earned between N215, 000 and above. Majority of the parents (70%) were civil servants. Sixty percentages (60%) of the pupils selected were male, more than half (58%) of the pupils were not exclusively fed. Higher percentages (61%) attended day care. Fifty five percentages (55%) of the pupil's skipped breakfast, thirty percent skipped lunch, and two percents (2%) skipped dinner while thirteen percent do not skip meals at all. General rating of academic performance revealed that five (5%) of the pupils were rated poor, twenty one percentages (21%) were rated average, forty seven percentages were rated good, and twenty seven percentages (27%) were rated excellent. Majority of the pupils (91%) had normal weight for age as indicated by World health Organization standard, nine percentages (9%) had moderate age for weight. Stunting assessment shows that none was stunted; majority (54%) had normal height for age. Protein malnutrition as determined by Mid Upper Arm Circumference (MUAC) showed that one percentage (1%) had protein malnutrition. Sixty nine percent consumed protein daily, greater percentage of the pupils (91%) consumed carbohydrate daily, fifty nine percent consumed vitamin giving food daily, higher percentage (73%) eat mineral rich food daily while sixty six percent consumed fat rich food. The major determinants of feeding habit and academic performance of the pupils are the socio economic factors.

**CONCLUSION:** The study showed a positive significant correlation between the academic performance and stunting, socio economic factors and nutritional status, socio economic factors and academic performance ( $p < 0.005$ ). Therefore, government should embark on school feeding programme in order to improve the nutritional status and

academic performance of the students. There is for proper education for the parents and teachers on the importance of breakfast for the pupils before going to schools.

**KEY WORDS:** Determinants, Academic performance, Pre-school children, Breakfast

### **P31. TRENDS IN STUNTING AND WASTING IN ZIMBABWE**

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**BACKGROUND:** Zimbabwe has implemented routine food and nutrition assessments to provide information which has proved useful for decision making, programming and resource mobilisation. These assessments includes 1) the ZIMVAC, an annual food and nutrition assessment which is usually conducted around May 2) the MICS and ZDHS conducted five yearly 3) the National Nutrition Surveys (NNS) with district level representativeness conducted in 2010 and 2018 4) the Emergency Nutrition Assessment (SMART Survey) conducted in January 2017 in 25 drought affected districts.

**METHODS:** Although these assessments may differ in the main objectives and sometimes methodology, the Nutrition indicators they measure are generally standard, and therefore comparable. It is against this background that this trend analysis is done. This analysis focuses on 7 assessments from 2010 to 2018. All the above mentioned assessments were pooled together and an analysis of key nutrition indicators done. The aim of the trend analysis was to identify and define any pattern which may exist between the surveys. The key indicators analysed are stunting and wasting.

**RESULTS:** The prevalence of Global Acute Malnutrition (GAM) has generally remained around 3% since 2010. The only notable exception was in the year 2016, where prevalences of 5.7% and 4.4% were reported in the ZIMVAC assessments of January and May respectively. The



prevalence of Severe Acute Malnutrition (SAM) has consistently declined to reach 0.3% in the 2018 NNS. The stunting prevalence has fluctuated between 25% and 29% across the different assessments. The lowest stunting prevalence (25.1%) was reported in the SMART Survey of January 2017.

**CONCLUSION:** There is a general improvement in the nutrition status of children 0-59 months, as shown by declining undernutrition rates. There are differences in principle and in methodology of these assessments, which may question the comparability of their data.

**KEY WORDS:** Stunting, Wasting, Assessments

### **P32. PROTEIN INTAKE OF CKD PATIENTS AT A TERTIARY FACILITY IN GHANA**

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**BACKGROUND:** Background: Dietary protein intake in CKD is crucial to disease outcome. Excess intake can further deteriorate kidney function while inadequate intake leads to malnutrition resulting in further complications. The aim was to determine the dietary protein intake of CKD patients at the Korle-Bu Teaching Hospital in Accra, Ghana.

**METHODS:** Study design was cross-sectional. Confirmed CKD patients at the Renal Unit were purposively sampled. Dietary protein intake was assessed using a validated quantitative food frequency questionnaire. Amount of food consumed was converted into nutrients using MicroDiet nutrient analysis software version 3.0. Nutritional status was determined using the Subjective Global Assessment (SGA) tool. SPSS vs 20.0 was used to analyse data.  $P \leq 0.05$  was considered statistically significant.

**RESULTS:** A total of 134 CKD patients (63.4% males and 36.6% females), mean age  $48.07 \pm 12.2$  years participated. Pre-dialysis formed 62.7% while 37.3% were on dialysis. Some patients (29.9%) were well nourished, 67.9% had mild to moderate malnutrition and 2.2% had severe malnutrition. Protein intake for pre-dialysis and dialysis patients were 0.64g/kg/day and 0.75g/kg/day respectively. The most frequently consumed protein foods were smoked fish with 66.4% eating it 3 or more times in a week. It was followed by evaporated milk, chicken and boiled eggs consumed by 21.7%, 10.5% and 8.2% respectively, 3 or more times weekly.

**CONCLUSION:** Protein intake of CKD patients, especially those on dialysis was below recommended intakes. It could increase their risk of malnutrition with associated complications.

**KEY WORDS:** CKD, protein intake, malnutrition, pre-dialysis.

### **P33. PREVALENCE OF DOUBLE BURDEN OF MALNUTRITION AND ASSOCIATED RISK FACTORS AMONG RURAL HOUSEHOLDS IN OKOLO-ERUWA COMMUNITY OF OYO STATE, NIGERIA**

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**BACKGROUND:** Double Burden of Malnutrition (DBM) is increasing in Nigeria, yet, data on associated risk factors are scarce. Understanding these determinants of DBM is essential in designing appropriate policies and programmatic actions. This study was designed to determine the prevalence and risk factors of double burden of malnutrition among rural households in Okolo-Eruwa Community, Ibarapa, **NIGERIA**.

**METHODS:** This community-based cross-sectional study involved 160 consenting mothers-child (age 0-59 months)

dyads. A semi-structured, interviewer-administered questionnaire was used to collect data on socio-demographic characteristics, infant feeding practices, and immunization history. Vaccination status was categorized as complete (12), incomplete immunization ( $>0<12$ ) and none (0). Weight and length/height were assessed and analyzed in both dyads using standard procedure. Data were analyzed using descriptive statistics, Chi-square test and logistic regression at  $p=0.05$ .

**RESULTS:** Household size was  $2.3\pm0.9$ , 98.7% were male-headed, 74.4% practised monogamy, and 98.1% practised open defecation. Mothers' age was  $28.9\pm7.9$  years, 56.9% were farmers, and 79.4% attended ante-natal clinic. Age of index children was  $29.4\pm14.9$  months, 51.9% were females, and 20.0% were firstborn. Only 26.3% were breastfed within 1 hour of birth, 56.9% were not fed colostrums, 39.9% were exclusive breastfed as at Day 3 of birth, and 30.0% had complete immunisation for age. Stunting, wasting and underweight were 48.1%, 8.1% and 16.9% respectively. Overweight and underweight among mothers were 30.0% and 8.1% respectively. Double burden of malnutrition was 27.5%, principally mothers' underweight and child's stunting (53.8%). Practice of polygamy (OR: 2.6; CI: 1.4-5.7), open defecation (OR: 1.8; CI: 1.3-4.8) and lack of ante-natal care (OR: 1.5; CI: 1.1-2.0) are major odds for DBM.

**CONCLUSION:** The prevalence of double burden of malnutrition among rural households in Okolo-Eruwa community, Ibadan, Nigeria is 27.5% and mothers' underweight and child constitutes 53.8%. The key determinants of mothers underweight and child stunting are marriage type, toilet type and the use of ante-natal care services.

**KEY WORDS:** Mothers underweight, stunting, infant feeding practices, vaccination status.

#### **P34. ADOPTING GENDER SPECIFIC PUBLIC INFORMATION SERVICES TO ENHANCE NATIONAL NUTRITION POLICY FOR INCLUSIVE NUTRITION STATUS IN AFRICA**

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**BACKGROUND:** We employ key lessons learned, best practices, gender analysis tool, Ugandan national food and nutrition policy applications to illustrate the vital need for public awareness communication campaigns for gender specific analysis to enhance community food and nutrition strategies based on mainstreaming gender equality and food security in Africa.

**METHODS:** Using Uganda's national food and nutrition policy, laws, and national action plan for nutrition, and nutrition advocacy communication strategy, we undertook a systematic literature review, policy analysis, lessons learned, and best practices for food security planning for sustainable family, community, national, and African regional nutrition policy. Data were obtained from African Development Bank strategy, news bulletins, and multiple internet searches. The paper presents, discusses, and explains the critical food security and nutrition multiple gaps and the adverse effects on health in tandem with the challenges of agriculture production, PPPs, research and policy communication

**RESULTS:** Low awareness of the contributions of gender specific analysis of men, women, girls, and boys to agriculture production for food security and nutrition; have negative nutrition differentiated socio-economic impacts aggravated by climate change. Besides, gender equality enhances women and girls' access to sustainable food and nutrition security in households and local communities in connection to national and regional food and nutrition security policies. Public awareness promotes food and nutrition education.

**CONCLUSION:** Food and nutrition security is a very urgent need at all levels of policy planning and multiple stakeholders' coordination at national and regional level interventions. It is imperative to promote gender analysis strategy to mitigate policy related food and nutrition security with a focus on local community empowerment, research, South - South and North-South partnerships, technology transfer, nutrition funds, SDGs, and national nutrition

advocacy communication strategy for sustainable livelihoods.

**KEY WORDS** – Africa, nutrition policy, food security, gender equality, North- South

### **P35. THE USE OF SEASONAL DIETARY SURVEYS TO IDENTIFY UNDERUTILIZED FOOD GROUPS TO DIVERSIFY DIETS OF WOMEN OF REPRODUCTIVE AGE IN ZAMBIA AND MALAWI**

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**BACKGROUND:** Information on seasonal changes in dietary diversity and changes in the proportion of women consuming food groups over seasons is under documented. We studied seasonal variation in women living in rural Zambia and Malawi where the effect of seasonal agricultural production and seasonal food availability on dietary diversity is likely to be high. Overall, diets in both countries are dependent on staple crops and lack diversity and micronutrients, manifesting in persistently high child stunting rates. As the first 1,000 days of life are crucial for child development, Bioversity International developed a dietary monitoring tool to measure changes in food consumption and analyze seasonal changes in dietary diversity of women of reproductive age in project areas of Zambia and Malawi.

**METHODS:** An enumerator-assisted questionnaire was administered every-other month beginning in September 2017 using 24-hour recall and weekly food frequency questions. The list-based 24-hour recall was informed by focus groups on locally available foods categorized into 10 food groups for measuring minimum dietary diversity for women (MDD-W).

**RESULTS:** Between September and January, 18-43% of women met MDD-W (5+ food groups). Dietary diversity was highest (59-79%) in the harvest season between March and May. Across all seasons, 3 food groups dominated women's diets, staple grains and tubers, dark green leafy vegetables and other vegetables. Maize, cassava, tomatoes and onions were highly reported, however the variety of dark green leafy vegetables reported changed seasonally. Beans are widespread and frequently consumed in Malawi, and respondents reported greater richness of bean varieties in comparison to Zambia. Seeds and inputs for beans are low in target communities in Zambia, affecting production in these areas.

Fish is the most common flesh food consumed in both countries, and consumption is greater in communities closer to large water bodies, although availability and consumption decrease seasonally at times of fishing bans. Vitamin-A rich fruits and vegetables, other fruits, dairy and eggs are highly seasonal in our study areas.

**CONCLUSION:** Improved nutrition-sensitive processing, storage and access to diverse food varieties from food groups which vary seasonally in local food systems have potential to positively affect dietary diversity in the first 1,000 days.

**KEY WORDS:** Dietary Diversity, Seasonality, Zambia, Malawi, Nutrition in the First 1,000 Days, Benchmarking of food environment

### **P36. IDENTIFYING DONOR ORPHANS IN AID FOR NUTRITION IN AFRICA**

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**BACKGROUND:** Donor aid for nutrition is fragmented. While major nutrition donor agencies meet regularly to discuss global efforts to improve nutrition, funding decisions are made independently by each agency according to their own criteria and in response to perceived demands from recipient countries. This raises the question of whether, in

aggregate, aid flows to countries that need it most. This is critical for Sub-Saharan Africa, where the number of children who are stunted is increasing.

**METHODS:** There is no single unambiguous formula for how much nutrition aid each country should receive. We draw on the experience of the Global Fund and Gavi to examine multiple potential criteria for aid allocation for nutrition. We model the allocations resulting from different allocation formulae and compare this with actual disbursements to African countries seen through the OECD Creditor Reporting System.

**RESULTS:** While some alignment is seen between aid allocations and measures of financing need (e.g. on average, allocations increase with burden of malnutrition and decrease with recipient country GDP per capita), some countries appear to be receiving very limited aid relative to need – nutrition donor orphans. We explore some explanations for this phenomenon, including whether other pressing priorities for the recipient countries may be crowding out nutrition, whether orphans are those judged to have lower absorptive capacity, and whether other country characteristics (e.g. size, geographical remoteness, fragility) and health indicators (e.g. child mortality) may be driving differences.

**CONCLUSION:** The results suggest that increased attention should be given to support nutrition donor orphans. Greater efforts are likely needed to improve absorptive capacity for some donor orphans. Additionally, a pooled financing mechanism may be useful for providing support at scale for orphan countries. Finally, global actors including the SUN movement could use this type of analysis to support targeted resource mobilization and allocation.

**KEY WORDS:** finance, aid allocation, aid tracking

### **P37. CONTROL OF IRON CONTENT OF FORTIFIED WHEAT FLOUR IMPORTED TO BURKINA FASO FROM 2015 TO 2017**

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**BACKGROUND:** Essential micronutrient malnutrition (iodine, iron and vitamin A) is a public health problem in developing countries in terms of health consequences and socio-economic development. WHO recommends food fortification as an effective medium and long-term solution. Burkina Faso, like the other West African Economic and Monetary Union (WAEMU) countries, is involved in program to fortify soft wheat flour with iron and folic acid by adopting texts regulating this food. The objective of this study was to contribute to improving the coverage of iron needs of Burkina Faso's population.

**METHODS:** It is a longitudinal study in which we used three techniques for data collection and processing. These techniques are document exploitation, sampling and laboratory analysis. A total of 199 samples of wheat flour were analyzed at import in Burkina Faso between 2015 and 2017 for determination of iron content. Iron contents were compared to the national standards for this micronutrient.

**RESULTS:** The average content was 45.34 ppm of iron (with a variation from 0.41 to 154.26) for wheat flour. Only 14.57% of wheat flour complied with national standards. These compliances rates were very low (14.57%) compared to the success criteria of WHO's micronutrient food fortification programs (80% of compliance). Some fortified wheat flour brands have strongly influenced these results because of their large proportions compared to those analyzed at import.

**CONCLUSION:** The study on iron intakes control of fortified wheat flour allowed to highlight the low compliance rates of these intakes compared to regional and national standards and to make some suggestions.

**KEY WORDS:** micronutrients, iron content, imported fortified wheat flour, Burkina Faso.

**P38. UNDERSTANDING AND THE USE OF FOOD AND NUTRITION LABELS AMONG SENIOR HIGH SCHOOL STUDENTS IN SOUTH TONGU DISTRICT, VOLTA REGION-GHANA.**

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**BACKGROUND:** Understanding and using food labels are important in tackling unhealthy diets and obesity. It is important young people cultivate the habit of reading and using food labels, however knowledge on this is scanty among this age group.

**METHODS:** This descriptive cross-sectional study with a sample size of 403, determined the level of understanding and use of food labels among high school students in South Tongu district. Data analyses were performed using STATA version 12.1. Chi-square test was used to assess the associations between variables.

**RESULTS:** The mean age of study participants was 16.7 years. Though majority of the students (78 %) were aware of food labels, it did not translate into good knowledge (26%). Label usage was poor among majority of the students (69%). Label usage was associated with the school enrolled ( $p^* = 0.041$ ), student's class ( $p^* = 0.031$ ) and whether student was resident on campus or not ( $p^* = 0.049$ ). Also, 92% of students asserted to read food labels for reasons of health and little over half (50.5%) read labels when buying a new product. Small font sizes, unfamiliar language, use of technical terms and unlabelled products were some hindrances to label reading.

**CONCLUSION:** Though awareness about food labels was high, knowledge levels on labelling information was not satisfactory and usage was poor. Therefore, food label education at the secondary level should be increased.

**KEY WORDS:** Food and nutrition label, High School Students, South Tongu

**P39. ACUTE DIARRHEA AND ASSOCIATED RISK FACTORS AMONG UNDER-FIVE CHILDREN IN THE REFUGEE CAMPS AND HOST COMMUNITIES IN GAMBELLA REGION, ETHIOPIA. A COMPARATIVE CROSS SECTIONAL STUDY**

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**BACKGROUND:** Diarrhea is one of the most common causes of child morbidity and mortality in refugee camps, aggravated by inadequate WASH services and nutritional deficiencies, particularly in developing countries. The study objective was to assess acute diarrhea and associated risk factors among under-five children in the refugee camps and host communities in Gambella Region, Ethiopia.

**METHODS:** A comparative cross-sectional study was conducted from September to December 2016 using a structured questionnaire and the Potatest<sup>+</sup> water quality testing kit. Data was entered to Epi-data Version 13 and exported to STATA Version 14 for cleaning and analysis. Bi-variate and multi-variable models and the Mann-Whitney U test were used. P-values < 0.05 with 95% confidence interval [CI] were considered statistically significant.

**RESULTS:** Prevalence of childhood diarrhea was 38 % in the refugee camps and 33% in the host communities. Child age and maternal education were the common predictors of childhood diarrhea in both communities. Households of children in which the water containers were not covered, consumed less than 15 liters of water per capita per day and lacked hand washing setups were specific predictors of diarrhea in refugee camps. In the host communities, children of households which did not have a latrine and consumed surface water had significantly a higher risk of diarrhea than their corresponding households. Households with heads without formal education, surface water source, water shortages and unavailability free residual chlorine were determinants of fecal coliform contamination of stored water.

Coliform counts exceeded the moderate risk were associated with acute childhood diarrhea [ $P = 0.002$ ].

**CONCLUSION:** Diarrhea burden was significantly higher among children in the refugee camps than in the host communities. Hygiene related factors and facility problems were the main predictors of diarrhea in the refugee camps and host community, respectively. Therefore, further collaborations between government and non-government organizations are required to identify persisting factors of diarrhea transmission and draw relevant resolutions in the region.

**KEY WORDS:** Diarrhea, Under-five, children, Refugees, Gambella.

#### **P40. RETURNING TO WORK IS BARRIER TO CONTINUED BREASTFEEDING FOR WOMEN WORKING IN THE INFORMAL SECTOR IN KWAZULU-NATAL, SOUTH AFRICA.**

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**BACKGROUND:** In Sub-saharan Africa, many women work in the informal work environment. Returning to work is a known barrier to sustained breastfeeding, yet little is known about breastfeeding practices among these women. To explore infant feeding and childcare practices among informally working women in KwaZulu-Natal.

**METHODS:** A cross-sectional non-probability design, with purposive and snowball sampling, was used. Mothers in informal work with children aged <2 years were recruited from two sites (urban/rural). Domestic workers and informal traders were purposively selected. Structured questionnaires were used collect data on android tablets. Data was analysed using SPSS. All participants provided written informed consent.

**RESULTS:** Interviews were conducted with 247 informally working mothers between February-May 2017, comprising 170 informal traders and 77 domestic workers. Mothers mean age was 32 years and 13 months for children. Most participants worked during their pregnancy (198/247, 80.2%), took time off work when baby was born (174/198, 87.8%) and initiated breastfeeding (208/247, 84.2%). Most mothers were currently living with their child (224/247, 92.9%). At the time of the study, 112/247 (45.3%) women were still breastfeeding, 96/247 (38.9%) had stopped breastfeeding and 39/247 (15.8%) never initiated breastfeeding. The most common reason for stopping breastfeeding was the need to return to work (34/96, 35.4%). Some mothers (76/247 30.7%) reported having given their baby expressed breastmilk. Almost half of mothers (107/247; 43.3%) took their baby with them when they first returned to work, and 28.3% (70/247) were still doing so. Informal traders were more likely to take their child to work with them compared to domestic workers (32.4 vs 19.5%;  $p=0.041$ ).

**CONCLUSION:** Returning to work is a barrier to continued breastfeeding among informal working women. However since women reported being able to take their child to work and to express breastmilk, this provides opportunities to support continued breastfeeding among these mothers.

**KEY WORDS:** Breastfeeding; working women; workplace; child health; South Africa; informal economy

#### **P41. ASSOCIATIONS AMONG SOIL ZINC, SERUM ZINC, AND LINEAR GROWTH OF CHILDREN IN ETHIOPIA**

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**BACKGROUND:** To our knowledge, the relationships among soil zinc, serum zinc, and children's linear growth have not been studied at population level. We aim to describe the geographical distribution and associations among soil zinc, serum zinc, and linear growth of young children in Ethiopia.

**METHODS:** We use data from the cross-sectional, nationally representative, multi-stage Ethiopian National Micronutrient Survey (ENMS), which provided anthropometric and serum zinc data (measured by atomic absorption spectrometry) on children aged 6–59 months (n=1776). For each of the 316 ENMS clusters, soil zinc data were extracted from the digital soil map of Ethiopia, developed by the Africa Soil Information Service. Children's linear growth was computed using length/height and age converted into Z-scores for height-for-age. A multi-level mixed linear regression model was used.

**RESULTS:** Nationally, 28% (24% when adjusted for inflammation) of children aged 6–59 months were zinc deficient and 38% were stunted. Thirty-eight percent of ENMS clusters were located on zinc-deficient soils, with regional variability. In sparsely populated regions, relatively more clusters were located on zinc-deficient soils (with 20–96% of clusters zinc deficient in these regions) compared with populous regions (with 3–35% of clusters zinc deficient).

**CONCLUSION:** Cluster-level soil zinc was positively associated with children's serum zinc, which increased 1.17 µg/dL for each 1 mg/kg increase in soil zinc ( $p=0.011$ ), but children's linear growth was not associated with soil zinc ( $p=0.407$ ) or serum zinc ( $p=0.921$ ). Low soil zinc was a predictor of the lower serum zinc among Ethiopian preschool children. Further longitudinal and interventional studies are

needed to understand causal linkages between soil zinc, serum zinc, and linear growth in Ethiopian children.

**KEY WORDS:** soil-zinc; serum-zinc; linear growth; Ethiopia

#### **P41. EFFECT OF QUALITY PROTEIN MAIZE ON PROTEIN STATUS AND LINEAR GROWTH OF ETHIOPIAN CHILDREN: A RANDOMIZED CONTROLLED TRIAL**

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**BACKGROUND:** Quality protein maize (QPM), a biofortified crop with high lysine and tryptophan content, has shown effects on linear growth in studies with some control over children's diets. While QPM is now being promoted in Ethiopia, no studies have analyzed the effect of QPM on protein status and linear growth of children in a real-life setting.

**METHODS:** A randomized controlled trial with eligible children (n=873) aged 6-35 months at baseline were randomly assigned to 3 arms: (1) control group (n=263), (2) Adoption Encouragement (AE) only (n=320), and (3) AE + Consumption Encouragement (CE) (n=290). Children's linear growth over the 11-month study was computed using length/height for age difference. Serum transthyretin and serum insulin-like growth factor-1(IGF-1) were determined using immunoturbidimetry and ELISA kits, respectively. Mixed linear regression models with unstructured covariance matrices based on intention-to-treat were used.

**RESULTS:** Almost all intervention households requested the full amount of seed offered through the adoption encouragement, and most of that seed was planted. Adoption of the biofortified crop did not result in reduced area of the conventional crop. Both treatments, AE (p=0.228), and AE+CE (p=0.519) had no significant effect on the linear growth of children. No significant differences between treatments versus control in change of quality protein intake, serum transthyretin, or IGF-1.

**CONCLUSION:** Encouragement to adopt and feed QPM to infants and young children in a real-life setting did not have a significant effect on children's protein biomarkers or linear growth. The biofortified crop and food may be treated as a new product rather than used to substitute for the conventional product. Implementation and evaluation of multi-year interventions are needed to understand how biofortified crops promoted at scale in real-life settings could change intakes at household level and in turn improve biomarkers and outcomes in target populations.

**KEY WORDS:** Biofortification; quality protein maize; protein status; serum protein; linear growth; Ethiopia

#### **P42. CONTRIBUTION OF SOCIAL NETWORK DIVERSITY IN INDIGENOUS LEAFY VEGETABLES SALES IN BENIN**

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**BACKGROUND:** The traditional sale model (farm-gate instead) of indigenous leafy vegetables (ILVs) in Benin has revealed its inefficiency through the losses caused to actors throughout the value-chain. This study explored how relational networks diversity can contribute to improve the sale of ILVs in Benin.

**METHODS:** Data (sales, relational networks and socio-demographic characteristics) were collected during individual semi- structured face to face interviews with 130 producers of ILVs and analysed using multiple linear regression and speech analysis tools.

**RESULTS:** It appears that the sale of ILVs is improved by 13 % when the producer is networked with market gardeners only. The sale is up 9 % more than the previous case when he belongs to other networks in addition to the networks of market gardeners.

**CONCLUSION:** These results clearly show the importance of alternative options for the actors of the ILVs value-chain in order to improve their sales and consequently their income by considering the diversification of networks as a competitive strategy in which they must invest. Improving household income contributes to food security through the availability of resources to obtain the necessary food.

**KEY WORDS:** Benin, diversity, relationship networks, traditional leafy vegetables, sale.



**P43. MORBIDITY PROFILE OF PREGNANT WOMEN ATTENDING ANTENATAL CLINIC IN NANYUKI TEACHING AND REFERRAL HOSPITAL, KENYA - A CROSS SECTIONAL STUDY**

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**BACKGROUND:** Morbidity during pregnancy results to a negative impact on the woman's nutritional wellbeing and may subsequently affect the birth outcome. The aim of the study was to determine the health morbidity profile of pregnant women attending antenatal clinic in Nanyuki Teaching and Referral hospital.

**METHODS:** A cross-sectional study was conducted among pregnant women where data on maternal morbidity profile was collected. A total of 254 pregnant women attending antenatal clinic were recruited.

**RESULTS:** More than half (57.5%) of the women recruited in this study reported to be unwell in the immediate two weeks preceding the day of the interviews. The common diseases/disorders reported were heartburn (42.9%), anorexia (15.4%), vomiting (14.2%) and constipation (11.4%) with most of them having a duration of more than 7 days. Other morbidities such as fever, abdominal pain, upper respiratory infection, diarrhoea and headache were also reported. Further, out of all those who reported being sick, only 40.4% who sought medical attention.

**CONCLUSION:** Morbidity among the pregnant women was notably high. Public health awareness campaigns among pregnant women on prevention, early identification and timely treatment of diseases/disorders during pregnancy should be up-scaled.

**KEY WORDS:** Antenatal, Awareness, Birth outcome, Morbidity, Pregnant women

**P44. GLOBAL CONCEPT – IMPROVING MATERNAL AND CHILD HEALTH THROUGH EDUCATIONAL VIDEOS, PAPER COMICS AND MOBILE APPLICATION IN LOW-INCOME COUNTRIES**

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**BACKGROUND:** Video offers a cost-effective way to educate multiple persons simultaneously and gives an opportunity for people to observe the actions and success of others. According to the Social Cognitive- and Influence Theories, these are key in successful behavior change. Video interventions appear to be effective in modifying health behaviors and has several advantages compared to other educational forms.

Programme intervention: GloCal(Global issues in local context) is a composite of short educational videos, paper comics and a mobile application to educate mothers, other family members and healthcare workers on maternal and child nutrition and health. The videos are simple enough to reach even the least educated people in the most remote areas. We target directly the grassroot level, which is hard to reach but where change needs to happen. All the material uses local languages. A set of 50 educational videos have been approved and adopted by Unicef in Kenya. The video set for Africa has been translated to several languages and is freely available at [www.glocalnutrition.com](http://www.glocalnutrition.com).

**METHODS:** During 2017 we tested the influence of the videos on 900 mothers of children 0-24 months on maternal knowledge, attitudes and practices in urban slums and rural areas of Kenya. The results were highly positive; better knowledge, attitudes and child feeding practices were seen among mothers who had watched the videos for 4-6 months

compared to those who had not. The response of mothers and healthcare workers was enormously positive.

Programme implications: The GloCal- videos have been displayed on TV screens in the waiting rooms at health facilities and successfully used as a part of health talks at the Mother-Child Health Centers in Kenya. In Uganda, Village Health Teams are currently testing how to bring the videos along on their visits to remote villages with simple smartphones and tablet computers. Different possibilities to use the GloCal-videos in distinct locations are constantly being studied and the experiences of the locals will be refined further.

**P45. MOTHER'S AND THEIR CHILDREN'S DIETARY DIVERSITY SCORES ARE CORRELATED; THE CASE OF HAWASSA PUBLIC HEALTH INSTITUTION ATTENDANTS, SOUTH ETHIOPIA**

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**BACKGROUND:** Dietary diversification is a well-recognized nutrition science focus that is assumed to be sustainable to preventing different forms of under- nutrition, over-nutrition and nutrition related health problems. Existing evidences failed to assess mother-child pairs' Dietary Diversity Score (DDS) and dig for their correlation. Therefore, this study aimed to assess the mother-child (6-23 months) pairs' DDS; identify associated factors and examine correlation and mothers and children DDS.

**METHODS:** A health facility based cross-sectional study was conducted. A total of 416 mother-child pairs selected through systematic random sampling technique were involved in the study. DDS scores were computed; logistic regression was used to identify factors associated with DDSs; and bivariate correlation analysis done.

**RESULTS:** Only 32.9% of the mothers and 52.9 % of the children met the minimum DDS with average score of  $4.27 \pm 1.32$  and  $3.67 \pm 1.25$ , respectively. Two and less under-five children in the household (AOR=2.59, 95%CI; 1.35, 4.98), age 12 months and above (AOR=2.65, 95%CI; 1.68; 4.18), complementary feeding initiation time-6 months and after (AOR=2.84, 95%CI; 1.75, 4.60) and urban residence are found associated with infant and child DDS. Urban residence (AOR=1.999, 95%CI; 1.200, 3.331), and secondary (AOR=2.01, 95%CI; 1.151, 3.495) and College & above ( AOR=2.92, 95%CI; 1.554, 5.493) educational statuses were associated with mothers' DDS. Correlation ( $r=0.225$ ,  $p<0.0001$ ).

**CONCLUSION:** Low proportion of Mother and infant and young children met minimum DDS with to be improved average score. Residence, educational status, child age, number of under-five children and complementary feeding initiation time are associated with DDS. Though weak, mothers' and IYCS's DDS are correlated.

**KEY WORDS:** Dietary Diversity Score; Mother-Child Pairs; Correlation

**P46. ARE NEW AGRICULTURE GRADUATES READY TO SUPPORT IMPLEMENTATION OF NUTRITION SENSITIVE AGRICULTURE STRATEGY? THE CASE OF ETHIOPIAN HIGHER EDUCATION**

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**BACKGROUND AND OBJECTIVE:** Although significant improvements have been made in the last decade ,38%, of children are still stunted. The consumption of minimum acceptable diet by children 6-23 months in Ethiopia is only 7% which is very low compared to other sub-Saharan African countries. This assessment was done to generate evidence if new agriculture graduates are ready to support implementation of nutrition sensitive agriculture strategy designed by Ethiopian Ministry of Agriculture and Livestock Resources so as to discharge their roles as given by the National Nutrition Program.

**METHODS:** A cross-sectional study design was employed to assess nutrition sensitive agriculture competences of agriculture students. A stratified cluster sampling technique was used to select study participants. Written knowledge assessment questions and objectively structured practical examination (OSPE) were used to assess knowledge and skill competency of students respectively. Modified Angoff method was used to set a criterion-referenced passing point. Bivariate and multivariable statistical analysis were performed using SPSS version 23.

**RESULTS:** The assessment result revealed that 51.2% and 59.8% of the students passed the knowledge and skill assessments, respectively. The combined knowledge and skills competence score showed that only 36.6% of the students scored equal to or greater than the pass mark as determined by experts.

**CONCLUSION:** The Assessment result indicates that agriculture higher learning institutions need to put adequate

emphasis to addressing nutrition sensitive agriculture contents in their curricula so as to equip students with desired competency so as to contribute to the implementation of the nutrition sensitive agriculture strategy of the country.

**KEY WORDS:** Nutrition sensitive agriculture, curriculum, malnutrition, competency

**P47. PREPARING NUTRITION-SENSITIVE AGRICULTURE WORKFORCE AT PRESERVICE EDUCATION LEVEL: THE CASE OF FEED THE FUTURE GROWTH THROUGH NUTRITION ACTIVITY IN ETHIOPIA**

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**BACKGROUND AND OBJECTIVE:** Ethiopia is one example of a country that has set out to tackle under nutrition by making agriculture more nutrition sensitive. Ministry of Agriculture designed a five-year nutrition-sensitive agriculture strategic plan. Despite the agriculture sector has designed nutrition sensitive agriculture (NSA) strategies to address malnutrition with promoting of diversified production and consumption, the agriculture cadres graduated from the Ethiopian universities did not have the competencies that address this issue as their curriculum lack the essential NSA competencies.

**METHODS:** Nutrition sensitive agriculture core competencies were defined using desk review, key informant and group interview of experts from different segment of agriculture sectors. Consultative workshop to discuss on the importance of integrating the competencies into agriculture curricula and make decisions on how to incorporate the competencies, syllabus development and validation workshop and finally NSA learning/teaching material development workshop have been organized in collaboration with Universities, Ministry of Education and Ministry of Agriculture.

**RESULTS:** Growth through Nutrition in collaboration with Federal Ministry of Agriculture and Education developed

four nutrition sensitive agriculture syllabi tailored to agriculture disciplines of Plant Science, Animal Science, Natural Resource Management and Rural Development and Agriculture Extension. Training packages for all departments were developed and validated with all agriculture college deans. Currently, Ministry of Education endorsed nutrition sensitive agriculture syllabi in to agriculture curricula throughout all universities.

**CONCLUSION:** The lack of NSA training for agricultural workers is acknowledged nationally as a significant barrier to combating malnutrition through agriculture and food systems. Integrating nutrition-sensitive agriculture competencies in to agriculture curricula will equip students before graduation and become competent and contribute to the implementation of the nutrition sensitive agriculture strategy designed by Ministry of Agriculture.

**KEY WORDS:** agriculture, preservice, education level, Ethiopia.

#### **P48. PREVALENCE OF DIABETES AND CARDIOVASCULAR RISK FACTORS IN PERI-URBAN AREAS OF THE ISLAND OF ANJOUAN (COMOROS)**

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**BACKGROUND AND OBJECTIVE:** Sub-Saharan Africa, like the rest of the world in nutritional transition, is experiencing an increasing prevalence of diabetes alongside other non-communicable diseases, in addition to, the paucity of data from Africa on diabetes is significant,

considerably limits the development of potential preventative strategies. The aim of this study was to estimate the prevalence of diabetes mellitus (DM) and impaired fasting glucose (IFG) in the peri-urban adult population living of the island of Anjouan, Comoros, and to investigate the factors associated with diabetes.

**METHODS:** A cross-sectional study with random sampling population selected by the quota method was used, included 1080 subjects (540 women and 362 men) aged 25-64 years. Fasting blood glucose was measured in capillary blood (Contour®Xt ,Bayer).

**RESULTS:** Participation rate was 85.1%. The mean age of subjects was  $39.48 \pm 11.61$  years. The sex ratio was 0.67. Overall crude diabetes and IFG prevalence were 8.5% and 8.1%, respectively. The risk factors for diabetes type 2 onset were a family history of diabetes ( $P = 0.006$ ), older age ( $P = 0.000$ ), Glycemic control ( $P=0.010$ ) Excess waist circumference ( $P= 0.03$ ) and hypertension  $P=0.000$ , were significantly positively associated with DM, contrary to sex ( $P=0,142$ ).

**CONCLUSION:** These high figures confirm that diabetes and factors associated do not spare Anjouan population. Awareness, primary prevention, are to set up for a better control of non-communicable diseases.

**KEY WORDS:** Diabetes, Risk Factors, Anjouan, Comoros.

**P49. ASSESSMENT OF DOUBLE BURDEN OF MALNUTRITION AMONG CHILDREN UNDER FIVE IN POPOKABAKA HEALTH AREA, KWANGO (DRC), APRIL 2017**

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**BACKGROUND AND OBJECTIVE:** The problem of undernutrition and overweight affects all countries of the world, especially the low and middle-income countries, where the World Health Organization (WHO) refers to their simultaneous presence as the double burden of malnutrition (DBM). The Democratic Republic of Congo (DRC) is not exempt from this phenomenon, particularly the Popokabaka health area (HA) where the prevalence of malnutrition is high. This study aimed to assess DBM among children under five in Popokabaka HA and its associated factors.

**METHODS:** This was a cross-sectional analytical study, which collected anthropometric indicators, dietary intake, and physical activity data. Anthropometric indices were classified according to the 2006 WHO criteria. Children were classified as having DBM when they had height-for-age Z scores of <-2SD co-existing with weight-for-height Z scores of >+2SD. HDDS tool was used for dietary data.

**RESULTS:** A total of 385 children under five were surveyed in Popokabaka HA. The prevalence of DBM was estimated at 1%. The nutritional status was as high as 40.3% for stunting, 24.7% for underweight, 5.2% for wasting, and 1.6% for overweight/obesity. The dietary diversity score was medium for the majority of their households. This medium score ranks the majority of these households in the food insecurity category at the 'hidden hunger' level.

**CONCLUSION:** DBM was rare but high levels of stunting and poor dietary diversity were identified in children under five in Popokabaka HA. Interventions to improve and promote dietary diversity such as the positive deviance approach, participatory nutrition education, community-based interventions, women's literacy, and social protection interventions are recommended to improve the nutritional status of children under five in Popokabaka HA.

**KEY WORDS:** Double burden of malnutrition, Stunting, Overweight/obesity, DRC, Dietary diversity.

**P50. VALIDATING 'HOUSEHOLD FOOD INSECURITY ACCESS SCALE' TO ASSESS SEASONALITY IN FOOD INSECURITY IN WOLAITA AREA IN SOUTHWEST ETHIOPIA**

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**BACKGROUND:** The study was designed to validate the household food insecurity access scale' to assess seasonality in food insecurity in Wolaita area in southwest Ethiopia

**METHODS:** We did a cohort study in a drought affected area in Wolaita in south Ethiopia. The aim was to validate the 'Household Food Insecurity Access Scale (HFIAS)' to measure seasonality in food insecurity. The HFIAS was recently validated in Butajira district in central Ethiopia with two rounds of cross-sectional data. However, its validity has

not been established yet with longitudinal data and across different settings in the country. We therefore validated the HFIAS on 473 households in cohorts of lowland and highland altitude villages in two rural districts in the Wolaita area.

**RESULTS:** The prevalence of Household Food Insecurity (HFI) in the study area was 84% in one of food scarce months; about 28% higher than the risk in a food plenty month in the same year. The questionnaire had a satisfactory reliability ( $\alpha=0.881$ ). We observed a decreasing trend in likelihood of affirmative responses to food insecurity conditions with ascending wealth quintiles. The nine questions in the scale have acceptable internal consistency. However, respondents, tended to say 'yes' for the first question '*...worry about food...*' due to possible intentions to get food aid, and some were embarrassed with the fourth question '*...eat foods that you really did not want...*' due to food taboos. Moreover, some questions related to severe food shortage conditions would hardly be responded affirmatively due to religious perceptions. These items were, '*...ever no food to eat...*', '*... went to sleep hungry...*', and '*... spent day and night without food...*'

**CONCLUSION:** The HFIAS could be adapted to be used in the study area. Responses to the access questions should be carefully tracked with subsequent follow-up questions on frequency items. Socio-culturally sensitive items such as specific food taboos should be discussed before the interviews. Familiarity with the context of the area is important.

**KEY WORDS:** repeated surveys; validity; wealth quintiles; Wolaita

#### **P51. THE PREVALENCE OF NON-COMMUNICABLE DISEASES AMONG UNIVERSITY OF VENDA ACADEMIC STAFF MEMBERS**

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**BACKGROUND:** Globally non-communicable diseases (NCDs) remain unacceptably high amongst adult population and its prevalence increases yearly. The aim of the study was to determine the prevalence of non-communicable diseases among UNIVEN academic staff members.

**METHODS:** The study design used was cross-sectional. The study population was randomly selected from UNIVEN academic staff members. Data was collected using a self-administered questionnaire. Trained field workers also took anthropometric, clinical and biochemical measurements. Descriptive data statistics were used to interpret data.

**RESULTS:** The majority of participants (93%) were Africans. The majority of the participants (82.3%) did not suffer from any chronic diseases of lifestyle. About 7.7% had SBP between 140-159mmHg, while 5.4% participants had  $\geq 160$ mmHg. About 13.8% had DBP between 90-99mmHg, 5.4% participants had  $\geq 100$ mmHg. About 43.8% of the participants were pre-diabetic. Nearly two thirds (66.2%) of the participants fell within high borderline of cholesterol, while 13.8% of participants had normal total cholesterol. About 40% of the participants were overweight, 20.7% were obese class I. About 43.8% of participants had low waist circumference, more than one thirds (35.4%) had high waist circumference.

**CONCLUSION:** Majority of participants was at risk of developing Non-communicable diseases.

**KEY WORDS:** Non-communicable disease, obesity, hypertension, diabetics mellitus

#### **P52. NUTRITIONAL STATUS AND THE USE OF TRADITIONAL MEDICINE AMONG DIABETIC PATIENTS IN MAWENZI HOSPITAL, TANZANIA**

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**BACKGROUND:** Premature deaths among diabetic people are common in developing countries probably due to late

diagnosis or poor adherence to use of diabetic medicine. This cross-sectional study aimed at assessing nutritional status and use of alternative medicine among diabetic patients at Mawenzi hospital.

**METHODS:** A total of 119 Weight and height were measured using standard procedures and BMI was computed and used to categorize participants into underweight, overweight, obese and normal according to WHO standards. The collected data was processed and analyzed using Statistical Product and Service Solutions (SPSS Inc.) version 20.

**RESULTS:** Mean age of the participants was 58 years, 77% were females. Mean BMI was 26%, majority being overweight or obese (58%) and very few were underweight (4.2%). About 79% of respondents had diabetic complications and the most common problems were hypertension, vision and pain in the lower limbs. Majority of respondents (73%) used medicine provided at the clinic together with diet to control blood glucose level. Only 21% reported to use traditional medicine from parts of plants such as drumstick tree (*Moringa oleifera*) and or java plum tree (*Syzygium cumini*). About 45% of the respondents skipped some days without taking their prescribed medicine.

**CONCLUSION:** There was high prevalent of overweight and obesity among type 2 diabetic adults. Some of the patients used traditional medicine in addition to diabetic medicine provided at the clinic. Further research is needed on the weight reduction interventions among diabetic patients and on the composition and dose of the used traditional medicine.

**KEY WORDS:** Type 2 diabetes, compliance, nutritional status, alternative medicine

### **P53. PREDICTORS OF ANEMIA AMONG CHILDREN AGED 6 – 59 MONTHS IN POPOKABAKA CITY, DRCONGO**

Alex Baloji Nkashama

**BACKGROUND:** More than 71% of children aged 6 to 59 months in DRC are anemic. In DRC anemia is a serious public health problem according to the standards of the World Health Organization (WHO) and data on factors associated with anemia are limited. The main of this study was to identify dietary, health and nutritional factors these influence the occurrence anemia in children aged six to 59 months in Popokabaka City.

**METHODS:** We conducted a cross-sectional study of children aged 6 to 59 months in this area. The variables collected at the baseline were on the following factors: (i) demographic children questions (e.g., sex, age, weight, height, food intake, vaccination, vit A take.), (ii) mothers socioeconomic status (e.g., educational level, employment, number of family members, age), (iii) household characteristics. Blood samples were used for testing of hemoglobin (Hb) and hemoglobin measurement was obtained in the field with the HemoCue. The households dietary diversity score, food consumption score and the household hunger score were built based on the food consumption, then the regression logistic was used for determine factors associated with anaemia

**RESULTS:** Anemia (hemoglobin level <11.0 g/dl) was detected in 65.6% of the 427 children sampled. Anemia was associated with religion (revival church), mother's occupation (farmer) and inversely associated with the nutritional status. A multivariate model for the child's hemoglobin level revealed associations with good nutritional status (AOR: 0.4; 95% CI: 0.1 – 0.9, p=0.04), and membership in a revival church (AOR: 1.6; 95 % CI: 1.1 – 2.7, p=0.05).

**CONCLUSION:** Anemia / iron deficiency increased strongly with nutritional status and revival church membership among the study children. The data reveal the importance of targeting interventions promoting healthy dietary practices and providing nutritional and health counseling.

**KEY WORDS:** anemia, hemoglobin, nutritional status, food consumption

**P54. DEVELOPMENT AND TESTING OF PHOTOGRAPHIC FOOD ATLAS FOR DIETARY ASSESSMENT AMONG SCHOOL-AGED CHILDREN IN THE ASHANTI REGION**

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**BACKGROUND:** There are challenges associated with current methods used for estimating food portions during dietary assessment in children. Photographic Food Atlas (PFA) have been recommended for the assessment of portion sizes in school-aged children.

**METHODS:** We developed a PFA of some Ghanaian foods and tested its usability and appropriateness for estimating portion sizes among children aged 8-12 years. Foods included in the photographic atlas, portion ranges, and plate types for serving were determined by a steering group of nutrition specialists, and guided by mothers with children within 8-12 years old. Development of the Atlas involved serving, weighing, taking photographs, coding and arranging into a photo album.

**RESULTS:** Photographs were developed for 25 different foods/meals. The developed PFA contained Eleven (11) foods in eight portions, one (1) food in seven portions, eleven foods (11) in six portions and two (2) in five portions. To test their appropriateness, 150 children were asked to select a portion size greater, and less than an indicated portion, and in between two indicated portions. Two thousand and seven hundred estimations were made. Questions were asked to determine the perception and preference of these children when comparing the photographs with food models for estimating portion sizes during a 24-hour recall. Majority of participants were able to determine portions between (77.56%), smaller than (99.44%) and above selected portions (99.89%), indicating high accuracy. Almost all (99%) of the participants said they could easily identify portions they consumed from the list of

foods in the PFA. About three quarters of the pupil preferred the PFA over food models/household measures.

**CONCLUSION:** In conclusion, the photographic food atlas developed may accurately be used to estimate food portion sizes of school-aged children.

**KEY WORDS:** Photographic Food Atlas, Portion size, Estimate, Validity, Dietary assessment

**P55. THE IMPACT OF SOCIAL AND BEHAVIOR CHANGE INTERVENTIONS OF THE MWANZO BORA NUTRITION PROGRAM (MBNP) IN TANZANIA**

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**BACKGROUND:** Mwanzo Bora Nutrition Program (MBNP) is a 7-year project (2011-2018) in 9 regions in Tanzania (6 Mainland; 3 Zanzibari). To reduce stunting and anemia by 20%, Africare, funded by USAID (Feed the Future; Global Health Initiative), implemented 17 key behaviors that targeted the first 1,000 days of life. The Tanzania Demographic Health Survey (TDHS) showed a reduction in stunting of 20% in MBNP zones of influence (ZOIs) in 2010 - 2015, and Africare commissioned ICF consultants to assess if MBNP might have had an impact on behavior change.

**METHODS:** ICF compared 3 primary MBNP implementation sites (Dodoma, Manyara, Morogoro) to 2 non-intervention



sites (Arusha, Tanga) looking at knowledge and perceptions in 290 subjects in July 2017 (145 in target and comparison). Quantitative data analyses from TDHS 2010, 2015, in the same regions were used to cross-validate findings where possible.

**RESULTS:** Key facilitators and barriers with notable impact on the practices of women and their households in ZOIs were identified. Women in MBNP ZOIs are more likely to attend antenatal care in the first trimester (64% vs. 25%); take iron and folic acid supplements during pregnancy (76% vs. 17%); exclusively breastfeed in the first 6 months (77% vs. 50%); and, feed children diverse foods (fruit, animal protein, vegetables) after 6 months (83% vs. 30%). Of the 17 key behaviors, 4 (as listed) showed significant positive change, 11 positive change, and 2 none or negative change, in ZOI versus comparison.

**CONCLUSION:** The results indicate positive change in nutrition behaviors affirming the efficacy of MBNP behavior change efforts. The report (available online) made key recommendations for sustained impact.

**KEY WORDS:** Nutrition, 1000 days, Mwanzo Bora, Tanzania, Behavior Change, Africare

#### **P56. UNDERNUTRITION AMONG PRIMARY SCHOOLCHILDREN IN THE ERA OF OVERWEIGHT/OBESITY IN SOUTH AFRICA: A CHILD MOTHER PAIR STUDY**

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**BACKGROUND:** Despite implementation of the National School Nutrition Programme over two decades ago, undernutrition remains one of the major public health concerns in South Africa and occurs when the country is in the era of overweight/obesity transition. We estimated the

recent magnitude of undernutrition among schoolchildren, determined maternal factors and explored their influence on child growth.

**METHODS:** This is a convergent mixed method study conducted among 508 schoolchildren (6-15years) selected (multistage sampling) from five largest primary schools in Dikgale Health and Demographic Surveillance Site, South Africa, and paired with their mothers. Maternal data collected included sociodemography (using questionnaire), and anthropometry (using digital scale and stadiometer) (quantitative). Maternal cultural beliefs and practices influencing nutrition and child growth were explored through focus group discussions (qualitative). Children's anthropometry (quantitative) was measured and Z-scores used to define undernutrition were body mass index-for-age (thinness), weight-for age (underweight), height-for-age (stunting) generated from WHO Anthroplus software. Data was analysed using Stata 10 (quantitative), Nvivo 11 (qualitative) and joint display (mixed method analysis).

**RESULTS:** Mean age of children was 10years (SD=±2years) and thinness (24.8%), underweight (24.1%) and stunting (21%) were prevalent. Most mothers [mean age of 37years (SD=±7years)] were household heads (68.1%), living in larger households (57.7%), unemployed (82.3%), and dependant on social grant (86.8%). Maternal age and BMI were significantly associated with undernutrition. Emerging themes included perceptions about child growth, food unavailability, decision to purchase foods, perceptions about school feeding programme, etc. Narratives of mothers suggested that children were exposed to poverty and inadequate intake of quality foods in their households.

**CONCLUSION:** Childhood undernutrition is still persistent in the era of overweight/obesity in South Africa and associated with maternal factors. Most qualitative themes were congruent with quantitative constructs. Emphasis should be given to sustainable evidence based school intervention programs to address nutritional status of children.

**KEY WORDS:** Undernutrition, primary school children, mothers, rural, mixed method

**P57. OVERNUTRITION AMONG SCHOOLCHILDREN IN DIKGALE HEALTH AND DEMOGRAPHIC SURVEILLANCE SITE, SOUTH AFRICA: A RURAL CONTEXT STUDY**

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**BACKGROUND:** Childhood overnutrition (i.e. overweight and obesity) should be addressed from a public health perspective taking into consideration the variability in the prevalence attributable to setting, age, gender, ethnicity and topography. Alarming rates of childhood overnutrition in South Africa has prompted us to describe the prevalence of overweight and obesity among schoolchildren and variations in the prevalence by age, gender and grade from a rural context.

**METHODS:** A descriptive cross sectional study was conducted among 508 children aged 6 to 15 years selected through multistage sampling from five largest primary schools, in Dikgale, South Africa. Body weight and height of children were measured using a digital scale and stadiometer, respectively. WHO Anthroplus software generated body mass index-for-age z-scores (BAZ) to define overnutrition. STATA 10 was used to analyse the results.

**RESULTS:** Schoolchildren were fairly distributed from grade one to seven [mean age of 10years (SD=±2years)]. The overall prevalence of overweight and obesity were 3.7% and 1%, respectively. The risk of developing overweight for all children was 8.3%, with 8.6% for boys and 8% for girls but higher (22.7%) among children aged 13 to 15 years. Prevalence of overweight was observed among children aged 9years (4.5%) and 12years (3.3%). While overweight was noticeable in children aged 8years (5.7%), 9years (7.6%) and 12years (6.7%) and less in other age groups (1% to 3%). There was no significant difference in the prevalence of overweight and obesity among boys and girls.

**CONCLUSION:** A significant number of schoolchildren suffered thinness compared to overweight and obesity. However, schoolchildren are at risk of developing overweight especially as they approach age 13 to 15 years. There is a need to improve the nutritional status of schoolchildren, conduct longitudinal studies to assess development of overweight/obesity and investigate specific related risk factors to develop context specific behavioural interventions.

**KEY WORDS:** Overweight, obesity, thinness, primary schoolchildren, rural

**P58. ASSESSMENT OF MINIMUM ACCEPTABLE DIET AMONG 6-24-MONTH-OLD GHANAIAN CHILDREN**

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**BACKGROUND:** Nutrition in the first 1,000 days of life is particularly important to reducing undernutrition. More so is the appropriate introduction of complementary foods after 6 months of exclusive breastfeeding. The World Health Organization (WHO) provides guidelines on complementary feeding. The minimum acceptable diet is a composite which comprises feeding frequency and dietary diversity and is seen as key component in infant feeding. Several studies have shown that meeting the minimum acceptable diet is an indicator for child growth. Dietary diversity is a more qualitative means of accessing food consumption while feeding frequency provides a quantitative means to measure how much energy and nutrients are consumed by young children. This study seeks to examine how many young children meet the minimum acceptable diet in the Ho Municipality, Ghana.

**METHODS:** A cross sectional descriptive study was undertaken to recruit 230 mothers/caregivers with infants and young children between 6-24 months. The study was conducted at the Child Welfare Clinics in the Ho Municipality. Information on young children feeding frequency and dietary

diversity was obtained from mothers/caregivers through interview. Feeding frequency and dietary diversity score was determined based on the various age categories (6-8 months, 9-11 months and 12-24 months) using WHO recommendation. Data was analysed using SPSS.

**RESULTS:** The study showed that 61% of all children did not meet the dietary diversity score. With regards to feeding frequency 31.1%, 39.1% and 27.9% of children 6-8 months, 9-11 months and 12-24 months respectively were below the recommended feeding frequency. Only 12.1%, 25.5% and 36.8% of children 6-8 months, 9-11 months and 12-24 months respectively met the minimum acceptable diet. In all only 28.3% of all children met the minimum acceptable.

**CONCLUSION:** Low minimum acceptable diet among the children is due to low dietary diversity score owing to low food diversity in households.

**KEY WORDS:** Infants, feeding frequency, dietary diversity, minimum acceptable diet.

#### **P59. RETURNING TO WORK IS BARRIER TO CONTINUED BREASTFEEDING FOR WOMEN WORKING IN THE INFORMAL SECTOR IN KWAZULU-NATAL, SOUTH AFRICA**

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**BACKGROUND:** In Sub-saharan Africa, many women work in the informal work environment. Returning to work is a known barrier to sustained breastfeeding, yet little is known about breastfeeding practices among these women. To explore infant feeding and childcare practices among informally working women in KwaZulu-Natal.

**METHODS:** A cross-sectional non-probability design, with purposive and snowball sampling, was used. Mothers in informal work with children aged <2 years were recruited from two sites (urban/rural). Domestic workers and informal traders were purposively selected. Structured questionnaires were used collect data on android tablets. Data was analysed using SPSS. All participants provided written informed consent.

**RESULTS:** Interviews were conducted with 247 informally working mothers between February-May 2017, comprising 170 informal traders and 77 domestic workers. Mothers mean age was 32 years and 13 months for children. Most participants worked during their pregnancy (198/247, 80.2%), took time off work when baby was born (174/198, 87.8%) and initiated breastfeeding (208/247, 84.2%). Most mothers were currently living with their child (224/247, 92.9%). At the time of the study, 112/247 (45.3%) women were still breastfeeding, 96/247 (38.9%) had stopped breastfeeding and 39/247 (15.8%) never initiated breastfeeding. The most common reason for stopping breastfeeding was the need to return to work (34/96, 35.4%). Some mothers (76/247 30.7%) reported having given their baby expressed breastmilk. Almost half of mothers (107/247; 43.3%) took their baby with them when they first returned to work, and 28.3% (70/247) were still doing so. Informal traders were more likely to take their child to work with them compared to domestic workers (32.4 vs 19.5%; p=0.041).

**CONCLUSION:** Returning to work is a barrier to continued breastfeeding among informal working women. However, since women reported being able to take their child to work and to express breastmilk, this provides opportunities to support continued breastfeeding among these mothers.

**KEY WORDS:** Breastfeeding; working women; workplace; child health; South Africa; informal economy.

#### **KEY MILESTONES IN ADDRESSING MICRONUTRIENT DEFICIENCIES IN ZIMBABWE**

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**BACKGROUND AND OBJECTIVE:** In Zimbabwe, prevalence of micronutrient deficiencies is high while coverage of key micronutrients interventions remains low. Among women of childbearing age and children under the age of 5 years, anemia was reported as 27% and 37% respectively (NMS, 2012). This paper explores the post-independence (1980) strategies and policies introduced in Zimbabwe to address the burden of micronutrient deficiencies.

**ACHIEVEMENTS:** The 1988 National Goiter Survey highlighted that the whole country was at risk of developing iodine deficiency disorders (IDD) and prompted the inception of a national task force to address IDD and a national Statutory Instrument mandating that all salt be iodized passed. A 2012 National Micronutrient Survey reported high prevalence of micronutrient deficiencies (affecting about 7 million people) across socioeconomic divides and the rural/urban classification. This has prompted the National Food Fortification Strategy in 2013 coercing the addition of key micronutrients to staple foods (maize meal, wheat flour, cooking oil, and sugar). Statutory Instrument (SI) 160 of 2016, the Food and Food Standards Act and the Public Health Act, are since used for regulatory monitoring of compliance and to ensure consumer protection. The 2014/2018 National Nutrition Strategy took a holistic multi-sector approach to address micronutrient deficiencies across all walks of life targeting nutrition sensitive agriculture, supplementation, food fortification and nutrition education and communication. Acknowledging that industrial fortification would not effectively cover vulnerable populations, micronutrient powders (MNPs) were introduced as point-of-use fortification by rural communities in 2017.

**CHALLENGES AND FUTURE ACTIONS:** Key challenges to address micronutrient deficiencies in Zimbabwe include the prevailing economic conditions for industry to procure micronutrient premixes. Government lacks state-of-the-art laboratory equipment to monitor and enforcing the fortification legislation. Nutrition being a broad and multi-disciplinary subject, needs to strengthen and forge more partnerships with government bodies and private sector.

## EXAMINING DIETARY GAPS IN ETHIOPIA

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**BACKGROUND AND OBJECTIVE:** Undernutrition and micronutrient deficiencies are known problems of malnutrition in Ethiopia. Recent evidence shows overweight and obesity are also growing especially in urban areas. Identifying entry points for intervention requires examining the food and nutrient gaps which this study aims to contribute to.

**METHODS:** The absence of country specific food based dietary guidelines remains a major constraint to studying dietary gaps in Ethiopia. Hence, we employ the Dietary Approaches to Stop Hypertension (DASH) and the Global Burden of Disease (GBD). We examine household dietary gaps based on food groups which make up healthy diets according to DASH and GBD dietary recommendations. We used data from the 2015/16 Ethiopia Living Standard Measurement Surveys.

**RESULTS:** Preliminary results suggest that the average DASH index score is higher among urban households and increases with income profile, suggesting better access to food by these groups. Consumption shortfall is observed in six out of eight food groups under study. The largest shortfall is observed in fruits, followed by milk, vegetable and tubers, and meats. Grain is the only food group whose recommendation is met by most households (80%) both urban and rural. We observed excess consumption of grains, nuts, seeds and legumes at national average, but also excess consumption of sweets and added sugars among urban households. The study further explored food groups with positive or negative relationship with GBD diseases and conditions when consumed beyond recommendations. Results showed that the share of rural households consuming the negative food groups below the

recommended amount is larger than the corresponding share of urban households; and, the average index score for positive food groups is higher among urban households and increases with income profile.

**CONCLUSIONS:** This study shows the state of dietary gaps and room for potential interventions. However, identifying the drivers of food choices in Ethiopia requires further research.

**KEY WORDS:** Dietary gap, DASH, GBD, Ethiopia

#### **MAXIMISING SHORT-TERM TECHNICAL ASSISTANCE FOR SCALING UP MULTISECTORAL NUTRITION EFFORTS IN DEVELOPING COUNTRIES**

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**BACKGROUND AND OBJECTIVE:** From 2012-2016, Maximising the Quality of Scaling Up Nutrition (MQSUN) provided technical expertise on the design, implementation and evaluation of evidence-based nutrition programming/policies. Following on its successful model, MQSUN+ (2016-2020) provides short-term technical assistance (STTA) to DFID, Scaling Up Nutrition (SUN) countries and the SUN Movement Secretariat to catalyse multisectoral country efforts to scale up nutrition impact, maximise the quality, effectiveness and innovation of nutrition-related programmes, support evidence generation and uptake, and develop nutrition capacity.

**PROGRAMME INTERVENTION:** The purpose of MQSUN+ STTA is to act as a catalyst or facilitator in the country-led process for scaling up nutrition efforts. In 2012, MQSUN was a new programme model for supporting countries to move the SUN agenda forward—with no framework for how to do this successfully. As delivering STTA in each country is unique, MQSUN and now MQSUN+ has designed and re-designed STTA to fit country needs. Our lessons learned are integrated into future STTA.

**METHODS:** MQSUN+ tracks the characteristics that

facilitate quality STTA through financial monitoring, STTA monthly updates, exit feedback surveys/interviews, and knowledge management.

**RESULTS:** MQSUN(+) has provided STTA to over 40 SUN countries. From our “learning by doing” approach, MQSUN+ has identified key “ingredients” for quality STTA: the process is government-owned; nutrition champion identified close to the SUN focal point; STTA tailored to country context; mutual clarity on the scope of work; use of a national consultant; balanced STTA team's skills mix; cost sharing STTA activities; and learning from past experience. MQSUN+ has country case examples illustrating these ingredients from STTA provided in Somalia, Togo, Madagascar, and Guinea.

**PROGRAMME IMPLICATIONS:** By considering these “ingredients” in every country request, MQSUN+ has been able to provide quality STTA to SUN countries and support their multisectoral nutrition efforts. As STTA is a growing funding mechanism, this model has valuable learnings that can be considered in other programmes.

**KEY WORDS:** STTA, technical assistance, scaling up nutrition, multisectoral

#### **PROTOCOL FOR A RANDOMIZED CONTROL TRIAL: WILL EGG SHELL CALCIUM CONSUMPTION DECREASE BODY FLUORIDE LOAD AND MITIGATE DENTAL AND SKELETAL FLUOROSIS AMONG MOTHERS IN ETHIOPIAN RIFT VALLEY?**

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**BACKGROUND AND OBJECTIVE:** Fluorosis affects teeth,

bones, joints, and brain functions. Diets rich in calcium may reduce the severity of fluorosis by binding fluoride thereby prevent its absorption. With the promotion of eggs and chickens to rural farmers, eggshells are available as sustainable and low cost source of calcium (2000 mg/egg). The aim of the study will be to assess the effects of eggshell calcium consumption on body fluoride load and mitigation of dental and skeletal fluorosis among mothers in Ethiopian rift valley.

**METHODS:** At baseline, 41 mothers at the intervention site and 41 at the control site were assessed, as well as all mothers (n= 135) of under 2 children at each site underwent examination for fluorosis by dentist and physiotherapist. The intervention is six months supplementation of 2.5g eggshell powder/day in three divided doses. Blood, urine, food and water samples were collected from study mothers and sent to Ethiopian Public Health Institute for analyses.

**RESULTS:** The mean dietary diversity score of mothers computed using ten food groups was approximately  $5 \pm 2$ , with no significant difference ( $P=0.572$ ) between the two groups. Dietary calcium intake was low. Prevalence of anemia (Hgb <12.5g/dL) was 18.3%. More than half (56.3%) of the mothers had mild to severe dental fluorosis; those with moderate and severe dental fluorosis was 68 (25.2%) and 25 (9.3%) respectively. The overall prevalence of skeletal fluorosis among all mothers was 34.4% using a score of 16 signs and symptoms. Majority of the mothers feel lower back pain (70.7%), some had neck pain with movement (46.3%) and abdominal pain (48.5%). There were no significant ( $P>0.05$ ) differences in most signs and symptoms of fluorosis among mothers between the two sites.

**CONCLUSIONS:** These suggest the need for innovative approaches to mitigate the toxic effects of excess fluoride in Ethiopian rift valley.

**KEY WORDS:** Eggshell powder, Fluorosis, Mothers.

#### DIET PATTERNS POLICY BRIEF

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**BACKGROUND AND OBJECTIVE:** This brief aims to broaden the scope of our knowledge on the drivers of dietary choices in Ethiopia, by analyzing questions related to the role of agricultural production, sales, and female decision-making in diet diversity; seasonal fluctuations in diet patterns; food and nutrient inequities within households; and the accuracy of individual dietary intake estimation using household data. Tufts University led the research.

**METHODS:** The Ag-Nut panel study followed 1200 smallholder agricultural households randomly selected from ten Oromia and SNNPR woredas where both ENGINE and AGP were active. A multi-stage sampling strategy was conducted to select rural households; two kebeles from the ten woredas chosen for a total of 20 using the PPS method. These households were surveyed twice per year in the post-harvest and 'lean' seasons over two years.

**RESULTS:** The majority of the households reported a low DDS, with a two-year average of 3.8 food groups consumed in the previous 24 hours. Grains, legumes, and oil/fats were the most commonly consumed food groups, while consumption of meat, eggs, and fruit was less common. Study participants exhibited variable dietary diversity across agricultural seasons, generally consuming fewer and different food groups during the lean season as compared to the post-harvest season, namely, lower consumption of legumes, fruit, vegetables, eggs, and sugar. The intra-household inequities in the distribution of energy, protein, and iron did not always discriminate against typical nutritionally vulnerable groups. Women's say in decision-making was significantly and positively associated with favorable household diet patterns.

**CONCLUSIONS:** Even wealthier households with higher production and purchase diversity, among other characteristics, were unable to smooth diet diversity during the lean season. Future interventions should strive to enable households to maintain diet diversity across seasons, by supporting initiatives to increase smoothly functioning markets, post-harvest processing and preservation. Intra-household inequity of nutrient distribution should be addressed in program and policy design and implementation. Agriculture programs that educate and empower women to have greater control over assets and

other decision-making will likely see improved dietary diversity independent of commercialization efforts.

**KEY WORDS:** Diet diversity; ENGINE; Diet Pattern

### **THE FOOD SAFETY LEGAL FRAMEWORK IN ZIMBABWE: LESSONS LEARNT FROM SOUTH AFRICA'S LISTERIOSIS OUTBREAK**

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**BACKGROUND AND OBJECTIVE:** Despite the advancements in food processing and preservation technologies food safety burden continue to be a global challenge. While the causes of food safety cases vary among nations, a fragmented legal framework and poor implementation remains a challenge for developing countries. Following the world's biggest listeriosis outbreak in South Africa, most countries in the SADC region banned the imports of meat products from South Africa. This was due to lack of Food Control Systems that could deal with the situation before embarking on the ban. The objective of this study was to evaluate the effectiveness of the Zimbabwean food safety legal framework in protecting the public.

**METHODS:** All food safety legislation in Zimbabwe were listed and extensively reviewed. The review criteria focused on evaluating how each legal tool and the judiciary system protect the consumer in a case like the listeriosis outbreak and any situation leading to such or similar outbreaks.

**RESULTS:** The study showed that there are several legal

tools directly associated with food safety and consumer protection. Food safety battles can be resolved in court of law; however, the procedures to be followed do not make it easier for the general public. Gaps exist in the legal framework making it difficult not only to protect the consumer but practically impossible to bring a guilty manufacturer to book. In addition, the review showed that contrary to the culture in most developed countries, the framework has no room for special courts where experts must be used to deal with legal battles pertaining food safety.

**CONCLUSIONS:** There is a sound food safety legal framework in Zimbabwe. However the framework does not fully protect consumers in various aspects. It is essential that the framework be revised based on current scientific evidence. In addition, capacitation of food safety enforcing bodies is necessary and urgent.

**KEY WORDS:** Food Safety, Legislation, Listeriosis, SADC

### **SOCIAL AND PHYSICAL ENVIRONMENT AS DRIVERS OF FOOD CHOICE IN A LOW INCOME URBAN SETTING: A PARTICIPATORY PHOTO VOICE PROJECT IN NAIROBI CITY, KENYA: A TACLED PROJECT**

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**BACKGROUND AND OBJECTIVE:** Kenya is experiencing rapid urbanisation leading to changes in social and physical food environments, which are associated with non-communicable diseases (NCDs). The aim of our study was to identify which drivers in the social and physical food environment influence food choices among low income

urban dwellers in Nairobi.

**METHODS:** We used participatory photography (Photo voice) with men/women aged  $\geq 13$  years living in a low income area in Nairobi. Participants used cameras to take photographs representing: places they eat; things that make eating healthy difficult or easy; a person or things that influence what they eat. Follow-up in-depth interviews allowed participants to tell the 'stories' of their photographs. NVivo was used for thematic analysis.

**RESULTS:** Poor hygiene, environmental sanitation, food contamination and adulteration were key concerns regarding foods sold in the neighbourhood. While quality and food preparation methods were major considerations in decisions on food purchase and consumption, financial access was highlighted as a major barrier to accessing good quality and healthy foods. In the home environment, urban farming was practised to supplement household food needs. Within the social food environment, family and food vendors emerged as key influencers of participants' food choices. In the family, children, spousal and parental preferences were key drivers of food purchases, and consumption. Food vendors' hospitality and services including credit, packaging and subsidized food prices also influenced participants' food choices.

**CONCLUSIONS:** There is a need to address the key drivers in the social and physical environments that emerged, with interventions to promote healthier and safer dietary practices. Poor hygiene, environmental sanitation and food adulteration reveal the continuing challenges of poor food hygiene alongside unhealthy diets associated with NCDs. Enforceable food safety legislation is essential in lowering this risk. Urban farming, could be promoted to reduce financial barriers that affect healthy food choices.

**KEY WORDS:** drivers of food choice, social environment, physical environment, women, men, adolescents, urban, Kenya

**DIETARY PRACTICES, PHYSICAL ACTIVITY, ECONOMIC LEVEL AND BLOOD PRESSURE OF HYPERTENSIVE PATIENTS ATTENDING THARAKA-NITHI COUNTY HOSPITAL, KENYA**

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**BACKGROUND AND OBJECTIVE:** The consequences of hypertension are severe and are associated with 50% of chronic diseases in eastern Kenya. There is paucity of literature regarding secondary hypertension in eastern Kenya. This study determines the effects of dietary practices, physical activity and economic level on blood pressure levels targeting secondary hypertensive patients attending outpatient clinic at Tharaka Nithi County Hospital.

**METHODS:** Cross-sectional analytical study randomly involving 234 participants. Researcher-administered questionnaire was used to elicit information on socio-economic, medical history, dietary practice; physical activity and blood pressure levels. Quantitative data collected was analyzed using SPSS software. The data is summarized using descriptive statistics and chi square test used to compare the association. Correlation analysis established linear relationships between the study variables.

**RESULTS:** The respondents (57.3%; CI: 48.925-65.675) had controlled blood pressure and mean systolic level ( $136.98 \pm 19.415$ ). Those diagnosed with other diseases before hypertension were 56.25% (CI: 43.018-69.482). The association between dietary practice and economic level was not significant,  $\chi^2_4 = 3.675$  ( $p=0.452$ ). The Dietary diversity and systolic blood pressure levels were significant ( $p=0.005$ ). The Mean physical activity levels were  $4,724.39 \pm 4,398.714$ . A negative and significant correlation between physical activity and systolic blood pressure levels ( $r=-0.194$ ,  $p=0.003$ ); and physical activity with diastolic blood pressure levels ( $r=-0.138$ ,  $p=0.035$ ). Disease diagnosis and systolic blood pressure had a significant positive correlation ( $r=0.348$ ,  $p=0.001$ ).

**CONCLUSIONS:** Blood pressure was controlled in some patients. More than half of the respondents had pre-existing conditions which were associated with increased the blood pressure in patients. Dietary practices had no relationship with economic level but the diet had a profound effect on blood pressure levels. Moderate physical activity was



observed and contributed to lower blood pressure levels.

**KEY WORDS:** Dietary Practice, Physical Activity, Hypertension

**INFANT FEEDING PRACTICES WHEN THE USE OF MOTHERS OWN BREAST MILK IS NOT FEASIBLE; A MIXED METHODS STUDY IN NAIROBI, KENYA.**

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**BACKGROUND AND OBJECTIVE:** Mother's milk is recommended as the first ideal feed for newborns, but when this is not possible, donated breast milk or infant formula could be the second best option. In Kenya, there is paucity of evidence on the infant feeding options used when use of mother's breast milk is not feasible. This study aimed to establish the feeding practices for newborns without access to their own mother's breast milk in a Kenyan urban setting.

**METHODS:** A mixed methods approach was used to collect data. Quantitative interviews were conducted with 868 mothers of children < 3years from four health facilities in Nairobi, Kenya. Qualitative interviews entailed 17 focus group discussions, 29 key informant interviews, and 25 in-depth interviews with women of childbearing age, and other community members, leaders, health workers and policy makers. STATA 14 was used for quantitative analysis. NVivo was used for thematic analysis of the qualitative data.

**RESULTS:** Forty four percent of the mothers reported to have been separated from their children after delivery and hence unable to breastfeed. During the separation, 36% of the infants were not fed anything. For those who were fed, infant formula, animal milk and mashed foods were the main feeds used. Wet nursing and informal milk sharing were reported to have been more common in the past, but reduced greatly with the emergence of HIV/AIDS. Financial constraints in purchasing alternative feeds, poor hygiene, risks of food intolerance and infections in newborns were some of the main challenges in feeding children without

access to their own mothers milk.

**CONCLUSIONS:** Personalized support by health workers, for caregivers of such newborns is required, to address the concerns highlighted and to ensure the selection of the best and most sustainable feeding option. Strategies to provide safe donated breast milk should also be explored.

**KEY WORDS:** Infant feeding, breastfeeding, wet nursing, informal milk sharing, infant formula, donated breast milk

**NUTRITION AND COPING STRATEGIES AMONG ADULT INMATES IN PRISON FACILITIES IN KINSHASA: CASE OF MAKALA CENTRAL PRISON AND N'DOLO MILITARY PRISON.**

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**BACKGROUND AND OBJECTIVE:** Prisoners in Kinshasa are malnourished and food insecure. Therefore, the goals of this study were to determine the prevalence of malnutrition and its associated factors and to explore inmates' coping strategies with their perceived severity.

**METHODS:** Quantitative and qualitative approaches were employed in this study. Inmates were interviewed and their nutritional status was assessed. A semi- structured questionnaire focused on coping strategies and individual perceived severity was used to gather data.

**RESULTS:** In total, 526 prisoners were recruited, 514 (98%) were men and 12 (2%) women. The median age was 31 (15) years old. Fifty-two percent were single, 46% had an incomplete secondary education, 82% were unemployed and 93% were Christians. Eleven percent of inmates had a Body Mass Index (BMI)  $\leq 18.49$  Kg/m<sup>2</sup>. After performing a

multivariate analysis, unemployed ( $p=0.034$ ) and time in jail  $\leq 1$  month ( $p=0.016$ ) were associated with malnutrition. Sixteen food-related coping strategies (using less preferred food, eating in solidarity, etc.) and 3 nonfood-related coping strategies (increasing cash by doing small job, etc.) were implemented with perceived severity from less to very severe. Most of prisoners displayed these methods at least once a week and a half per day.

**CONCLUSIONS:** The prevalence of malnutrition was 11%, profession and time in jail were its associated factors and inmates used multiple coping strategies when they experience food insecurity.

**KEY WORDS:** Nutritional status, Coping strategies, Prisoners, Kinshasa.

#### **EXPERIENCE OF FARMERS IN A NUTRITION-SENSITIVE AGRICULTURE PROJECT IN UGANDA AND TANZANIA**

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**BACKGROUND AND OBJECTIVE:** A project identifying pathways that enhance consumption of diverse diets by children 6-59 months through agrobiodiversity, was implemented in 100 households in Kiboga district, Uganda and Bukoba district, Tanzania. It involved assessment of consumption patterns, where a Household Self-Dietary Intake Recording, Diagnosis, and Learning (HS-DIRDL) tool was developed; Increase of agrobiodiversity with iron-rich beans, orange-fleshed sweet potato, grain and leafy amaranth, pawpaw and chicken for eggs; Capacity building through household visits and monthly farmer group meetings with thematic trainings, child growth monitoring, and one-on-one discussions. A farmer experience study was carried out to ascertain farmer perception with project aspects.

**METHODS:** A semi-structured questionnaire establishing farmer experiences and engagement in the project was administered in Uganda (43 households) and Tanzania (48

households). A 10-point scale was used to rate satisfaction/benefits attributable to the project, 1-highly dissatisfied/not beneficial, and 10-highly satisfied/beneficial.

**RESULTS:** Respectively, 67% and 49% of households in Uganda and Tanzania were highly satisfied with child feeding and nutrition aspect. Fifty and 40% indicated high satisfaction with the crop and livestock production aspect in Uganda and Tanzania respectively. Most helpful project activities in aforementioned aspects were participatory farmer group meetings (100% Tanzania, 47% Uganda), and one-on-one discussions between families and field assistants (40% Uganda). Spouse collaboration was noted in 83-85% of households, with mothers attending meetings, preparing food, feeding child, filling HS-DIRDL tool and farming. Fathers built poultry structures, attended meetings/ gave permission to spouse, fed child, filled HS-DIRDL tool and met poultry and child medical bills. Joint farming of project options was also noted.

**CONCLUSIONS:** Farmers appreciate regular interaction during project implementation. Household approaches engaging both father and mother encourage spouse collaboration and project execution. Understanding farmer experiences can help identify why project aspects that were successful or not, to inform follow up studies and/or scaling up.

**KEY WORDS:** Agrobiodiversity; Nutrition; Project experience; Perception

#### **THE EFFECT OF HIGHLY ACTIVE ANTI-RETROVIRAL THERAPY ON SERUM SELENIUM, ZINC AND COPPER CONCENTRATIONS OF PEOPLE LIVING WITH HIV**

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**BACKGROUND AND OBJECTIVE:** Selenium (Se), zinc (Zn) and copper (Cu) are important for immune competence. Deficiencies are associated with immune abnormalities and increased susceptibility to infectious diseases. Research on the effect of HAART on serum values of these three trace elements among PLWH in Ghana is limited. The aim of the study was to determine the association between types of HAART and serum concentrations of Se, Zn, and Cu among PLWH in the Accra metropolis.

**METHODS:** An experimental study involving 100 PLWH on HAART recruited from the Accra Metropolis of the Greater Accra Region. About 5mls of venous blood was collected for analysis of serum Zn, Se and Cu concentrations. Serum Se, Zn and Cu were analyzed with the neutron activation method.

**RESULTS:** Average age was  $36 \pm 2.3$ , with majority being females (61.5%). More than 70% of respondents were on Zidovudine (AZT) + Lamivudine (3TC) + Nevirapine (NVP), while those on other HAART combinations were about 30%. Serum concentrations of Se, Cu and Zn were significantly low ( $0.63 \pm 0.21$   $\mu\text{mol/L}$ ,  $1.12 \pm 0.14$   $\mu\text{mol/L}$ ,  $1.33 \pm 0.92$   $\mu\text{mol/L}$ ) respectively ( $p < 0.001$ ). Respondents on AZT + 3TC + NVP had higher serum Se and Cu concentrations but lower Zn concentration compared to those on other medications but this effect was not significant.

**CONCLUSIONS:** Intake of AZT + 3TC + NVP may improve serum concentrations of Se, and Cu, but negatively affect serum Zn concentration. An intervention study may be needed to investigate the actual effect of HAART on serum concentration of Se, Cu and Zn for PLWHA.

**KEY WORDS:** HIV, Highly active anti- retroviral therapy, Selenium, zinc and copper.

**PREDICTORS OF CHILD MORTALTY AT UNDER TWO YEARS IN RURAL AREAS IN A CONTEXT OF FOOD SUPPLEMENTATION IN BURKINA FASO: PAIRED CONTROL CASE STUDY NESTED IN A COHORT.**

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**BACKGROUND AND OBJECTIVE:** Child mortality is a good indicator of the level of health and social development of a country. We examined the predictive factors of the child mortality in rural areas in a context of food supplementation in Burkina Faso.

**METHODS:** This is a paired control case study (1: 2), nested in a cohort. A cox regression was used to identify predictors of child mortality. A significance level of 0.05 was considered.

**RESULTS:** A total of 104 deaths and 208 controls were included in the study, a sample of 312 children. The mean age of mothers was  $26.13 \pm 6$  years. In multi-varied analysis, twins were 5.5 times more likely to die before their second birthday than non-twins. Moderate acute malnourished children were protected against death compared to severe acute malnutrition (HR = 0.03, 95% CI [0.19-0.98],  $P < 0.001$ ). Other predictors child mortality was lack of a private latrine, non-breastfeeding, absence of over 65 in the household, children born to mothers under 18 years of age. Moderate acute malnourished children were protected against death compared to severe acute malnutrition (HR = 0.03, 95% CI [0.19-0.98],  $P < 0.001$ ).

**CONCLUSIONS:** Twins were 5.5 times more likely to die before their second birthday than non-twins. Special attention should be given to twins, to reduce the risk of dying before their second birthday.

**KEYWORDS:** Child mortality, Predictors, Food supplementation, Burkina Faso

**NUTRITION AND HEALTH SERVICES FOR MOTHERS IN**

## **MATERNITY WAITING AREA IN DIRASHE DISTRICT SOUTHERN ETHIOPIA: RESULTS OF QUALITATIVE STUDY**

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**BACKGROUND AND OBJECTIVE:** Nutrition and good health during pregnancy are among the key determinants of the health status in later life. Maternity waiting areas were designed to increase the maternity service utilization and contributing to the success of sustainable development goals. However, the need for planned good nutrition for the mothers at maternity waiting area is a challenge. The main aim was to explore nutrition and health services provided for mothers in maternity waiting areas in the District.

**METHODS:** A qualitative approach was used to explore the services using checklists, record review and key informant interviews. The collected data was analyzed using thematic content analysis.

**RESULTS:** Despite the availability, maternity waiting area is not adequate and not appropriate for pregnant woman. The number of health professionals and mothers not compatible. Nutrition related counseling and provisions of the services are suboptimal and provided when the professionals are not busy. Preparation of food by the pregnant women at the end of their pregnancy is uncomfortable and mothers report that they miss meals due to the place for preparation and the food items needed. There were many water, sanitation and hygienic problems in the facilities. Due to the inadequacy of spaces, there were poor postal services in the health facilities. Intersectoral collaboration between different sectors for improved maternal nutrition and health is weak. Working with agricultural in the selection and screening of malnourished and poor individuals for possible inclusion in the productive safety net programs is also loose.

**CONCLUSIONS:** There is critical shortage of maternity area and services delivered were sub-optimal with shortage of staff and necessary supplies. Building of additional maternity waiting areas and provision of appropriate services through

focused nutrition messages compatible with seasonal variation will improve utilization of the maternity waiting areas and contribute to a decrease in maternal mortality.

**KEY WORDS:** maternity waiting area, nutrition, counseling

## **CHANGE IN HABITS FOOD: RETAIL AND EATING IN MOROCCAN CONSUMER AND EFFECT ON HEALTH (OVERWEIGHT)**

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**BACKGROUND AND OBJECTIVE:** Moroccan food retail transition and eating have resulted in a change in food habits. The aim was to study the impact on the food eating habits and indirectly on health of Moroccans.

**METHODS:** An exploratory survey with a total of 264 people (M=131; F=133) of mean age  $35.5 \pm 9.3$  years in Casablanca. A questionnaire assessing socioeconomic and demographic data, some elements of preferences in food choice, dietary habits; as well as anthropometric measurement from which BMI was calculated.

**RESULTS:** Biological data shows that 76 participants were overweight. The use of food stores and the purchase rates were significantly different between overweight and normal weight participants ( $p=0.001$  and  $p=0.05$ , respectively). The most frequent combinations were supermarkets / traditional markets with or without convenience store. Overweight participants preferred shopping before meals, while those with normal weight preferred shopping after meals ( $p=0.01$ ). There was a significant difference ( $p < 0.001$ ) between overweight and normal-weight participants using food service (fast-food, gourmet restaurant). There was an increased use of supermarkets and eating outside the home in overweight (OR): 3.77; 95 % IC: 1.63-8.74,  $p=0.002$ ; shopping before meals (OR): 2.44; 95 % IC: 1.28-4.67,  $p=0.01$ ), in comparison with those who never go to

supermarkets (OR): 0.23; 95 % IC: 0.09-0.56),

**CONCLUSIONS:** Fast food, retail stores, encouraging the change in habit food, these changes lead to overweight in Morocco.

**KEY WORDS:** Food retail, overweight, eating outside the home

#### **ASSOCIATION BETWEEN NUTRIENT CONSUMPTION, ANTHROPOMETRIC MEASURES AND BODY COMPOSITION AMONG RURAL AND URBAN GHANAIA ADULTS**

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**BACKGROUND AND OBJECTIVE:** Obesity has become a threat to public health in all regions across the globe. Policies to regulate the food environment looks promising to reducing obesity rate but in Ghana there is not enough data to elicit a policy response. This study assessed the association between nutrients consumption and body composition among rural and urban Ghanaian adults.

**METHODS:** This was a cross-sectional study involving 565 Ghanaian adults. Structured interviewer-administered questionnaires were used to collect information on socio-demographics. Height, weight, BMI, waist circumference and body composition of all participants were determined. Independent sample t-test was used to analyze differences in anthropometric measures, body composition and consumption among rural and urban participants. Chi-square was used to measure differences in obesity prevalence by community and gender and multinomial logistic regression was used to model the risk factors associated with obesity.

**RESULTS:** The prevalence of overweight and obesity using BMI were 29.9 and 22.9 respectively with an overall prevalence of 52.8%. Use of waist circumference measurement resulted in the highest overall obesity

prevalence of 41.5%. Total caloric and carbohydrate consumption were higher among the obese group across all measures and participants who were obese by BMI had a significantly high sugar intake. Multinomial logistic regression revealed that males had higher odds of being normal rather than obese compared to females (OR 21.968, CI 10.876-44.373, p-value < 0.001) and rural participants had higher odds of being normal compared to their urban counterparts (OR 1.684, CI 1.039-2.729, p-value < 0.05)

**CONCLUSIONS:** Findings from this study show a similar prevalence of obesity by BMI among rural and urban dwellers. Interventions that regulate the food environment and make affordable and available healthy food options are needed to control the rise in obesity prevalence.

**KEY WORDS:** Obesity, body composition, waist circumference, visceral fat, body mass index

#### **BARRIERS AND FACILITATORS TO DIET AND PHYSICAL ACTIVITY: QUALITATIVE ANALYSIS OF ADULTS DIAGNOSED WITH TYPE 2 DIABETES MELLITUS IN MALAWI**

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**BACKGROUND AND OBJECTIVE:** Diet and physical activity are crucial to type 2 diabetes mellitus (T2DM) self-care management. However, socio-environmental and cultural factors can impede these lifestyle behaviors, and

hence T2DM management, especially in low income populations. We aimed to qualitatively identify barriers, facilitators and support for diet and physical activity among low-income adults diagnosed with T2DM in Malawi.

**METHODS:** We purposively sampled adults (n=39; 21 females and 18 males) diagnosed with T2DM (mean age=55.5years), from a larger clinical assessment study, conducted in urban and semi-urban hospitals in Malawi. Four focus group discussions (female=2 and male=2) were conducted, two in each study location. The data were audio-recorded, transcribed verbatim, coded and analyzed using thematic analysis.

**RESULTS:** Family, diabetes support groups and health worker ties were the emergent themes that facilitated both diet and physical activity and were ported as social-support systems. However, diabetes support groups were noted more in urban than in semi-urban areas. Barriers to diet appropriate for T2DM included: cost and access to food; household size; lack of knowledge on what and how much to eat; separate preparation and purchase of food; dilemmas of what to eat during functions and travel; and, conflicting dietary information from different sources. Comorbidities and fear of public ridicule were barriers to participants being physically active.

**CONCLUSIONS:** Barriers like food cost and accessibility, inadequate nutrition knowledge and inconsistent dietary information, influenced dietary quality and likely subsequent glycemic management. Physical activity engagement was hindered by diabetes-related comorbidities, which may emanate from chronic hyperglycemia. Therefore, a focus on socio-environmental factors should be prioritized by nutritionists, dietitians, and health workers when developing and providing nutrition and physical activity education in Malawi.

**KEY WORDS:** Diet, physical activity, barriers, facilitators, Type 2 Diabetes Mellitus (T2DM)

#### **GROWTH AND FEEDING PRACTICES OF TWIN AND SINGLETON INFANTS IN THE FIRST THOUSAND DAYS OF LIFE: A CROSS SECTIONAL COMPARATIVE STUDY IN THE HOHOE MUNICIPALITY, GHANA.**

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**BACKGROUND AND OBJECTIVE:** Multiple births have increased risk for intrauterine growth restriction, preterm delivery and low birth weight. Good nutrition during the first thousand days is critical as failure to catch-up growth has health and socio-economic implications. We compared singleton and twin children regarding nutritional status and infant and young child feeding (IYCF) practices.

**METHODS:** Fifty twin-mother and 100 singleton-mother pairs were randomly selected for this cross-sectional survey study conducted in the Hohoe municipality, Ghana. IYCF practices were assessed by 24-hour recall following the 8 core WHO indicators. Birth weight was extracted from medical records. Weight, recumbent length and mid-upper arm circumference (MUAC) were measured and converted to Z-scores using the WHO Anthroplus software. Analysis was done with STATA 12.1 using t-test, Mann Whitney and Chi-square test ( $p < 0.05$ ).

**RESULTS:** Age of the singletons ( $17.5 \pm 4.0$  months) and twins ( $17.9 \pm 4.5$  months) were similar. Compared to singletons, more twins were low birth weight (5.0% vs 57.0%,  $p < 0.0001$ ) and stunted (11.0% vs 26.0%,  $p = 0.006$ ). No significant differences were observed for underweight (13.0 vs 14.0%), wasting (11% vs 7%), thinness (12.0% vs 5%), overweight (5.0 vs 9.0%) and anaemia (59.0 vs 60.0%). Regarding IYCF, breastfeeding initiation within 30 minutes of birth was higher among singletons (57.0% vs 12.0%,  $p < 0.0001$ ) but their complementary feeding was untimely (26.0 vs 68.0%,  $p < 0.0001$ ). No significant differences were observed for exclusive breastfeeding for 6 months (79.0% vs 74.0%), continued breastfeeding at 1 year (73.0% vs 64.0%), consumption of iron-rich foods (78.0 vs 86.0%), minimum dietary diversity (48.0% vs 55.0%), minimum meal frequency (28.0% vs 18.0%) and minimum acceptable diet (43.0% vs 52.0%).

**CONCLUSIONS:** Optimal feeding practices in both groups was low but twins were worst off against the 8 core IYCF indicators. This reflected in their higher stunting levels. Counselling on optimum IYCF should intensify and targeted

at families with multiple births.

**KEY WORDS:** Twins, singletons, comparison, Hohoe, feeding practices.

#### **DEVELOPMENT AND TESTING OF PHOTOGRAPHIC FOOD ATLAS FOR DIETARY ASSESSMENT AMONG SCHOOL-AGE CHILDREN IN THE ASHANTI REGION**

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**BACKGROUND AND OBJECTIVE:** There are challenges associated with current methods used for estimating food portions during dietary assessment in children. Photographic Food Atlas (PFA) have been recommended for the assessment of portion sizes in school-aged children.

**METHODS:** We developed a PFA of some Ghanaian foods and tested its validity and appropriateness for estimating portion sizes among children aged 6-9 years. Foods included in the photographic atlas, portion ranges, and plate types for serving were determined by a steering group of nutrition specialists, and guided by mothers with children within 6-9 years old. Development of the Atlas involved serving, weighing, taking photographs, coding and arranging into a photo album.

**RESULTS:** Photographs were developed for 16 different foods/meals. The developed PFA contained ten (10) foods in eight portions, five (5) in six portions and one (1) in five portions. To test their appropriateness, 20 children were asked to select a portion size greater, and less than an indicated portion, and in between two indicated portions. Questions were asked to determine the perception and preference of these children when comparing the photographs with food models for estimating portion sizes during a 24-hour recall. Overall correct estimation made was 71.3% and this increased with age. Majority (>95%) of participants were able to identify their food portion sizes and understood the photographs. Most participants (55%)

preferred the PFA over food models/handy measures

**CONCLUSIONS:** In conclusion, the photographic food atlas developed seemed appropriate for estimating food portion sizes by school-aged children.

**KEY WORDS:** Photographic Food Atlas, portion size, estimate, validity, dietary assessment

#### **NUTRITIONAL KNOWLEDGE, DIETARY PRACTICE AND ASSOCIATED FACTORS AMONG ADULTS ON ANTIRETROVIRAL THERAPY IN FELEGE HIWOT REFERRAL HOSPITAL, NORTHWEST ETHIOPIA**

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**BACKGROUND AND OBJECTIVE:** Adequate nutrition is important to maintain the immune system, manage opportunistic infections, optimize response to medical treatment, and support optimal quality of life for PLWHA. Nutrition interventions can also help to optimize the benefits of antiretroviral drugs and may increase compliance with treatment regimens. The nutritional knowledge, dietary practice and associated factors among adults on antiretroviral therapy are not well understood generally in Ethiopia and particularly in Bahir Dar City. The aim of this study was to assess the nutritional knowledge, dietary practice and associated factors among adult PLWHA on ART in Felege Hiwot Referral Hospital, Northwest Ethiopia, 2017.

**METHODS:** Institution based cross-sectional study was conducted from April to May, 2017 in Felege Hiwot Referral Hospital. A systematic random sampling technique was used to select 539 adults on HAART. Data were collected using a semi-structured and pretested questionnaire. Bivariate and multivariate logistic regression analyses were carried out to identify factors associated with nutritional knowledge and dietary practice.

**RESULTS:** Results show that 25.8%, 52.5% and 21.7% of respondents had poor, average and good nutritional knowledge scores respectively. Ever heard about good nutrition and received dietary counselling were significant factors for nutritional knowledge. This study also reveals that 3.2%, 66.4% and 30.4% of respondents had poor, average and good dietary practice scores respectively. Presence of gastrointestinal symptom, ever heard about good nutrition and good nutritional knowledge were significant factors for dietary practice.

**CONCLUSIONS:** Nutrition education and counseling should be given by health care workers for patients on ART to improve their nutritional knowledge. The media should also strengthen its role in disseminating nutrition information. Health professionals should treat gastrointestinal symptoms to maintain patients' appetite for food by increasing their dietary intake.

**KEY WORDS:** HIV/AIDS, PLWHA, HAART, nutrition knowledge, dietary practice

#### **MICROBIAL QUALITY AND IDENTIFICATION OF HAZARD ANALYSIS CRITICAL CONTROL POINTS IN ETHIOPIAN TRADITIONAL COTTAGE CHEESE VARIETIES PRODUCED IN SELECTED AREAS OF EASTERN GOJJAM, NORTHWESTERN HIGHLANDS OF ETHIOPIA**

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**INTRODUCTION:** This study was conducted to evaluate the microbial quality, safety and identification of hazard analysis in Metata, Ayib and Hazo traditional cheese varieties obtained from dairy producers, dairy cooperatives and dairy product retailer shops and kiosks in selected areas of Eastern Gojjam.

**METHODS:** The microbial quality, safety and hazard analysis critical control were analyzed following standard procedures. Microbial analysis was also conducted to assess the total bacteria (TBC), coliform (CC) and yeast and mould (YMC) counts of these traditional cheese varieties.

**RESULTS:** Metata cheese samples had significantly lower ( $p<0.05$ ) TBC, CC and YMC counts than Ayib and Hazo cheese samples. *Salmonella* species and *Escherichia coli* O157:H7 were not detected in all of the traditional cheese variety samples collected from all the sampling sources. The highest percentage of pathogenic microorganisms isolated from Metata cheese variety samples were *Enterobacter*, *Escherichia coli* and *Staphylococcus epidermis* ranges from (10-22.5%), Ayib samples were *Bacillus* (30-33.33%), *Corynebacterium* (25%) and *Staphylococcus aureus* (10-20%) and Hazo cheese variety samples were *Escherichia coli* (10-16.7%), *Staphylococcus aureus* (0-37.5%) and *Corynebacterium* (2.5-10%). Five, six and three critical control points for microbial contamination could be identified where the hazards occur during traditional cheese making at dairy producers, dairy cooperatives and dairy product retailer shops and kiosks in respective order.

**CONCLUSIONS:** The quality of traditional cheese varieties produced in the study area was generally poor and microbial contamination occurred along the different sampling sources whilst being transported from production sites to dairy product retailer shops and kiosks. This calls for strict hygiene measures, health and safety protocols along the entire value



chain in order to improve the quality and safety of traditional cheese varieties.

**KEY WORDS:** Critical control points, Hazard, quality, safety

## **STUDY OF THE PREVALENCE OF LACTOSE INTOLERANCE IN MOROCCO - CASE OF THE CITY OF KENITRA**

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**INTRODUCTION:** Primary hypolactasia or lactose intolerance is a digestive problem that indicates a deficiency of the lactose digestion enzyme, lactase, which causes uncomfortable digestive symptoms.

**OBJECTIVE:** The purpose of our work was to study the prevalence of lactose intolerance in the sub-Saharan community residing in Morocco and the factors that influence it.

**MATERIALS AND METHODS:** Lactose intolerance was assessed by measuring blood glucose before and 30 minutes after administration of lactose overload and taking into account subsequent digestive symptoms. Subjects were also asked to answer questions about their consumption of milk and their knowledge of lactose intolerance.

**RESULTS:** The prevalence of hypolactasia in the Kenitra population was 10%. It was fairly high with more or less severe symptoms, after 20 minutes to 2 hours of experience.

These symptoms were mainly bloating and diarrhea. It varies significantly with age and can be influenced by milk consumption in adulthood but less by its consumption after weaning and childhood.

**CONCLUSION:** The prevalence of lactose intolerance in the Kenitra population is quite high. This calls for the participation of health authorities to create awareness in order to improve their quality of life.

**KEY WORDS:** Intolerance, lactose, lactase, milk, digestion, Morocco.

## **BECOME MALNOURISHED CHILDREN ONE YEAR AFTER NUTRITION EDUCATION IN THE KAYA NUTRITION EDUCATION CENTER IN BURKINA FASO.**

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**BACKGROUND AND OBJECTIVE:** Nutrition education is an integral part of successful care and prevention of malnutrition. We examined the outcome of malnourished children one year after nutrition education.

**METHODS:** This is a cross-sectional study. We used logistic regression to identify factors associated with nutritional status after the exit in the center.

**RESULTS:** A total of 135 children were included. We recorded five deaths and 30 children were not found. Among 100 children found one year after the release of CEN, we noted a relapse in malnutrition in 15% of cases. Also, 48% of children received food before 6 months of age. As for the

vaccination, 16% was not up to date with their vaccine and 40% had a birth weight of less than 2500 grams. In univariate analysis, breastfed children up to 6 months were protected against relapse into malnutrition. Taking colostrum at birth was a protective factor against malnutrition (OR = 0.14, P-value = 0.002 and IC [0.41-0.49]), children born at home were 4 times more likely to relapse compared to children born in a health center. Low birth weight of less than 2500 grams was associated with relapse into malnutrition after discharge at CEN. In multivariate analysis, only low birth weight was significantly associated with malnutrition (OR = 4.9 P-value = 0.019 and IC [1.29-18.65]).

**CONCLUSIONS:** The nutritional situation one year after nutrition education is critical and deserves special attention from the different institutions involved in improving the living conditions of households and child survival.

**KEY WORDS:** Becoming children, Malnutrition, Nutritional education, Kaya.

## EFFECTS OF NUTRITIONAL STATUS ON ACADEMIC PERFORMANCE OF UGANDAN PRIMARY SCHOOL CHILDREN.

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**BACKGROUND AND OBJECTIVE:** Numerous factors are known to affect the academic performance of students. These include prenatal conditions, birth conditions, postnatal events, nutritional, socio-economic factors and environmental factors. This study examined the nutritional status and its relationship with academic performance of 9-10 years old primary school children recruited randomly in Wakiso, Uganda.

**METHODS:** A standard self-administered questionnaire was utilized to obtain pertinent information and a face-to-face interview was also conducted with the parents. Results of the academic performances were extracted from the students' report cards. The intellectual performance was assessed using Raven's Coloured Progressive Matrices. Physical examination was also conducted on these students by doctors.

**RESULTS:** Overall 905 students and 894 parents responded to the survey. Of these 83.6% were Ugandan, 11.6% Sudanese, and 4.2% Kenyan. The majority (82.9%) were from urban areas. The female: male ratio was 51:49; mean age was 9.71 years. The mean height and weight were 32.3 kg and 135.2 cm respectively. Their mean BMI was 17.42 kg/cm<sup>2</sup>, with 0.9% underweight, 76.3% normal BMI, 16.3% overweight, and 6.3% obese. Academic performance was significantly correlated with breast feeding, income and educational level of their parents, BMI, and whether they have been taking breakfast. There was a weak correlation between presence of anaemia and intellectual performance.

**CONCLUSIONS:** Improving the socio-economic status of the parents will lend a helping hand in the academic performance of the pupils. Since breast feeding is associated with better academic and intellectual performance it must be emphasized, particularly to expectant mothers.

**KEY WORDS:** Nutritional status, academic performance, children

## **ADDED SUGAR INTAKE AMONG YOUNG ADULTS IN SELECTED RURAL, PERI-URBAN AND URBAN AREAS OF LILONGWE IN MALAWI**

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**BACKGROUND AND OBJECTIVES:** There has been a significant increase in morbidity and mortality due to non-communicable diseases (NCDs) in low-, middle-income and affluent countries. In Malawi, 15% and 6% of women aged 15–49 years are overweight and obese, respectively. A further, 6% of adult men and women are diabetic while 33% are hypertensive. Despite clear relationships between increased added sugar intake and NCDs, limited research has been conducted in Malawi to quantify added sugar consumption. The objectives of the study were to determine total energy intake from added sugars among young adults in rural, peri-urban and urban areas of Lilongwe; and to assess consumer knowledge on dietary added sugar intake and health outcomes.

**METHODS:** A cross-sectional study design was employed to collect data from 94 men and women aged 20 to 40 years in the selected areas. Data on knowledge, attitudes and practices were collected using a semi-structured questionnaire. Dietary intake data were collected using an interactive 24-hour recall.

**RESULTS:** Of the 94 respondents, 93.6% had knowledge on the relationship between excessive added sugar intake and development of NCDs. However, only 28.7% reported reducing their intake to avoid NCDs, suggesting that having knowledge on the subject did not translate into change in attitudes and practices. Further, 12.1% of the respondents exceeded the limit of 10% intake recommended by the WHO, with higher proportions observed in peri-urban (17%) and urban (13.3%) areas.

**CONCLUSIONS:** The study findings imply that despite that the added sugar intake of a majority of respondents was within limits, interventions to impart knowledge on added sugars and health outcomes should be planned to necessitate behaviour change that would be helpful in keeping added sugar intake within recommended limits.

**KEY WORDS:** Added sugars, energy, non-communicable diseases

## **FATTY ACID PROFILES IN BEEF PRODUCED UNDER COMMUNAL PRODUCTION SYSTEMS: A PROPOSAL**

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**BACKGROUND AND OBJECTIVE:** Although meat fat is an important component of meat, the proportions of fatty acids largely determine meat quality. Globally, fatty acid profiles on beef has been extensively studied and continue to be of health concern. It is generally accepted that forage feeding increases the proportion of essential fatty acids such as Omega-3 and -6 and their bio-hydrogenation intermediates. However, a few studies have been conducted on meat produced on natural pasture. Unfortunately, communal production systems have fewer resources and may not necessarily achieve 'controlled' meat production. Furthermore, there is strong evidence that red meat consumption is related to several diseases such as type 2 diabetes and cardiovascular disease which increase the risk of disease burden in Africa. Therefore, this study is aimed at providing quantitative information on the benefits of fatty acids in beef meat produced under communal production systems on health and well-being of the human population.

**METHODS:** This study will be conducted in communal areas of Umzongwana near Matatiele, South Africa. 50g meat

samples will be sampled at slaughter, treated accordingly then analysed for fatty acids profiles and cholesterol levels.

**RESULTS:** Findings from this study are anticipated to compare favorably to the WHO recommendations. However, insufficient supplementation during winter may have a negative impact on meat quality. Furthermore, non-described cattle breeds and irregular slaughter weight and age may negatively affect the essential fatty acid profile.

**CONCLUSIONS:** Beef consumption has increased, marking an increase in dependency on meat as a source of fat. However, fat in beef has a number of health concerns. Unfortunately, these health risks mostly threaten the livelihoods of disadvantaged communities. Therefore, extensive research in fatty acid profiles of meat may assist in alleviating the disease burden in Africa.

**KEY WORDS:** Communal production systems, Meat quality, Fatty acids, Beef production

#### **EVALUATION OF NUTRIENTS, ANTI-NUTRIENT AND PHYTOCHEMICAL COMPOSITION OF PUMPKIN SEEDS AND LEAVES. (*Cucurbita pepo*)**

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**BACKGROUND AND OBJECTIVE:** Pumpkin leaves and seed are health promoting but underutilized foods. Their existence is currently under threat, due to neglect in some parts of Nigeria. The study assessed the nutrient, anti-nutrient and phytochemical properties of pumpkin seed and leaf, using standard methods.

**METHODS:** One kg each of pumpkin seed and leaves were purchased from the market. They were cleaned, washed and drained of water. The seed was de-shelled manually by hand, to bring out the seed and divided into two portions; A and B. Sample A was boiled and dried under ambient temperature, grounded into fine powder and packaged for analysis. Sample B was only washed and dried under room temperature, grounded to powder and packaged for analysis. The pumpkin leaves were divided into two portions, C and D. Sample C was blanched, using warm water, dried under ambient temperature, grounded into powder and kept for analysis. Sample D was also dried, grounded and packaged for analysis.

**RESULTS:** The result showed that, boiled pumpkin seed recorded highest in protein (32.09%), crude fiber (2.21%), potassium (173.04mg/100g), Iron (13.01mg/100g) and tannins (2.32mg/100g) in relation to the unboiled, with protein (28.14%), crude fiber, (2.21%), and potassium, (168.13mg/100g). The pumpkin seed unboiled had the highest magnesium value of 5.68mg/100g While, pumpkin leave blanched recorded least value of protein (2.04%) crude fiber (1.39%), potassium (3.97mg/100g,) magnesium, (2.03mg/100g,) and iron (9.55mg/100g). The blanched pumpkin leave had the lowest (0.08mg/100g) tannin value.

**CONCLUSIONS:** Pumpkin leaves are good sources of iron, calcium, potassium and manganese. The high potassium in pumpkin leaves and seeds makes it potentially useful in the diet of hypertensive patients. Adequate consumption of this plant leaf and seed, may help in the management of some Nutritional deficiencies.

**KEY WORDS:** Evaluation, phytochemicals, antinutrients, pumpkin.

#### **STUDY OF FACTORS RELATED TO THE CONSUMPTION OF COW'S MILK IN MOROCCO - AFRICA**

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**BACKGROUND AND OBJECTIVE:** Milk is an essential food in our diet. Several determinants intervene in the decision of purchase and the consumption of cow's milk in Africa. The aim was to determine the main factors which influence the consumption and purchasing decisions for cow's milk among adults of Moroccans of sub-saharan African origin.

**METHODS:** Data collection was collected by means of a questionnaire relating to socioeconomic status, health, consumption of the milk and the dairy products and their frequency.

**RESULTS:** Chi<sup>2</sup> test demonstrated that gender (p=0.008), age (p=0.01), marital status (p=0.007) and monthly income (p=0.025) are the sociodemographic and socioeconomic parameters which influence the consumption of milk among the subjects of our study.

**CONCLUSIONS:** Our study identified that sex, age, marital status, price and monthly income are the major determiners of consumption of cow's milk in Moroccan Africans.

**KEYWORDS:** Consumption, purchase, milk, Morocco, Africa.

## **PERSISTENCE OF LACTASE IN RELATION TO FOOD AND ENVIRONMENTAL ADAPTATION**

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Nearly 70% of the world's population is lactose intolerant, while the rest have been able to maintain significant lactase activity. This persistence of lactase results from a genetic mutation, the mechanism of which is still unclear. The decline of lactase activity depends on ethnic and geographical origin; this disparity in the persistence of lactase in the various regions of the globe suggests that this mutation has benefited from a very important positive natural selection. It may be influenced by the ancestral consumption of milk and dairy products which has allowed them to adapt to a diet rich in lactose. The persistence of lactase also represents a survival element in difficult environmental conditions.

**KEY WORDS:** Lactose, intolerance, Lactase, milk, Africa.

## **NUTRITIONAL STATUS, ANTIOXIDANT MICRONUTRIENT INTAKE AND HEALTH STATUS OF ELDERLY IN EFFUTU MUNICIPALITY, CENTRAL REGION, GHANA.**

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**BACKGROUND AND OBJECTIVE:** Nutritional deficiencies are associated with reduced quality of life in the elderly but very little data exist for Ghana. This study sought to assess nutritional status, dietary antioxidant micronutrient intake and relate them with health status of the elderly in the Effutu Municipality.

**METHODS:** Using a cross sectional design and multistage sampling, socio-demographic, dietary intake, nutritional and health status information were obtained from 150 elderly ( $\geq 60$  years) in Effutu municipality. Anthropometry, 24-hour dietary recall, food frequency, Biochemical indices (Total antioxidant Capacity and Hemoglobin) were assessed. Additionally, the Mini Nutritional Assessment (MNA) questionnaire was used. Blood pressure (B.P), anemia, visual and oral health were indicators of health status. Test of association and relationships were done using Student's t-test, Chi-square and Pearson's correlation.

**RESULTS:** Mean age, BMI and MNA score were  $69.7 \pm 7.2$ ,  $25.4 \pm 18.4 \text{ kg/m}^2$  and  $21.4 \pm 3.5$ , respectively. Mean calorie and protein intakes were  $1248.9 \pm 249$  kcal and  $204.7 \pm 40.8$ g, respectively. Mean vitamin A, Vitamin E and Vitamin C were  $1193.6 \pm 590$ ,  $4.0 \pm 1.79$  and  $63.3 \pm 24.5$ , respectively, while that of iron, zinc and calcium were  $8.11 \pm 1.95$ ,  $4.53 \pm 1.17$  and  $172.4 \pm 64.4$ . Twelve (12%) were malnourished and 66% at risk of malnutrition using MNA. Health status assessment revealed 39.3% anemic, 24.7% hypertensive and over 90% had various degrees of visual and/or oral disease. Significant associations were observed between nutritional and health status (p-value 0.009) but no associations were shown between excessive vitamin A and Iron intakes and visual impairment or prevalence of anemia. The odds of being anemic increased with undernutrition (OR=1.0, 95%CI, p-value= 0.009) and inadequate Vitamin C intake (OR=2.8, 95%CI, p-value=0.007). Hypertension was associated with 2.2 increased odds of having multiple oral disease (95%CI, p-value=0.015) and 2.3 increased odds of anemia (95%CI, p-value=0.012).

**CONCLUSIONS:** Anemia, hypertension and generally poor nutritional status was observed in the elderly population, and these were related with antioxidant intake and status.

**KEY WORDS:** Elderly, nutritional status, health, morbidity, dietary antioxidants

## **ASPERGILLUS AND AFLATOXIN CONTAMINATION OF GROUNDNUT (*ARACHIS HYPOGAEA* L.) AND FOOD PRODUCT IN EASTERN ETHIOPIA**

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**INTRODUCTION:** Groundnut (*Arachis hypogaea* L.) is an important cash and food crop in eastern Ethiopia. *Aspergillus* and aflatoxin contamination of groundnut and groundnut food products in the area is lacking. The study was to: assess major *Aspergillus* species and aflatoxins associated with groundnut seeds and "Halawa" (local cake) across different agro-ecological zones in eastern Ethiopia; and evaluate growers' management practices that promote fungal contamination.

**METHODS:** A total of 160 samples were collected from farmers' stores during 2013/14 and 2014/15 cropping season. Additionally 50 groundnut cakes collected from open market cafe and restaurant were included in the study. Species of *A.flavus* including L and S-strains, *A. parasiticus*, *A. niger*, *A. tamarii*, *A. caelatus* and *A. ochraceus* were identified.

**RESULTS:** *A. flavus* species was the most dominant followed by *A. parasiticus* in both seasons (2013/14 and 2014/15). Aflatoxin analyses from groundnut seed samples was performed using UPLC protocol; and 22.50 and 41.25 % from 2013/14 and 2014/15, respectively was positive. The level of aflatoxin concentrations from seed samples varied between 0.06 to 2526.31 ng g<sup>-1</sup> of B<sub>2</sub> and B<sub>1</sub>, respectively. In

infected seed samples aflatoxin B<sub>1</sub> was the most dominant followed by G<sub>1</sub>. In both seasons the high percentage of aflatoxin levels > 100 ng g<sup>-1</sup> was recorded from Babile district. The contaminated groundnut cake “Halawa”, 68 % samples exhibited aflatoxin concentration below 20 ng g<sup>-1</sup>, as high as 158.09 ng g<sup>-1</sup> aflatoxin B<sub>1</sub> recorded from Dire Dawa samples.

**CONCLUSIONS:** The study confirms high level contamination of groundnut seeds and cakes in East Ethiopia.

**KEY WORDS:** Aflatoxins, *Aspergillus*, groundnut, cake, Ethiopia.

#### **SCHOOL FOOD ENVIRONMENT AND SNACKING BEHAVIOUR OF PUPILS IN IFELODUN LOCAL GOVERNMENT AREA, OSUN STATE, NIGERIA**

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**BACKGROUND AND OBJECTIVE:** Snacking contributes to the burden of obesity and diet related non-communicable diseases, yet poor snacking habits prevail among school pupils. Efforts to improve snacking habits need information on school food environment and its influence on food choice. This study was designed to evaluate the relationship between school food environment and snacking habits of school pupils in Ifelodun Local Government Area, Nigeria.

**METHODS:** This mixed methods study involved six public schools, 422 pupils and primary education stakeholders. A semi-structured, interviewer-administered questionnaire was used to collect data on socio-demographic characteristics and snacking habits of pupils. In-depth interviews were conducted with 12 school heads/assistant, six food vendors and local inspector for education to evaluate policy and actions on school food environment. An observation checklist was used to assess the snacks

available within 500 meter radius to the school. Descriptive statistics was done using IBM SPSS version 20.0 and qualitative data analysed thematically.

**RESULTS:** Age of pupils was 10.7±1.8 years, 54.3% were males, 95.5% were Yorubas, and 31.6% received ≥N50.00 (≥\$0.15) daily pocket money. Majorly consumed snacks were nuts (79.2%), pastries (78.7%) and confectioneries (70.1%) and determinants were preference (35.2%), physical accessibility (30.3%), affordability (23.0%) and peer influence (11.5%). Stakeholders revealed that their actions were guided by school food policy and considered the school food environment health-promoting. Vendors' meals service were based on state approval and fruit was served once weekly. The checklist showed that the in-school environment was controlled, however, cheap unhealthy confectioneries and pastries are freely available around the school areas, and affect snacks choice of pupils.

**CONCLUSIONS:** The in-school food environment was considered healthy, however unhealthy options are readily accessible to pupils outside the school. Efforts to restrict access to unhealthy snacks within a defined distance to schools is required to promote health-promoting snacking behavior among school pupils.

**KEY WORDS:** Diet self-efficacy, self-efficacy, young adults, Nigeria

#### **COWPEA-WHEAT VALUE ADDED PRODUCTS DEVELOPMENT AND QUALITY EVALUATION**

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**INTRODUCTION:** The research was conducted with the aim to develop cowpea flour incorporated with wheat flour.

**METHODS:** The cowpea and wheat flour blends were prepared in five blending ratios; B1(90,10), B2(40,60), B3(65,35), B4(78,22), and B5(53,47)), respectively. D-optimal mixture design software was used for flour blend formulation. Biscuit and extrudet products from cowpea and wheat blends were analyzed. Quality characteristics parameter used for value-added products include physical, functional, proximate, mineral and microbial quality. Bioactive components and sensory quality evaluation were also investigated. The biscuit samples were prepared at baking temperature of 205°C for 10 minute holding time. The extrudet samples were also manufactured at feed moisture (18 and 21%), barrel temperature (100, 110 and 120°C) and screw speed (175 and 220 rpm).

**RESULTS:** Results for mineral analysis of biscuit (B3) and extrudet (Ex-3) samples revealed Ca (2.205, 6.601 ppm), mg (2.571, 1.887 ppm), Fe (0.836, 1.661 ppm) and Zn (1.386, 1.537 ppm), levels respectively. Microbial quality analysis of biscuit (B3) and extrudet (Ex-3) samples also showed aerobic bacteria counts of ( $44 \times 10^{-5}$ ,  $42 \times 10^{-5}$ ) and yeast and mold (un-detected, un-detected), respectively. The highest overall sensory evaluation of biscuit (B3) and extrudet (Ex-3) samples scores were 7.6 and 7.14, respectively.

**CONCLUSIONS:** Based on quality evaluation parameters, 35% cowpea blend ratio acceptable for biscuit making and manufacturing of extrudet.

**KEY WORDS:** Bole cowpea, wheat (mangudo), extrusion, biscuit, extrudet

#### **PREDICTORS OF ANEMIA AMONG CHILDREN AGED 6 – 59 MONTHS IN POPOKABAKA CITY, DR CONGO.**

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**BACKGROUND AND OBJECTIVE:** More than 71% of children aged 6 to 59 months in DRC are anemic. In DRC anemia is a serious public health problem according to the standards of the World Health Organization (WHO) and data on factors associated with anemia are limited. The aim of this study was to identify dietary, health and nutritional factors that influence the occurrence anemia in children aged six to 59 months in Popokabaka City.

**METHODS:** We conducted a cross-sectional study of children aged 6 to 59 months in this area. The variables collected at baseline were: (i) demographic questions of children (e.g., sex, age, weight, height, food intake, vaccination, vit A take), (ii) mothers socioeconomic status (e.g., educational level, employment, number of family members, age), (iii) household characteristics. Blood samples were used for testing of hemoglobin (Hb) and hemoglobin measurement was obtained in the field with the HemoCue. Household dietary diversity score, food consumption score and the household hunger score were built based on the food consumption, then the regression logistic was used to determine factors associated with anaemia.

**RESULTS:** Anemia (hemoglobin level  $<11.0$  g/dl) was detected in 65.6% of the 427 children sampled. Anemia was associated with religion (revival church), mother's occupation (farmer) and inversely associated with nutritional status. A multivariate model for the child's hemoglobin level revealed associations with good nutritional status (AOR: 0.4; 95% CI: 0.1 – 0.9,  $p=0.04$ ), and membership in a revival church (AOR: 1.6; 95 % CI: 1.1 – 2.7,  $p=0.05$ ).

**CONCLUSIONS:** Anemia / iron deficiency increased strongly with poor nutritional status and revival church membership among the study children. The data reveal the importance of targeting interventions promoting healthy dietary practices and providing nutritional and health counseling.

**KEY WORDS:** Anemia, hemoglobin, nutritional status, food consumption



## **ASSESSMENT OF IODINE AND SODIUM CONSUMPTION OF UNIVERSITY STUDENTS IN MOROCCO**

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**BACKGROUND AND OBJECTIVE:** High sodium consumption is a major risk factor for non-communicable disease. Meanwhile, iodine deficiency is still a public health problem in Morocco. In this study we aimed to assess both sodium and iodine intake in University students.

**METHODS:** This study was conducted at the Ben M'sik School of Sciences in Casablanca. A sample of 120 students aged between 18 and 25 years old was recruited and asked to collect their 24-hours urine samples in special. After collection of the samples, the total volume of each sample was recorded and 30 mL was collected and stored at -20 degrees for later analysis. Iodine, sodium, potassium, creatinine and magnesium were analyzed in a certified laboratory. Additional collected data consisted of anthropometric measurements of the participants.

**RESULTS:** Results of urinary excretion analysis in 40 people showed that 15 people are below normal, and 23 people have normal values, while 2 people exceed 300µg, which means an iodine overload. The 24-hour sodium excretion was 3.1 g / day, equivalent to 7.7 g salt / day; 9g in men and 8.4g in women. The analysis of the results of the study sample showed that 15,20% were consuming less than 5g/day of sodium chloride, while 84,8% were consuming more than 5g/day of which 17.1% consume more than twice the recommendations.

**CONCLUSIONS:** Iodine deficiency was found in 37% of our population. Furthermore, 84% were consuming more than 5g of sodium chloride, which necessitates awareness campaigns and policies to lower sodium consumption whilst promoting iodine intake. Considering that salt is fortified with iodine, such initiative could amplify the problem of iodine deficiency.

**KEY WORDS:** Iodine, salt, urine collection, anthropometry, 24h reminder, Morocco.

## **THE ROLE OF THE MEDIA IN FOOD NUTRITION PUBLIC AWARENESS CAMPAIGNS FOR COMMUNITY EMPOWERMENT IN AFRICA**

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**BACKGROUND AND OBJECTIVE:** The media have a social responsibility to create, raise, or sustain public awareness of the values, functions, and benefits of nutrition accessibility, through effective information dissemination of research. Our objectives are to: explain the social responsibility of the media to disseminate nutrition research and policy information; discuss the effectiveness of media advocacy communication for nutrition policy issues; explain community radio for empowering communities household access to nutrition health; and review the role of community media in promoting food and nutrition health policies, research communication, and nutrition outreach practices.

**METHODS:** In this policy analysis and a systematic review, we collated evidence from international regional, and national nutrition government policy in Uganda, research findings, case studies, and internet searches conducted on occupational therapy research, policies, and practices; in tandem with the social responsibility theory, and FAO policy briefs.

**RESULTS:** The preliminary findings are still too disappointing. They reveal key gaps between policy and

practice, lack of public awareness and knowledge are compounded by a disconnect between research outputs and policies; research communication and evidence of policy practice are wanting; stunted growth among over 40 % of children below 5 years, acute nutrition deficiency in tandem with lack of food security, uncoordinated stakeholders' communication, cultural barriers, and climate risks.

**CONCLUSIONS:** Effective media can create, raise, and sustain public awareness of nutrition policy, research outputs, and family nutrition good practice, or break cultural barriers to poor food habits. The media are vital for bridging the knowledge and practice gaps among the researchers, policy makers, practitioners, communities, private sector, or donors. South-South and North-South collaboration and coordination will support local institutional, household, or community capacity building efforts for sustainable nutrition access.

**KEY WORDS:** Media, community empowerment, awareness, policy research, Africa

## **SODIUM COMPOSITION OF PACKAGED BREAD IN MOROCCO**

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**BACKGROUND AND OBJECTIVE:** Food labeling is an important means of information for the consumer about food

composition of nutrients including sodium. In this study we aimed to collect data about sodium composition of packaged bread given that bread is a staple food in Morocco and an important source of dietary sodium.

**METHODS:** We identified the principal supermarkets and shopping outlets in Casablanca. We also identified the 53 bread products belonging to 13 brands and collected the nutritional data from the labeling and then compared them to the data from the WASH survey.

**RESULTS:** The analysis of 53 samples (13brands), showed that the amount of salt indicated on the product varies between 0.05g/100g and 2g/100g. If we consider that the individual daily intake of bread is 350 g, this would be the equivalent of 7g of salt per day, which -by itself- exceeds the recommendations of 5g/d. These results are in line with recent studies conducted by the World Health Action and Salt (WASH). Regarding the evaluation of salt in bread, only the packaged bread was analyzed for salt content and the results showed that its content according to WASH remains moderately salty compared to the different countries that participated in the study.

**CONCLUSIONS:** Reducing salt in bread is a simple and effective way to lower salt consumption in the entire population - research has shown that the salt content of bread can be reduced by 25% over 6 weeks and that consumers do not notice the difference.

**KEY WORDS:** Bread packaging, labeling, Morocco

## **EFFECTIVE COMMUNITY BASED CLIMATE CHANGE INFORMATION SERVICES FOR WOMEN'S ROLE IN PROMOTING FAMILY NUTRITION**

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**BACKGROUND AND OBJECTIVE:** Mainstreaming gender equality in climate information services is more effective when the role of women is infused into the promotion of household and community nutrition. The objectives are to:

explain the role of communication campaigns in climate information services women centred household nutrition access and stability; assess the benefits of climate services to food security and nutrition in local communities; and discuss gender analysis matrix theoretical framework for effective food production for household and community food nutrition security planning needs.

**METHODS:** Ugandan climate change, public communication, gender equality, agriculture, health, food and nutrition policies were analysed. Data triangulation approach was employed to assess good or best practice, policy analysis, WHO, and FAO policies on gender equality for women empowerment were documented with a focus food availability, food nutrition access, food utilization, and food nutrition stability at various levels of local family, community, national, sub-regional, and regional context

**RESULTS:** Nutrition awareness is still low in most communities. Women are more active in food production than men and their contributions to food and nutrition are manifested through gender analysis of the roles of men, women, girls, and boys to agriculture production. Gender analysis matrix promotes effective agriculture and food policy implementation because it helps to enhance the gender specific perspectives for enhanced household nutrition accessibility and stability.

**CONCLUSIONS:** Women continue to play a leading role in the production and stability of household, community, national, and regional food and nutrition situation. In view of the adverse climate change effects, women are playing a pivotal role promoting household food security through active participation in food production and services.

**KEY WORDS:** Africa, climate change, information, SDGs, nutrition access, Uganda

## BEYOND NUTRIENTS, HEALTH EFFECTS OF ENTOMOPHAGY: A SYSTEMATIC REVIEW

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**BACKGROUND AND OBJECTIVE:** Edible insects are good sources of proteins, minerals and essential fatty acids and contribute to daily requirements of these nutrients in several developing countries. However, there is a dearth of knowledge with regards to nutrient bioavailability for metabolic activities and adverse health effects associated with entomophagy. We conducted a systematic review to analyse existing data on the impact of edible insect consumption on human health.

**METHODS:** We analysed a total of 12 articles- two acceptability studies and 5 case reports on adverse health effects of insect consumption and 5 randomized controlled trials examining the health benefits of entomophagy among children under 5 years.

**RESULTS:** The two acceptability studies which assessed infant tolerance of cereal foods enriched with edible termites and caterpillars reported no incidence of adverse health outcomes such as diarrhoea, vomiting, stomach-ache, skin rashes and breathing difficulty during and after the studies. On the contrary, the 5-case series reported breathing difficulty, mild nausea, flushing, swelling of face and even Takotusbo cardiomyopathy in one case among individuals with and without histories of allergic shocks when they ingested. Regarding health benefits of entomophagy, the 5 trials reported improved iron status and growth in infants who were fed cereals fortified with termites and caterpillars but not spiders. One of the studies also recorded significantly high blood levels of arachidonic acid among infants who were fed on termite enriched cereals.

**CONCLUSIONS:** This review shows that the utilization of edible insects as food promotes desirable health outcomes, but caution must be taken to prevent allergic reactions in sensitive people.

**KEY WORDS:** Edible Insects, Human Health, Entomophagy, Nutritional Status, Anaphylactic Reactions

**CONTRIBUTION OF FAMILY FEEDING AND ADHERENCE TO READY-TO-USE-THERAPEUTIC-FOOD IN THE RECOVERY OF TWO GROUPS OF SEVERELY ACUTE MALNOURISHED CHILDREN AGED 6-59 MONTHS IN AMBULATORY CARE IN BURKINA FASO**

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**BACKGROUND AND OBJECTIVE:** The dosage of Ready-to-Use-Therapeutic-Food (RUTF) designed for hospital covers 100% of the needs of Severe Acute Malnutrition (SAM) children in ambulatory care until recovery. The current dosage of RUTF may provide more than is actually needed for achieving recovery. The desire to optimize the dose of RUTF is part of a wider effort to reduce the cost of treating SAM treatment. This food intake study is embedded within a Randomized Controlled Trial (RCT) called MANGO conducted in the Eastern region of Burkina Faso, in Fada N'Gourma district. It aims at comparing a reduced dose of RUTF after 2 weeks of normal dose, to standard dose. The present food intake study is unique, and aims to determine the impact of family foods on treatment outcomes as well as adherence to RUTF prescription.

**METHODS:** The food intake study includes a 24-hour recall over the last day among 600 children in total. In addition in-depth individual interviews on practices around RUTF consumption are conducted, and observations of food preparation at home will be ensured to assess local recipes.

Samples of the local recipes will undergo biochemical analyzes to quantify their energy and nutritional value.

**RESULTS:** The proportion of energy and nutritional value from family foods for both groups will help conclude about the safety and effectiveness of a reduced RUTF dose for this population. The level of adherence to the prescribed RUTF diet on the outcomes of treatment will improve current SAM management protocols.

**CONCLUSION:** This study will determine the impact of family foods on SAM treatment outcomes in ambulatory care and the possibility of reducing the amount of RUTF. Practices and perceptions on the use of RUTF will help rethink SAM management taking in account families practices.

**KEYWORDS:** Severe Acute Malnutrition, Children under 5, Ready-to-Use-Therapeutic-Food, Family feeding, Food Intake, Adherence, Burkina Faso

**CAPACITY BUILDING IN DIETARY MONITORING AND PUBLIC HEALTH NUTRITION IN THE EASTERN MEDITERRANEAN REGION**

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**BACKGROUND AND OBJECTIVE:** Similar to Western Countries, the Eastern Mediterranean Region (EMR) also presents major public health issues associated with increased consumption of sugar, fat and salt. Therefore, one of the policies of the World Health Organization's (WHO) EMR is to reduce the intake of salt, sugar and fat (Saturated fatty acids, trans fatty acids) to address the risk of non-communicable diseases and obesity. The project objective is to assess status and provide training and capacity development in the use of improved standardized methodologies for updated food composition data, dietary intake methods, use of suitable biomarkers of nutritional value and determine health outcomes in low and middle-income countries (LMIC).

**METHODS:** Training exchanges have been developed with clusters of countries created including: Sudan, Egypt and Jordan; Tunisia, Morocco, and Mauritania; and other Middle Eastern countries.

Workshops were organized to provide training and capacity development in the use of improved standardized methodologies for food composition and food intake. Training needs identified and short-term scientific missions organized for LMIC researchers including (1) training and knowledge exchange workshops, (2) short-term exchange of researchers, (3) development and application of protocols and (4) development of strategies to reduce sugar and fat intake.

**RESULTS:** An initial training workshop, Morocco 2018 was attended by 25 participants from 10 EMR countries to review status and support development of regional food composition. 4 training exchanges are in progress.

**CONCLUSIONS:** The use of improved standardized methodologies for food composition and dietary intake will produce robust measurements that will reinforce dietary monitoring and policy in LMIC. The capacity building from this project will lead to the development and sustainability of

up-to-date national and regional food composition databases in EMR countries.

Supported by the UK Medical Research Council, Global Challenges Research Fund, (MR/R019576/1), and World Health Organization's Eastern Mediterranean Region.

**KEY WORDS:** Reduction, fat, salt, capacity building, food composition, methodology, EMRO

#### **EATING HABIT, NUTRITIONAL STATUS AND EFFECT OF NUTRITION EDUCATION ON NUTRITION KNOWLEDGE OF MEDICAL STUDENTS IN A NIGERIAN UNIVERSITY**

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**BACKGROUND AND OBJECTIVE:** Lack of good nutrition knowledge is a major contributor to unhealthy food choices among students, which consequently affects their nutritional status and overall health. Nutrition education is a viable tool for improving nutrition knowledge, facilitate dietary behaviour change, as well as medium to deliver nutrition information among students. The study was aimed at assessing food habit, nutritional status and effect of nutrition education on nutrition knowledge of medical students of University of Ibadan.

**METHODS:** The study was descriptive cross-sectional in design, involving a total of 202 consenting 500 and 600



Level Medical students of University of Ibadan, Ibadan, Nigeria. Information on socio-economic and demographic characteristics, nutrition knowledge, eating habit, food frequency, 24-hour dietary recall and anthropometric parameters of respondents were collected using pre-tested, semi-structured, self-administered questionnaire pre- and post-intervention. The experimental group (500 Level students) was given nutrition education while 600 Level students served as control. Data were analysed using descriptive statistics, Chi square test and regression at 5% level of significance.

**RESULTS:** Mean age of respondents was  $22.68 \pm 2.37$  years. Many (49% 500L, 39% 600L) respondents skipped breakfast and had snack in between meals. Mean nutrient intake of experimental group was higher than that of control. Most respondents had inadequate intake of vitamins and minerals, 4.9% & 7% were underweight, 69.6% & 82% had normal weight, 23.5% & 7% were overweight, and 2% & 4% were obese in experimental and control groups respectively. There was no significant difference ( $p > 0.05$ ) in knowledge score of both groups pre-intervention, but significantly higher ( $p < 0.05$ ) in experimental group post-intervention.

**CONCLUSION:** Nutrition education significantly improved nutrition knowledge and eating habit of the medical students; hence, cascading this intervention among other levels of medical students will improve their nutritional habits and status considerably.

**KEYWORDS:** Nutrition education, Nutritional status, Eating habit, Medical students.

#### **CHALLENGES AND OPPORTUNITIES IN DESIGNING WEEKLY IRON AND FOLIC ACID SUPPLEMENTATION PROGRAMS FOR ADOLESCENT GIRLS IN AND OUT OF SCHOOL IN KENYA**

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**BACKGROUND AND OBJECTIVE:** Kenya has an anaemia prevalence rate of 16% and 22% among younger (10-14 years) and older adolescent girls (15-19 years) respectively, with regional disparities of up to 25%. A quarter of girls get pregnant by the age of 18 years and 47% by 20 years. Yet, despite the WHO recommendation for weekly iron folic acid supplementation (WIFS), national policies and operational guidelines are lacking and the WIFS program is not being implemented. Our objective was to design a demonstration program informed by context specific formative research, to assess feasibility of delivery platforms that could inform national scale up to reach adolescent girls in and out of school system in Kenya.

**METHODS:** Formative research study was conducted in 2017 to identify the contextual opportunities for reaching adolescent girls with WIFAS and key factors that could influence coverage and adherence. Purposive sampling guided the selection of adolescents, teachers, community and religious leaders, health workers and policy makers. Qualitative research methods were used to conduct focus group discussions (45), in-depth interviews with adolescent girls and (36) key informant interviews with selected influencers such as community and religious leaders, health workers and policy makers from national and 3 regional administrative units (counties). Interviews were recorded on audio-capturing devices, transcribed and translated into English for final coding and analysis. Data analysis was done through a designed analytical and coding framework themed to match corresponding areas of inquiry.

**RESULTS:** Adolescents are a target audience with distinct segments based on age, school attendance and social status. Due to low access for preventative services through the health system, the delivery of WIFAS through the school system was the most efficient platform for reaching most girls. Engagement of teachers, peers and school attendance will be greatest influencers on coverage and adherence. Reaching out-of-school girls with health extension workers

will be more resource and time intensive. WIFAS benefits that motivate adolescent girls are related to current school performance, strength and health, and body image rather than future reproductive potential.

**CONCLUSIONS:** Reaching adolescent girls with WIFAS requires collaboration with the health and education sectors. Awareness of anemia is relatively high, but misconceptions are common. Impact requires overcoming gendered barriers to school attendance and youth-specific barriers to the health system, while also recognizing the specific motivators of diverse adolescents in each country.

**KEY WORDS:** Adolescent nutrition, anemia, WIFAS, formative research, program design

#### **KNOWLEDGE AND PERCEPTIONS ON ANAEMIA AMONG ADOLESCENT GIRLS AND THEIR KEY INFLUENCERS IN KITUI, NAKURU AND BUSIA COUNTIES IN KENYA.**

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**BACKGROUND AND OBJECTIVE:** Anaemia in adolescents is associated with micronutrient deficiencies resulting in retarded growth, poor school performance and poor physical activity. Weekly Iron and Folic acid Supplementation (WIFS) is recommended as a public health measure in adolescent girls where anemia is highly prevalent. To introduce WIFS in Kenya, Nutrition International (NI) conducted a formative study aimed at investigating the perspectives of adolescent girls and other relevant social influencers, to help design effective Behavior

Change Intervention (BCI) strategies to increase knowledge on prevalence and benefits and promote compliance of WIFS uptake.

**METHODS:** Qualitative research methods were used to conduct 45 focus group discussions with adolescent girls and 36 in-depth interviews with key informants selected influencers such as community and religious leaders, health workers and policy makers from national and 3 regional administrative units (counties). Interviews were recorded on audio-capturing devices, transcribed and translated into English for final coding and analysis. Data analysis was done through a designed analytical and coding framework themed to match corresponding areas of inquiry.

**RESULTS:** Knowledge of anaemia was low including causes, symptoms and prevention. Most of respondents thought anaemia only affected very young children, pregnant mothers, and the very old. We also analysed the values, positive influences, barriers, emotional appeals, and perceptions of adolescent girls in regards to their body image. Older girls (15-19 years and some peers excelling in their studies were considered role models for the younger girls (10-14 years) and are therefore key in behaviour change. Good behaviour and completing school were seen as key to success in future and a key aspiration for all the girls regardless of age. We noted differences in values and perceptions across cultures as well as the social status. Other than education, girls also value how they present and are perceived by others and therefore good health, good grooming, style and dressing were seen as important. Girls are influenced by mothers at household level and peers, teachers and health workers at community level. Culture, religious beliefs, placement, knowledge and cost were cited as barriers for uptake of WIFs.

**CONCLUSION:** Formative studies provide important context-specific information useful in developing evidence-based BCI strategies to address knowledge gaps in target populations. The evidence from this study was used to develop a campaign dubbed 'Anza kufeel poa' (start to feel good) incorporating the aspirations and desires of adolescent girls as enhancers of messaging for positive behavior change.

**KEY WORDS:** Formative study, qualitative, knowledge, perceptions, behavior change

## **HEAVY METALS AND NUTRIENTS ANALYSIS OF SOIL AND CROPS GROWN AROUND A MUNICIPAL DUMP SITE**

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**BACKGROUND AND OBJECTIVE:** Environmental pollution became a global threat within the 19th century with the overwhelming large scale of industrial activities. Environmental pollution by heavy metals, even if detected at low concentrations is of major health concern all over the world due to its long term cumulative health effects. Heavy metals occurrence in the soil for instance has grave consequences on the plant grown on it. The metals bi accumulate in the plants and subsequently move down the food chain. Healthy soil is therefore the basis for healthy plants for production of food crops which are healthy for consumption in both quality and quantity.

**METHODS:** The study was conducted on a normal farmland (control) and a waste dumpsite (test) in Omoko, a community in Ikwerre Local Government Area, Rivers State, Nigeria. Soil and food crop samples (*Telferia occidentalis*, *Talinum triangulare*, *Zea mays*) were collected from the two sites. Heavy metal and mineral concentrations of the soil and crop samples were determined by Atomic Absorption Spectrophotometry (AAS). Proximate composition, vitamin composition and amino acid composition of the selected

plant species were determined using Association of Official Analytical Chemist (AOAC) Standard Analytical methods.

**RESULTS:** The concentration of heavy metals (mg/kg) in test and control soil were lowest for mercury(Hg): 0.0006; 0.0003 and highest for Aluminium(Al) 5.32; 3.85. The mineral concentrations in mg/kg of the soil samples in test site showed high levels of Phosphorus (P)(109.4), Iron(Fe)(108.9) and lowest concentration of Chromium(Cr)(0.02). Heavy metal and mineral concentration in the plant samples from test site were higher when compared to control site with high levels of As(0.0013 and 0.0012mg/kg) in *Telferia occidentalis* and *Zea mays* respectively.

**CONCLUSIONS:** The concentration of all heavy metals, minerals determined were below the tolerable limits recommended by WHO and Federal Environmental Protection Agency (FEPA) but there is need for further monitoring since the inhabitants depend on such area for farming.

**KEY WORDS:** Pollution, heavy metals, accumulation, tolerable limit

## **COMPARATIVE STUDY OF NUTRIENT, ANTI NUTRIENT COMPONENTS AND ACCEPTABILITY OF AFRAMOMUM SCEPTRUM AND ZINGIBER OFFICINALE) SPICED BANGA SOUPS**

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**BACKGROUND AND OBJECTIVE:** Most indigenous spices which contribute flavour and aroma to food are underutilized and whilst studies have been carried out on recognised spices, little attention is given to the indigenous ones. The study was carried out to compare the nutrient, anti-nutrient composition and acceptability of *Orioma* (*Aframomum scepstrum*) seed and Ginger (*Zingiber oficinale*) flavoured *Banga* soup.

**METHODS:** *Orioma* (*Aframomum scepstrum*) seed, ginger (*Zingiber oficinale*) and other ingredients were purchased from a local market in Umuahia, Abia State, Nigeria, and used in preparation of *Banga* soup. The samples: *Orioma* seed, Ginger, *Banga*-*orioma* soup, *Banga*-ginger soup and *Banga* soup prepared without any of the spices (control) were analysed for their chemical composition using standard methods of AOAC; Acceptability of the soups was carried out using a 9-point hedonic scale. Data were analysed using Analysis of variance (ANOVA) with statistical significance at  $p < 0.05$ .

**RESULTS:** *Orioma* seed to contained higher amounts of macronutrients, minerals and vitamins B1 and B3 than Ginger. Cooking significantly reduced most of the nutrient content of the soups ( $p < 0.05$ ). However, *Banga*-*Orioma* soup retained more minerals and vitamin B1. *Banga*-Ginger soup retained more macronutrients and most of the vitamins. The anti-nutrient content of the samples were found to be generally low. Sensory evaluation showed *Banga*-*Orioma* soup was more accepted for Aroma, Taste and general acceptability than *Banga*-Ginger soup.

**CONCLUSION:** The use of *Orioma* seed as a spice in soups and some dishes should be promoted as it could contribute towards meeting human macro- and micro-nutritional needs.

**KEY WORDS:** *Orioma* seed, ginger, *Banga* soup, spices.

## NUTRITIONAL EVALUATION OF COCOYAM FORTIFIED WITH SOYBEANS IN PRODUCTION OF EBIRIPO

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**BACKGROUND AND OBJECTIVE:** Fortified meals serve useful purposes for improving nutrient deficiency when adequate nutrients cannot be obtained from a single foods. This study was conducted to determine the proximate composition and sensory properties of fortified *ebiripo* (a meal from cocoyam).

**METHODS:** Ordinary Cocoyam was used to produce Sample A (the unfortified food product) which served as control, Cocoyam and Soybean flour were then blended in a ratio of 90:10, 80:20, 70:30, 60:40 and 50:50 to produce the fortified meal labelled as Samples B, C, D, E and F respectively. The proximate composition was determined using Association of Official Analytical Chemists (AOAC, 2004) official method and sensory attributes of the *ebiripo* were determined using 25 trained panelists

**RESULTS:** Crude protein, crude fibre and ash content of fortified *ebiripo* increased with progressive increase in the proportion of soy flour, with sample F ratio 50:50 having the highest values of 25.71%, 3.11% and 4.81% respectively as compared to the control. Also, the moisture, crude fat and carbohydrate content of fortified *ebiripo* decreased, compared to sample A (control). A significant difference was observed in the sensory attributes of *ebiripo* produced with soy flour at various concentrations and 100% Cocoyam based on their appearance, texture, taste, aroma/flavor and over all acceptability.

**CONCLUSIONS:** Fortifying cocoyam with soy flour to produce *ebiripo* improved its nutritional value and sensory attributes. Fortification of indigenous foods rich in carbohydrate with soy bean can help combat malnutrition in developing countries like Nigeria.

**KEY WORDS:** Cocoyam meal, Ebiripo, Soybean, Fortification

#### **EFFECTS OF BORASSUS AETHIOPUM BREAD ON METABOLIC RISK PARAMETERS OF GHANAIAN CARDIOVASCULAR DISEASE OUTPATIENTS: A PILOT INTERVENTION STUDY**

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**BACKGROUND AND OBJECTIVE:** Dyslipidaemia and hypertension are leading causes of morbidity and mortality in cardiovascular diseases (CVDs) patients. The objective was to evaluate the effects of *Borassus aethiopum* bread on metabolic risk parameters among Ghanaian CVDs outpatients.

**METHODS:** A single blinded randomized placebo-controlled trial was conducted by administering borassus bread (150g) and indistinguishable placebo (150g bread) daily to 122 CVD outpatients for 90 days. The participants were divided in 1:1.1 ratio to receive borassus bread (n=63) and placebo (n=59). Efficacy was assessed by measuring weight, BMI,

waist circumference (WC), metabolic age, visceral fat (VF), blood pressure, and biochemical parameters; Total Cholesterol (TC), Triglycerides, High-density lipoproteins (HDL), Low-density lipoproteins (LDL) at baseline and end of study. Sociodemographic, and medication usage of participants were assessed.

**RESULTS:** There was no significant difference in BMI, metabolic age and VF for both groups, but a significant reduction in WC was observed in intervention group before (Male: 90.5±13.6, female: 102.0±15.1) and after (male: 88.4±13.6, female: 99.9±15.7, p=0.0047, all in cm) the study. Also, compared with control group, the experiment group had significant lower mean systolic and diastolic blood pressure in third (p-value=0.002; p-value=0.005) and fourth reading (p-value=0.009; p-value= 0-.005) respectively. There was significant reduction in TC, LDL and HDL before (TC: 5.9±1.1 mmol/L, LDL: 3.4±1.1 mmol/L, HDL: 2.2±0.5 mmol/L) and after the intervention (TC: 4.9±1.1 mmol/L, LDL: 2.8±0.9 mmol/L, HDL: 1.5±0.4 mmol/L) in experiment group (TC: p-value=0.001, LDL: p-value=0.016, HDL: p-value=0.000), but no significant values in control group.

**CONCLUSIONS:** The borassus bread significantly reduced levels of systolic and diastolic blood pressure, TC and LDL in CVD patients during the 90 days study period. There was improvement in waist circumference and BMI, reflecting overall benefits for CVD patients. The metabolic effect of the borassus bread could beneficially help in management of cardiovascular disease and other chronic diseases and merits further investigation.

**KEY WORDS:** Metabolic parameters, cardiovascular diseases, borassus bread

#### **RESILIENT MORINGA: A CROP FOR SUSTAINABLE NUTRITION, HEALTH, AND AGRICULTURE IN AFRICA**

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**BACKGROUND AND OBJECTIVE:** Nutrients and isothiocyanates (ITCs) formed in the leaves of *Moringa oleifera* (MICs) have potential to provide chemically stable, low-cost, and sustainable diet-based therapeutic agents to prevent and treat malnutrition, chronic inflammation, and related metabolic conditions in developing countries. Plant-produced ITCs are known to convey cytoprotective and anti-inflammatory activity by affecting several intercellular pathways including induction of Phase II detoxifying enzymes. In addition to moringa's nutrient density and sustainable cultivability, MICs confer unique physical and chemical properties, rendering them relatively stable compounds unlike other ITCs formed in cruciferous vegetables.

**METHODS:** A simple extraction/biotransformation was developed to convert moringa glucosinolates into MICs resulting in a food-grade moringa concentrate (MC) that contains approximately 3% MICs by dry weight. MC, and MICs purified by high pressure liquid chromatography, were evaluated for thermal stability, anti-inflammatory activity invitro, and anti-diabetic and anti-obesity properties in vivo.

**RESULTS:** Our studies showed MICs can significantly decrease inflammatory cytokine expression in macrophages and reduce glucose production in liver cells more effectively than SF. The animal study showed using a 5% MC supplementation in a very high-fat diet decreased weight gain by 20%, improved blood glucose metabolism, reduced the appearance of fatty liver, and decreased circulating levels of insulin, leptin, inflammatory cytokines, cholesterol, and triglycerides compared to the control mice.

**CONCLUSION:** Our phytochemical analysis and mechanist studies further support the use of moringa for its nutritional,

cytoprotective and therapeutic effects. These data suggest MC to be a promising dietary agent for pathological states related to malnutrition and chronic inflammation. Ongoing work in Kenya to develop best practices for sustainable cultivation of moringa, combined with further animals studies, will provide a conceptual framework to support further pre-clinical and clinical studies for dietary integration of MC.

**KEY WORDS:** Moringa, nutrition, inflammation, diabetes, isothiocyanates

## **AFLATOXIN DETECTION IN FOODS, TOXICITY TO HUMAN AND ANIMAL, PREVENTION AND REGULATION**

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**BACKGROUND AND OBJECTIVE:** Mycotoxins are fungal toxic metabolites that naturally contaminate food and feeds including grains and nuts such a corn sorghum, cotton seeds, peanut, cereals; fruits, oil seeds, dried fruits, cocoa, spices and beer in the field and during storage. Among the more than 300 known mycotoxins, aflatoxin represents the main trait worldwide. Aflatoxin when ingested, inhaled or adsorbed through the skin, has carcinogenic, hepatotoxic, teratogenic, and mutagenic effects in human and animals. It is also linked to edema of feet, jaundice, Reye's syndrome,

kwashiorkor, hepatitis, hypertension, impaired growth and immunosuppression in humans.

**METHODS:** Literature was reviewed extensively on the detection method, enabling factors for aflatoxin growth, and statistics on toxicity to humans and animals. Prevention strategies as well as set permissible limits by nations and organizations were reviewed.

**RESULTS:** Several methods such TLC, HPLC, and immunoassays over the years have been developed for the screening, detection and quantification of AFs in food and feeds. Measures to reduce AF contamination include good agricultural practices such as early harvesting, proper storage, and insect management. Aflatoxins are regulated in over 80 countries, but their legislation is not yet harmonized at the international level. There are different classifications and regulations for the toxins. The European Union (EU) has the most rigorous regulation concerning mycotoxins in foods. The permissible limits for AFB1 and total AF in foods are 5 and 10µg/kg respectively in most countries around the world while they are 2 and 4 µg/kg in EU. The maximum residual for AFM1 in milk is set at 0.05 µg/kg(50ppt) for all EU member states and 0.025µg/kg(25ppt) for baby food.

**CONCLUSIONS:** The danger posed by aflatoxins to both human and animal health calls for harmonization of regulation and legislation on acceptable limits in food and food products susceptible to aflatoxin contamination. The scientific community needs to create more awareness of its dangers.

**KEY WORDS:** Mycotoxin aflatoxin, contamination, permissible limit.

**CREATING DEMAND FOR WEEKLY IRON AND FOLIC ACID SUPPLEMENTATION AMONG ADOLESCENT GIRLS IN ETHIOPIA, KENYA AND TANZANIA BY IDENTIFYING KEY MESSAGES USING A BEHAVIOUR CHANGE COMMUNICATION THEORY-BASED APPROACH.**

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**Background and objective:** Weekly Iron and Folic acid Supplementation (WIFS) is recommended as a public health intervention in adolescent girls where anemia is highly prevalent. To introduce this intervention in Ethiopia, Kenya & Tanzania, Nutrition International (NI) developed Behavior Change Intervention (BCI) strategies using a theory-guided approach to increase knowledge on prevalence, risk barriers, benefits and promote sustained uptake of WIFS among adolescent girls.

**Methods:** Using formative research in Ethiopia and Kenya and a rapid assessment in Tanzania, we determined there was high awareness of the term anemia, but knowledge gaps around risks for adolescents, causes, symptoms and prevention. We concluded that the health belief model (HBM) of behavior change was suitable in addressing knowledge gaps and motivation messages towards the desired behavior.

**RESULTS:** We developed 3 unique BCI strategies for each of Kenya, Ethiopia and Tanzania to generate demand and support for the introduction of WIFS for adolescent girls. Plus a comprehensive package of information to address knowledge gaps and context-specific messages on susceptibility and seriousness of anaemia to girls, the health benefits of WIFS, how to overcome barriers, specifically gendered barriers. We added messages to build the confidence in the use, and aligned messages to emotionally appeal to adolescents. We pretested with target audience and influencers, and revised and validated with key stakeholders before production and dissemination.

**CONCLUSION:** An evidence- based and behavior change theory guided approach in BCI strategy provides effective method for responding to the communities involved and

addressing knowledge and motivation gaps for adaption of behaviors that contribute to improved nutrition.

**KEY WORDS:** Behaviour change, Evidence based approach, Messages, Improved outcomes

#### **KNOWLEDGE, ATTITUDE AND PRACTICES TOWARDS SUNLIGHT EXPOSURE AMONG MOTHERS VISITING PUBLIC HOSPITALS IN HARAR TOWN, 2018**

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**BACKGROUND AND OBJECTIVE:** Inadequate sunlight exposure predispose to Vitamin D deficiency, impaired bone mineralization, ultimately causing rickets in children and osteomalacia in adults. This study assessed knowledge, attitude and practice of mothers towards sun light exposure on infants attending selected public hospitals, at Harar town, eastern Ethiopia 2018.

**METHODS:** Institutional based cross sectional study was carried out on randomly selected sample of 382 Mothers who had infants in two public hospitals. The data were collected using structured and pre tested questionnaires by face-to-face interview. The data were processed and analyzed using SPSS Version 21.0 and presented in descriptive way. The knowledge and Attitude score was assessed using the mean knowledge score to classify as good knowledge and positive attitude towards sunlight exposure.

**RESULTS:** From the 382 mothers, 331 (86 %) of the mothers have knowledge about proper sunlight exposure and has positive attitude towards it and 314 (82.2%) of them has good practice on proper sun light exposure for their infants.

**CONCLUSIONS:** knowledge and attitude of mothers was satisfactory but it is not universal.

**KEY WORDS:** knowledge, attitude and practice on infant sun light exposure.

#### **BODY FAT PERCENT PREDICTION EQUATION AS A SEROGATE MARKER OF OBESITY AMONG ETHIOPIAN ADULTS**

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**BACKGROUND AND OBJECTIVE:** Determination of body fat generates clinically useful indicators to predict morbidity risks in people with obesity and enables optimization of preventive and therapeutic interventions. But use of advance body composition measurement methods may not be feasible in low income setups due partly to the cost of the facilities compounded with their unavailability. Developing a simple and cost effective surrogate marker is very critical to prevent the looming obesity and associated NCDs in developing countries. Although the Caucasian prediction equation was used to predict body fat percent as alternative, evidence show that it is not universally appropriate to all ethnic groups. This study was carried out to validate the Caucasian prediction equation and generate appropriate body fat prediction equation for Ethiopian adults based of local data.

**METHODS:** The study was conducted from February 2015 to April 2015 among 704 randomly selected adult employees of Jimma University representing different ethnic groups. Ethiopian body fat percent (BF%) prediction equation was developed using multivariable linear

regression model with Measured BF% as dependent variable and age, sex and body mass index as predictor variables. Air displacement plethysmography (ADP) measured body fat percent was compared with body fat percent estimated using Caucasian prediction and Ethiopian prediction equations. Bland Altman plot was used to determine the agreement between measured and predicted body fat percent.

**RESULTS:** Overall, the Caucasian prediction equation underestimated body fat percent by 6.78( $P<0.0001$ ) in both sexes, while the value was higher among males (7.21,  $P<0.0001$ ) than females (6.45,  $P<0.0001$ ). Difference between measured BF% and that estimated using Ethiopian overall prediction equation was not significantly different for both sexes and the different age groups ( $P>0.05$ ) except for Amhara and Yem Ethnicities. Body fat percent measured with ADP and estimated using Ethiopian Ethnic specific prediction equation were not significantly different ( $P>0.05$ ). Bland Altman plot showed poor agreement between BF% measured and estimated using Caucasian prediction equation (Mean difference =6.7825) and some of the points were outside 95% confidence interval. There was good agreement between BF% measured with ADP and BF% estimated using Ethiopian Prediction equation with mean difference close to zero (Mean difference=0.0055) and most points within the 95% confidence interval. Ethnic specific prediction equation performs even better in estimating BF% among Ethiopian adults.

**CONCLUSIONS:** The Caucasian prediction equation significantly underestimates body fat percent among Ethiopian adults. The Ethiopian overall prediction equation can be used as a very simple cheap effective alternative for estimating body fat percent among Ethiopian adults for health care provision and research purposes. For the Amhara and Yem, Ethnic-specific predictions should be used to better predict their body fat percent.

**KEY WORDS:** Body fat, predication equations, Caucasian, Ethiopian

## **OPTIMAL CUT-OFF FOR OBESITY AND MARKERS OF METABOLIC SYNDROME IN ETHIOPIAN ADULTS**

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**BACKGROUND AND OBJECTIVE:** Obesity and metabolic syndrome are emerging problems of both low and middle income countries, although they have been the leading causes of morbidity and mortality in high income countries in past decades. It has been indicated that the international anthropometric cut-off for detecting obesity is not appropriate for Ethiopians. This study developed optimal cut off values for anthropometric indicators of obesity and markers of metabolic syndrome for Ethiopian adults to enhance preventive interventions.

**METHODS:** A total of 704 employees of Jimma University were randomly selected using their payroll as a sampling frame. Data on socio-demographic, anthropometry, clinical and blood samples were collected from February 2015 up to April 2015. Receiver operating characteristic curve analyses were used to determine optimal anthropometric cut-offs values for obesity and components of the metabolic syndrome. WHO indicators of obesity using body fat percent of 25% for males and 35% for females were used as binary classifiers for developing anthropometric cut-offs. The optimal cut-off values were presented using sensitivity, specificity and area under the curve.

**RESULTS:** The optimal cut-off for diagnosing obesity using body mass index was 22.2kg/m<sup>2</sup> for males and 24.5kg/m<sup>2</sup> for females. Similarly, the optimal cut-off of waist circumference for detecting obesity was 83.7cm for males and 78 cm for females. The cut-off values for detecting obesity using waist to hip ratio and waist to height ratio were: WHR (0.88) and WHtR (0.49) for males, while they were 0.82 and 0.50 for females, respectively. Anthropometric cut-off values for predicting the components of metabolic syndrome were



lower compared to the international cut-off. The normal range for BMI was set to be 18.3 to 20.8 kg/m<sup>2</sup> for males and 20.6 kg/m<sup>2</sup> to 21.8 kg/m<sup>2</sup> for females.

**CONCLUSIONS:** The international cut-off for WC, WHtR, WHR and BMI underestimate obesity and metabolic syndrome components among Ethiopian adults. This should be considered in developing intervention strategies. WC and WHtR are better indicators of metabolic syndrome components in both men and women. It is recommended to develop guidelines based on the cut-off values for better assessment of obesity and associated non-communicable diseases in Ethiopia.

**KEY WORDS:** Obesity, Cut-off, metabolic syndrome, Ethiopia

#### **RESPONSIVE FEEDING AS A KEY DETERMINANTS OF ENERGY AND NUTRIENT INTAKES FROM COMPLEMENTARY FOODS: DEFINING KEY MESSAGES AND NEED FOR QUANTITATIVE ASSESSMENT**

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**BACKGROUND AND OBJECTIVE:** In order to satisfy the nutritional requirements of young children, a complementary food (CF) eaten in addition to breast milk should exhibit a high nutritional quality after preparation under the as-eaten form, but also should be eaten in sufficient quantities. In poor settings where undernutrition is highly prevalent, reduced appetite is widespread among children under two years and intakes per meal are below the assumed gastric capacity of 30g/kg body weight/meal that was used to establish recommendations. To address this issue, it is important to establish a conceptual framework of intake determinants and to specify their quantitative effects. Several studies have already highlighted the effect of some CF characteristics, such as energy density, but less studies have focused on the effects of feeding style.

**METHODS:** Two observational studies were carried out in rural settings of Amhara region in Ethiopia and Alaotra Mango region in Madagascar with respectively 106 and 101 mother-9 to 12 month-old infant pairs. A standard commercial fortified complementary food was provided to mothers for the preparation of porridge. Videos of mother and their children were recorded during a morning porridge meal. Feeding behaviours (FB) of mothers were coded into responsive, active, self-feeding, social and distraction categories, either positive when it increased infants' intakes, or negative when it had a negative effect on intakes.

**RESULTS:** Responsive positive FB were observed in 35 and 51 % of mothers in the study sites in Ethiopia and Madagascar respectively, and active positive FB, in 67 and 92% of mothers. In both settings, the presence in mothers of responsive positive, but not active positive FB was associated to higher energy intakes ( $p < 0.05$ ).

Thorough observations of videos suggested some key messages that could be used to promote responsive feeding in such settings.

**CONCLUSIONS:** Studies investigating the effects of the promotion of responsive feeding on intakes on the long term are required.

**KEY WORDS:** Feeding style, infant and young child feeding, reduced appetite, intakes

#### **FEEDING PRACTICES AND FACTORS FOR CHILDREN UNDER FIVE YEARS OF AGE IN MUSANZE DISTRICT, RWANDA**

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**BACKGROUND AND OBJECTIVE:** Under-nutrition is the major cause for stunting and wasting in children under five years, resulting in impaired physical and mental development. A survey was aimed at evaluating feeding practices for children less than five years in Musanze District in order to know practices and factors that influence under nutrition in Musanze District in order to identify nutrition gaps where the university will focus in nutrition intervention.

**METHODS:** A cross- sectional study was conducted with the structured questionnaire that was administrated to the total number of 392 households having under 5 year children.

**RESULTS:** Around 84.1% of respondents knew the period of breastfeeding before introducing complementary food to infants as six months. It was also found that 82.2% of mothers breastfed their children exclusively and every time the child wanted. However, 34.7% of respondents reported to have challenges for breastfeeding. 98.6% of assessed children have good growth conditions, even if there is always the need of improving these conditions to eliminate under-

nutrition. Regarding the food given to children, 60.4% of respondents were giving a special diet to their children and 39.6% reported to share the family meal with their children. Major factors contributing to feeding practices have been nutrition education on these feeding practices and knowing a balanced diet to be able to prepare an adequate special food for children under five years of age in Musanze District

**CONCLUSIONS:** There is a need for continuing to sensitize different stakeholders about the importance of nutrition education to improve feeding practices, promoting the consumption of nutritious foods and fortified staples and investment in strategies that tackle the causes of under-nutrition.

**KEYWORDS:** Stunting, under-nutrition, feeding practices, breastfeeding, complementary feeding.

#### **IMPACT OF COMMUNICATION FOR DEVELOPMENT-C4D IN ENSURING SUCCESS TO A CONTROVERSIAL NUTRITION DEVELOPMENTAL PROGRAMME IN A RESOURCE-LIMITED SETTING: THE MANDATORY FOOD FORTIFICATION CASE OF ZIMBABWE**

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**BACKGROUND AND OBJECTIVE:** Food fortification is a unique developmental intervention, delivered by for-profit food manufacturing companies for a human need. Zimbabwe implemented mandatory food fortification but the programme halted due to resistance by food manufacturing



companies. Commitment to invest in a humanitarian cause was low, resulting in two government-targeted lawsuits. The aim of this paper is to illustrate impact of C4D to ensure success on national developmental programme.

**METHODS:** A multi-stakeholder C4D campaign on food fortification was conducted for six months through a Private-Public Partnership mechanism. Strategies to amplify community voices, modern social-marketing and shift negative attitudes of key programme drivers were employed. A social marketing company previously utilized by food companies was the key campaign driver. Public voices were amplified in the ten provinces in response to 100 nationwide dance edutainment roadshows, 12 local radio stations, 4 national newspapers with a reach of 1,1million readers, social media messages and IEC/BCC distributed to 4 113 000 people, a C4D public discussion live-streamed on the UNICEF-Facebook page, 300 school visits, 300 Ladies Group and Church shows. Education demonstrations were conducted by a team known as "FBI- Fortification Benefit Informers." High level advocacy was conducted with the Minister of Health as the key driver.

**RESULTS:** Over four million people were reached with messages and demonstrations on food fortification during the six-month campaign. Positive attitudes were expressed by opposing food manufacturing companies in response to demand by consumers- 100% of sugar and 90% cooking oil and 50% milling companies initiated fortification processes. Social and Behaviour Change Communication delivered through public-private partnerships improved reception of messages by the public. In response to education messages and demonstrations of how food fortification works, 200 000 consumers responded mainly through social media demanding for food fortification and this motivated key manufacturing industries to commit to the programme.

**CONCLUSIONS:** Beyond strong nutrition governance C4D strategies ensure success in public-private partnership nutrition developmental programmes. Social marketing of fortified products by private companies was used to market a nutrition intervention, a practice that can be applied to developmental interventions that include a tangible marketable product by resourced private sectors.

**KEYWORDS:** C4D, food fortification, public-private-partnership

## **WATER USE EFFICIENCY OF LOCAL AMARANTH AS AFFECTED BY TIMING AND APPLICATION METHODS OF FERTILIZER MICRO-DOSING**

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**Background and objective:** Previous studies conducted on fertilizer micro-dosing focused on cereals-based cropping systems and led to promising productivity results. Efforts are underway to adapt the technology to other high value crops such as African indigenous leafy vegetables. The recommended hill placement method of application for cereals would not be a viable option with vegetables given their high planting density.

**Methods:** To test the potentials of alternative application methods, a field experiment was performed in northern Benin using a randomized complete block design to evaluate the effects of five nitrogen rates (0, 20, 40, 60 and 80 kg N ha<sup>-1</sup>, respectively coded N0, N20, N40, N60 and

N80), two application dates (0 (d1) and 14 (d2) days after transplanting) and three application methods (broadcast, hill and strip application) on biomass yield and water use efficiency (WUE) of local amaranth. All plots received manure (5t ha<sup>-1</sup>) during bed preparation except those intended to highest level of N (N80).

**Results:** The broadcast micro-dosing method performed equally, with the strip and hill placement application enabling to save time and labor while guarantying biomass yield and WUE. Early timing of urea application also gave equal performance like the two weeks after transplanting one, giving farmers a considerable slot of time for an effective application. Nitrogen application significantly increased biomass yield and WUE. Significantly higher biomass yield and WUE were obtained with N60. Biomass yield for N0, N20, N40 and N60 were 77%, 122%, 165% and 247% higher than that of N80, respectively. WUE for N0, N20, N40 and N60 were 75%, 118%, 161% and 236% higher than that of N80, respectively.

**CONCLUSION:** These results suggest that broadcast micro-dosing, at transplanting of up to two weeks after transplanting, on Local amaranth is a valuable option to increase biomass yield and WUE.

**KEY WORDS:** micro-dose, *Amaranthus cruentus*, leafy vegetable, manure, yield, broadcast

#### **MALNUTRITION, ANAEMIA AND ITS RISK FACTOR AMONG RURAL SCHOOL CHILDREN IN WONAGO DISTRICT, GEDEO ZONE, SOUTHERN ETHIOPIA**

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**BACKGROUND AND OBJECTIVE:** Malnutrition is a major problem affecting children, adolescents and adults in Africa. There are few studies done on nutritional status and

anaemia among school children from South Ethiopia. The aim of this study was to assess the prevalence and risk factors for malnutrition and anaemia in the Wenago district in South Ethiopia.

**METHODS:** A random sample of 864 school children from the Wenago district was included in this survey using multi stage sampling. Measurements such as weight, height and haemoglobin were made. Information about socio-demographic characteristics, household assets, hygiene, food insecurity, and information and past child illness was collected from parents or guardians. Stool test for intestinal parasite was also made. Epi-data version 3.1 was used for data entry, WHO AnthroPlus was used to calculate nutritional indices, and the data was analysed using SPSS software.

**RESULTS:** The mean age was 11.4 years (range 7-14); 55.9% (483) were boys. Prevalence of stunting was 32.3% (278 of 861 children) and wasting was 9.9% (85 of 861 children). The odds of either stunting or wasting were 2.87 times higher in boys compared to girls [AOR: 2.87 (95% CI: 1.33, 6.24) and children using treated water at home were 62.6% less likely to be wasted or stunted [AOR: 0.374 (95% CI: 0.15, 0.91). The prevalence of anaemia was 18.4% (149 of 810) among children. The odds of anaemia was 2.18 times higher among children not able to eat a kind of food they preferred [AOR: 2.18 (95% CI: 1.35, 3.51). Children who did not wash their hands after latrine use were 2.81 times more likely to be anaemic [AOR: 2.81(95% CI: 1.42, 5.59). Children with hookworm infection were 2.95 times more likely to become anaemic [AOR: 2.95 (95% 1.37, 6.34).

**CONCLUSIONS:** The prevalence of stunting and anaemia was high among school children in South Ethiopia. Boys and children not using treated water had higher risks of stunting or wasting. Children not able to eat a kind of food they preferred, who never wash hands after latrine use, and who had hookworm infection had higher risks of anaemia.

**KEY WORDS:** Wasted, Stunted, Anaemia, School children, Southern Ethiopia

## **IMPLEMENTING A MULTI-SECTORAL FOOD FORTIFICATION INITIATIVE IN ECSA REGION: EXPERIENCES AND LESSONS**

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**BACKGROUND AND OBJECTIVE:** ECSA-HC in collaboration with GAIN and USAID, worked with 13 countries to strengthen capacity to monitor the quality and safety of fortified and nutritious foods. Through the established regional platform, the project facilitated capacity building, networking and collaboration to enhance food safety and quality.

**METHODS:** The project was implemented through a consultative approach whereby multi-sectoral stakeholders from ECSA countries and beyond were consulted leading to formation of the four technical working groups. Members of the TWGs came from the government ministries, regulatory authorities, academia, private sector, development partners and other regional organizations. The TWG thematic areas: Production, QA/QC and Food Safety; Inspection and Enforcement; Laboratory Networking and Consumption Monitoring and Program Impact each chaired by experts from regional or partner organization.

**RESULTS:** The initiative facilitated identification of regional and national priorities in relation to strengthening monitoring of fortified and nutritious foods and acceleration of food fortification programs. The project facilitated learning, knowledge exchange and expertise from multi-sectoral experts; review and harmonization of manuals for food quality control and inspection and establishment of a regional laboratory proficiency network. Countries were enabled to undertake consumption and impact monitoring activities, laboratory testing of micronutrients and QA/QC

aspects; and inspection and enforcement practices. The private sector contributed to identification of opportunities and priorities towards advancing the food fortification programs.

**CONCLUSIONS:** A harmonized regional approach is essential in addressing the existing knowledge and capacity gaps at national and regional levels. Greater efforts are needed to strengthen regional coordination and support the capacity building efforts for effective monitoring of quality and safety of locally produced fortified and nutritious foods.

**KEY WORDS:** Food Fortification, Regional Approach, Multi-sectoral, Capacity

## **NUTRITIONAL STATUS, ANTIOXIDANT MICRONUTRIENT INTAKE AND HEALTH STATUS OF ELDERLY IN EFFUTU MUNICIPALITY, CENTRAL REGION, GHANA.**

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**BACKGROUND AND OBJECTIVE:** Nutritional deficiencies reduce quality of life in older adults but very little data exist for Ghana. This study sought to assess nutritional status, dietary antioxidant intake and association with health status in older people in Effutu Municipality, Ghana.

**METHODS:** Using a cross sectional design and multistage sampling, socio-demographic, dietary intake, nutritional and health status information were obtained from 150 respondents ( $\geq 60$  years). Anthropometry, 24-hour dietary recall, food frequency, Biochemical indices (Total Antioxidant Capacity and Haemoglobin) were assessed. Additionally, Mini Nutritional Assessment (MNA) questionnaire was used. Blood pressure (B.P), anemia, visual and oral health were indicators of health status. Test of association and relationships were done using Student's t-test, Chi-square and Pearson's correlation.

**RESULTS:** Mean age, BMI and MNA score were  $69.7 \pm 7.2$ ,  $25.4 \pm 18.4 \text{ kg/m}^2$  and  $21.4 \pm 3.5$ , respectively. Mean calorie and protein intakes were  $1248.9 \pm 249$  kcal and  $204.7 \pm 40.8 \text{ g}$ , respectively. Mean vitamin A, Vitamin E and Vitamin C were  $1193.6 \pm 590$ ,  $4.0 \pm 1.79$  and  $63.3 \pm 24.5$ , respectively, while that of iron, zinc and calcium were  $8.11 \pm 1.95$ ,  $4.53 \pm 1.17$  and  $172.4 \pm 64.4$ . Twelve percent (12%) were malnourished and 66% at risk of malnutrition using MNA. Assessment of health status revealed 39.3% anemic, 24.7% hypertensive and over 90% had various degrees of visual and/or oral disease. Significant associations were observed between nutritional and health status (p-value 0.009) but no associations showed between vitamin A and Iron intakes and visual impairment or anemia prevalence. Hypertension was associated with 2.2 increased odds of having multiple oral disease (95%CI, p-value=0.015) and 2.3 increased odds of anemia (95%CI, p-value=0.012). The odds of being anemic increased with inadequate Vitamin C intake (OR=2.8, 95%CI, p-value=0.007) and reduced with well-nourished (OR=0.685, 95%CI, p-value=0.009) unlike with undernutrition (OR=1.0, 95% CI, p-value=0.009)

**CONCLUSIONS:** Anemia, hypertension and generally poor nutritional status were observed in older adults and were related with antioxidant intake and status.

**KEYWORDS:** Elderly, nutritional status, morbidity, dietary antioxidant

## **A REVIEW OF THE STEWARDSHIP OF INSECTS AS COMPLIMENTARY NUTRITIOUS FOOD RESOURCES IN SUB-SAHARAN AFRICA**

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**BACKGROUND AND OBJECTIVES:** Edible insects are gaining popularity as alternative food resources in the face of climate change and increasing carbon and environmental footprints associated with conventional agricultural production. Among the positive attributes that make insects suitable food and feed substrates include rapid reproduction, high energy conversion efficiency, wide distribution, diversity and high nutritional composition. In Sub-Saharan Africa (SSA), considerable data exists on use of insects as food. However, coherent policies regarding safety, sustainability, trade and regulation of insects as food are lacking.

**METHODS:** This study reviewed policies with some relation to edible insects for 10 selected countries with >10 edible insect species in East, West, Central and Southern African. Policies considered for review in relation to edible insects were restricted to biodiversity, natural resources, culture, education, research, technology development, trade, gender, health and nutrition. Policy documents were accessed through publications, government documents, online databases and grey literature.

**RESULTS:** Adequate policy and institutional frameworks exist in SSA countries to support an emerging edible insect sector based on exploitation of wild insect resources. These

policies however don't give specific reference to edible insects although these species are invariably encompassed in the general policy statements. Policy contents show lack on the awareness by SSA governments on the need to boost captive rearing of insects as a way for alleviating poverty through development of robust value chains based on edible insects as food. There is evidence of lack of regulatory framework for most SSA countries.

**CONCLUSIONS:** There is strong evidence of already existing successful case studies on the good stewardship of edible insect use in SSA based on wild populations. These case studies and already existing policy frameworks can be used as platforms to lobby governments to implement structured interventions to support the sustainable use on insects of food.

**KEY WORDS:** Edible insects, policy, Africa, stewardship

#### **EVIDENCE-BASED DECISION-MAKING FOR NUTRITION POLICY AND PROGRAMME FORMULATION IN ETHIOPIA: A QUALITATIVE STUDY EXPLORING BARRIERS AND FACILITATORS**

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**BACKGROUND AND OBJECTIVE:** Policies and programs are the articulation of commitment to act on major problems like malnutrition. However, having a policy in place does not assure that the policy objectives are achieved. Evidence generation, advocacy for evidence use and proper utilization is important in shaping government policy for nutrition and health to enhance use of evidence. The main aim of this study is to describe existing pathways on utilization of evidence and to identified barriers and facilitators in formulating nutrition policy and program decisions in Ethiopia.

**METHODS:** A key informant interview was conducted among the most influential 30 key stakeholders identified during December 14, 2017 stakeholder mapping workshop prior to the data collection. The data analysis is conducted using five stage qualitative framework analysis approach using NVIVO 11 software.

**RESULTS:** Even though government demand is perceived to exist and increased over time, there are perceptions of critical capacity gaps translating research findings into policies and program. Decision-makers perceived, they don't not have enough information about ongoing research especially research that comes from universities. Many of ongoing research are perceived not based on priority research agendas of the country. Majority of evidence users looking for grey literature rather than published literature and assess the quality of the research by looking the method section, the reputation of the research institution and names of researcher. Main barriers of evidence utilization include poor quality especially student's thesis, weak linking of research findings to action, poor coordination, limited resources, lack of access, delay timelines and reporting. Evidence demand, existing institutional structure, partners' growing interest in investing on nutrition, and improved dissemination practices are key facilitators.

**CONCLUSIONS:** Strong coordination and enough resource allocation is needed to create a platform and maintain the



quality of research for a better utilization of evidence to inform program and policy decision in Ethiopia.

**KEY WORDS:** Evidence, Decision-makers, Nutrition Policy, Ethiopia

### **MINERALS CONTENT OF EDIBLE CATERPILLARS USED FOR ENRICHMENT OF GRUELS FOR INFANTS AND YOUNG CHILDREN IN CENTRAL AFRICAN REPUBLIC (CAR)**

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**BACKGROUND AND OBJECTIVE:** Central African Republic has recorded the highest rate of chronic malnutrition over the last 3 decades, with 40% of prevalence among children under five (MICS IV, 2016). Among the causes is an episode of severe acute malnutrition with complications such as parasitic and / or acute respiratory infections, diarrhea and malaria leading to iron deficiency anemia. Traditional approach of solutions envisaged is to improve infants and young child feeding during weaning to provide nutrients for its growth and psychomotor development. Recent research results show that a *multimix* flour made from local foods, is an asset and important in nutritional and economic terms for the parent-child. The

focus of this project aims to use a preventive approach as solution for formulate a child gruel using local products and a better knowledge of the edible caterpillars.

**METHODS:** HADAMARD 'experimental designs method has led to 12 infant gruel formula based on 7 ingredients: *maize, cassava, peanut, mango, orange albedo, sweet banana, and caterpillars Imbrasia*. Ingredients were lyophilized and powdered. Mixture is used to prepare 12 gruels which were analysed for texture (Texture profile analysis), proteins (Kjeldahl, LC – MS), lipids (CPG – MS), vitamins (HPLC) and minerals (ICP – AES).

**RESULTS:** A specific research identified an interesting mineral profile of *Imbrasia*: 1, 01 mg/L of *Calcium*, 0, 34 mg/L of *Iron*, 1, 60 mg/L and of *Magnesium*. *Multimix* flour will offer 600 kcal / 3 meals of 250g each which will covering child nutritional needs.

**CONCLUSIONS:** The evidence has shown that Magnesium helps to fix Calcium on bones. These results will contribute to decrease Anemia and underweight rate for children under five that use *multimix* flour henceforth called *KoulouMix* in local language *Sango* that we are seeking for manufacturing.

**KEYWORDS:** Children, Chronic malnutrition, Multimix flour.

### **EXPLORING THE USE OF INDIGENOUS KNOWLEDGE SYSTEMS IN NUTRITION COMMUNICATION AMONG MARGINALIZED COMMUNITIES**

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**BACKGROUND AND OBJECTIVES:** Indigenous knowledge has continued to receive increasing recognition as an important aspect of development especially among marginalized communities. However, the paucity of information on indigenous knowledge systems especially in the field of nutrition, agriculture and health has greatly hindered its utilization in realizing positive nutrition outcomes among these communities. With this study therefore, we examine the local knowledge system surrounding nutrition, agriculture and health as well as the attitudes and perceptions related to it and explore its possible use in nutrition communication and education.

**METHODS:** We gathered relevant information through narratives and songs by community members, twelve gender disaggregated focus group discussions and eleven expert interviews. Recurring elements were coded into themes and analyzed in accordance to Lasswell's model.

**RESULTS:** Our findings indicate that basic information about nutrition is available in the community and the participants are aware of possible consequences of a poor diet. However, external factors like availability or affordability were reasons for the current situation of undernutrition. The community enjoys listening to narratives especially from the elders or at least a member of the community. Although not many nutrition-related messages could be found in the gathered narratives, they still represented a good tool for future interventions, as it is easy for the local population to understand messages delivered within narratives. External knowledge might be perceived as a threat to local traditions and NGOs are primarily seen as deliverers of goods and not information. Only for certain topics, like agricultural production, information from outsiders was welcome. It became evident, from the expert interviews that men have to be included in nutrition interventions as they are the main decision makers in the households.

**CONCLUSIONS:** The findings demonstrate that indigenous knowledge systems are key in nutrition communication and education in populations living within marginalized areas.

**KEY WORDS:** Indigenous knowledge, nutrition communication, community, attitudes

#### **CONSUMPTION PATTERN OF NEGLECTED AND UNDERUTILIZED VEGETABLES AMONG RURAL HOUSEHOLDS IN AKINYELE LOCAL GOVERNMENT AREA, IBADAN, NIGERIA**

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**BACKGROUND AND OBJECTIVE:** Vegetables constitute a major portion of the human diet worldwide as sources of micronutrients, dietary fibre and phytochemicals. Some indigenous vegetables have become neglected/underutilized in Nigeria despite their great potential in food and nutrition security. The study assessed consumption patterns of neglected/underutilized green leafy vegetables among rural households in Akinyele Local Government Area (LGA), Ibadan, Nigeria.

**METHODS:** A descriptive cross-sectional study was carried out among 220 women living in rural households in Akinyele

LGA. Information on socio-demographic characteristics and frequency of vegetable consumption of respondents was collected using pre-tested, semi-structured, interviewer-administered questionnaire. Data was analysed using descriptive statistics and Chi square test at  $p < 0.05$ .

**RESULTS:** Mean age of respondents was  $44.69 \pm 17.97$  years, 34.5% had no formal education, 30.5% had primary education, 50.9% were petty traders, 12.7% farmers, 50.5% earned between 10,001 – 30,000 naira, while 40.9% earned less <10,000 naira monthly. Few respondents know, have seen and ate *Solanum scarbrum* (7.3%), *Moringa* (26.4%), *Solanum americanum* (35.0%), *Launea taraxacifolia* (31.4%), *Crassocephalum rubens* (30.9%), *Senecio bialfræ* (41.8%) from all vegetables studied. Many respondents consume *Senecio bialfræ* (42.7%), *Crassocephalum rubens* (53.6%), *Telfaria occidentalis* (28.2%), *Launea taraxacifolia* (40.5%), *Solanum americanum* (41.4%) and *Solanum macrocarpon* (27.7%) once a month and 65.0%, 30.0%, and 59.1% has not consumed *Solanum scarbrum*, *Occimum gratisimum*, and *Moringa* respectively in the last one month. Most (96.4%) of the respondents reported seasonal nature of the vegetables affects their consumption. Few (4.5%), 83.6% and 11.8% of respondents had low, medium and high dietary diversity score respectively. No significant association existed between dietary diversity score and consumption of neglected/underutilized vegetables ( $p > 0.05$ ).

**CONCLUSIONS:** Consumption of neglected/underutilized green leafy vegetables was low among the respondents. There is need for nutrition education on the importance of underutilized vegetables as a means of improving dietary diversity and nutritional status of consumers.

**KEY WORDS:** Green leafy vegetables, Neglected/Underutilized vegetables, Rural households, Nutritional status

## **NUTRITION KNOWLEDGE, DIET QUALITY AND ANTHROPOMETRIC CHARACTERISTICS OF PUBLIC PRIMARY SCHOOL TEACHERS IN LAGOS STATE, NIGERIA**

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**BACKGROUND AND OBJECTIVE:** Intake of adequate diet does not occur by instinct rather it is achieved or learned through experience that grows out of knowledge and appropriate selection of food. It is therefore pertinent to understand how nutrition knowledge among teachers influences their diet quality and anthropometric characteristics as these could influence teachers' health, and their role in nutrition mentoring of pupils. We examined the nutrition knowledge, diet quality and anthropometric characteristics of public primary school teachers in Lagos state, Nigeria.

**METHODS:** A semi-structured, interviewer-administered questionnaire was used to obtain information on socio-demographic, nutrition knowledge, dietary intake and anthropometric characteristics of 379 teachers from the three geopolitical zones in Lagos state, Nigeria. Knowledge on micronutrients and macronutrients was categorized as good ( $>49$ ), fair (25-48) and poor ( $<24$ ). Diet quality was determined using Diet Quality Index International from 24-hour dietary recall. Anthropometric measurements were used to assess body mass index using standard procedure. Data was analysed using descriptive statistic and Chi-square test at  $\alpha 0.05$ . SPSS version 20.0 was used for quantitative data analysis.

**RESULTS:** Age of respondents was  $39.9 \pm 7.9$  years, 50.9%, 64.4% and 57.0% were males, married and National Certificate of Education holders respectively. Majority (94.5%) ate three meals/day, 10.3% consumed alcohol and



1.1% smoked cigarette. Only 13.7% and 86.3% had good and fair nutrition knowledge respectively. Majority (68.1%) and 30.6% had high and medium diet quality respectively. About 50.0% were overweight and 11.3% had obesity grade 1. About 66% of respondents with good nutritional knowledge had high diet quality, and there is a strong association between nutrition knowledge and body mass index.

**CONCLUSIONS:** Nutrition knowledge and diet quality of public school teachers were strongly associated with their body mass index. Nutrition education of teachers needs to be strengthened to enhance health and productivity.

**KEY WORDS:** body mass index, nutrition knowledge, diet quality, primary schools

#### **THE NUTRITIONAL STATUS OF CHILDREN AGED <5 YEARS IN KHARTOUM STATE, SUDAN**

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**BACKGROUND AND OBJECTIVES:** Malnutrition is a condition of impaired development or function caused by either a long-term deficiency or excess in energy and/or nutrient intake. Of all population groups, children are most

seriously affected by malnutrition which may undermine investments in education, health and other development sectors. The current study aimed to assess the nutritional status of hospitalized children (< 5 years) and determine the possible risk factors associated with their nutritional status.

**METHODS:** A cross-sectional study was conducted in Omdurman Teaching Hospital, Sudan between January-June 2017. Hospitalized children with various diseases were selected. Venous blood (3 ml) was collected from the cubical vein or the back of the leg, mixed and centrifuged to obtain plasma for the analysis of total protein, albumin, magnesium (Mg), iron (Fe), zinc (Zn) and C-reactive protein (CRP). Body weight, length/height, mid upper arm (MUAC) and head circumferences (HC) were measured twice following standard protocols. Factors such as immunization, living in displaced areas and mothers' education were assessed for their association with nutritional status. Data was analysed using WHO Anthro Program version 3.2 and SPSS version 21.

**RESULTS:** Patients (n = 250) aged 5-60 months were included. Of these, 140 (56%, Mean age = 21.7±11.4 months) were boys and 110 (44%, Mean age = 17.5±11.3 months) were girls. Most of the children aged between 5 and 20 months. Girls had normal weight-for-age, HC, MUAC compared to boys who were severely underweight, microcephalic and had very low MUAC. Both boys and girls were severely stunted. Girls had normal serum protein-for-age, normal Mg, Zn and higher CRP whereas very low serum Fe and albumin levels. On the other hand, boys had lower than normal serum protein-for-age, Fe, Zn and albumin levels but normal Mg and higher CRP. Immunization, living in a displaced area, breastfeeding practices and mothers' education affected the children's nutritional status negatively.

**CONCLUSIONS:** Nutrition programs should be targeted towards children in displaced areas focussing on nutrition education, immunization, breastfeeding practices.

**KEY WORDS:** Malnutrition, biomarkers, anthropometrics, Sudan, children < 5years.

## **ANALYSING THE ESSENTIALS OF PROGRAM DESIGN AND IMPLEMENTATION OF NUTRITION PROGRAMS IN AFRICA USING THE EXAMPLE OF RIGHT START PROGRAM IN 4 COUNTRIES IN AFRICA**

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**BACKGROUND AND OBJECTIVE:** Interventions mitigating maternal and child malnutrition and mortality continue to be the focus of a number of governments of developing countries and development partners. Implementation science seeks to understand how these interventions work to achieve the desired outcomes. Nutrition International (NI) is implementing Right Start program which is composed of interventions that address the health and nutrition of children, adolescent girls and women. We analyze the critical elements that were considered for Right Start program design and implementation.

**METHODS:** We reviewed the program design and implementation plans and through theoretical deduction identified eight essentials that were considered in the design and implementation of the Right Start program in Africa., namely: 1) enabling environment; 2) magnitude of need and program eligibility; 3) intervention package; 4) understanding context and designing contextually relevant strategies; 5) global targets & program targets; 6) implementation research; 7) theory of change; and 8) scalability of program. We also assessed how these elements fit into the five domains of implementation science -object of implementation; implementing organizations; enabling environment; individuals, households,

communities and community actors; and implementation process.

**RESULTS:** Outputs from the eight identified components include: A stakeholder analysis that describes the enabling environment; landscape analysis, situation assessment, formative research, and/or baseline surveys that define the scope of the need and program eligibility; the package of interventions designed by considering proven interventions and using contextually relevant strategies; program targets set in line with global targets; implementation research questions; logic models, performance measurement frameworks, monitoring and evaluation plans designed to define and measure the theory of change; and lastly scale up, exit and/or sustainability plans proposed to ensure that Right Start package of interventions is implemented at scale. The assessment of fit to the five implementation science domains revealed that 50% of the elements focus on the implementation process; 25 % on the object of implementation; 12.5% on the enabling environment and another 12.5% on individuals, household and communities. None of the essential elements focuses on the organizational characteristics or staff of the implementing organizations.

**CONCLUSIONS:** Implementers should systematically analyze the components they consider in implementation and compare with implementation science frameworks. We recommend that frameworks proposing domains of implementation should ascribe weights to guide implementers on the relative importance of each domain.

**KEY WORDS:** Program design, Program implementation, Implementation science

## **SENSORY PROFILE AND CONSUMER ACCEPTABILITY OF FUFU PRODUCED FROM YELLOW-FLESHED CASSAVA ROOTS**

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**BACKGROUND AND OBJECTIVE:** Biofortification of staple crops such as cassava is a food-based approach that has been adopted to address micronutrient deficiencies. However, biofortification might alter the sensory attributes of food products and influence consumer acceptability. This study examine the sensory profile and consumer acceptance of biofortified *fufu* in Sierra Leone.

**METHODS:** Quantitative descriptive analysis was used to determine the sensory profile of the 28 *fufu* samples using 10 trained panelists who developed and evaluated 13 *fufu* descriptors. In the consumer testing, 400 consumers evaluated the acceptability of five selected *fufu* samples using a 5 - point hedonic scale. The samples included six genotypes of yellow-fleshed and one genotype of white cassava roots, processed into *fufu* using conventional (oven and sun dried) and traditional (bowl and river) methods. Data were analyzed using means which were then separated by Duncan's multiple range test. Principal component analysis (PCA) was also performed to summarize the sensory characteristics of the samples.

**RESULTS:** Significant differences ( $p < 0.05$ ) in all the scores for the various *fufu* attributes. The first two PCA with Eigen values of 6.6326 and 2.0797 accounted for 67.02% of the variance and the effects of processing methods were clearly revealed by the PCA. The consumer acceptability result revealed significant differences ( $p < 0.05$ ) among the various

yellow *fufu* samples relative to the control (white *fufu*). The mean values ranged from 2.66 to 4.29 for colour, 2.57 to 4.05 for taste, 2.73 to 3.91 for aroma, 2.90 to 3.89 for texture, 2.74 to 4.06 for appearance and 2.67 to 3.99 for the overall acceptability.

**CONCLUSIONS:** The consumers preferred the white *fufu* samples for the overall acceptance. Public awareness and promotion of biofortified *fufu* into the food system of Sierra Leone is recommended.

**KEYWORDS:** Cassava roots, Consumer acceptability, Sensory profile, Yellow-fleshed

## **MODELING THE POTENTIAL OF FORTIFIED BISCUITS TO ADDRESS VITAMIN A, FOLATE, AND VITAMIN B12 DEFICIENCIES AMONG YOUNG CHILDREN IN CAMEROON**

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**BACKGROUND:** Processed snack foods such as biscuits are often fortified with micronutrients (MN) on a voluntary basis, but the potential contributions of these products to addressing inadequate nutrient intake are unknown. We modeled the impacts on nutrient adequacy among young children in Cameroon of biscuits fortified with vitamin A (VA), folate, and vitamin B12.

**METHODS:** In a nationally representative survey stratified by macro-region (North, South, and Yaoundé/Douala), 24-h dietary recall data were collected from 843 children 12-59 mo. We simulated total MN intake under various scenarios using observed biscuit intake and different amounts of VA (200-600µg RAE/100 g of biscuit), folic acid (46-300µg), and vitamin B12 (0.74-2µg) in fortified biscuits. Usual intake distributions and prevalence of inadequate intake for each scenario were estimated using the National Cancer Institute method.

**RESULTS:** Baseline (considering only natural food sources) prevalence of inadequate intake was 52.7% for VA, 47.1% for folate, and 82.9% for vitamin B12 nationally, and varied by macro-region. In general, vitamin-fortified biscuits were predicted to have the greatest impact on intake in the urban macro-region. Biscuits fortified with VA (500 µg RAE/100g of biscuit), folic acid (300µg/100g), and vitamin B12 (2µg/100g) were predicted to reduce the prevalence of inadequate VA, folate, and vitamin B12 intakes by 9.6, 11.9, and 4.2 percentage points (pp), respectively, in Yaoundé/Douala, but differences at the national level were < 5 pp. When VA-fortified oil (12 mg/kg VA in oil) was considered in the model, the expected marginal impact of VA-fortified biscuits was reduced overall and was greatest (2.6 pp) in the North region.

**CONCLUSIONS:** Given current patterns of biscuit consumption in Cameroon, biscuit fortification alone is unlikely to substantially reduce the prevalence of inadequate intakes, but fortified biscuits may contribute to nutrient adequacy in the absence of large-scale MN fortification programs, particularly in urban areas.

**KEY WORDS:** Fortified biscuits, Micronutrient deficiencies, nutrition modeling, preschool children, Cameroon

#### ASSESSING THE READINESS OF LOCAL KEY INFORMANTS TO ADDRESS THE CONSUMPTION OF UNHEALTHY FOODS AND BEVERAGES AMONGST

#### ADOLESCENT GIRLS AND WOMEN IN GHANA: A DFC DIETARY TRANSITIONS IN GHANA STUDY

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**BACKGROUND AND OBJECTIVES:** Ghana has reached an advanced stage of nutrition transition, contributing to an increase in nutrition-related non-communicable diseases, particularly among women. It is therefore essential to identify interventions to enhance healthy dietary practices. This study assessed community readiness to reduce unhealthy food and beverage consumption in women of reproductive age in urban Ghana.

**METHODS:** The Community Readiness Model (CRM) assessed the stage of readiness of communities within Accra (Ga Mashie) and Ho (Ho Central) to address the consumption of unhealthy foods and beverages. In-depth individual interviews were conducted with 24 key informants across the two cities. The CRM consists of 36 open questions addressing five readiness dimensions (community knowledge of efforts; leadership; community climate; knowledge of the issue and resources). The interviews were quantitatively scored using the CRM protocol, and qualitative thematic analysis was undertaken.

**RESULTS:** The mean community readiness scores were  $3.35 \pm 0.54$  (Ga Mashie) and  $3.94 \pm 0.41$  (Ho central). These scores correspond to the “vague awareness stage”. In the Ga Mashie community, the mean readiness score for knowledge of the issue was the highest of all the dimensions

(4.10 ± 1.61), followed by leadership (3.50 ± 1.34). In Ho central, the highest scores were displayed for knowledge of the issue (4.38 ± 1.81) and community climate (4.29 ± 1.32). In both communities, the lowest scores were found for resources. The thematic analysis currently underway will provide contextual information to explain the scores.

**CONCLUSIONS:** Communities in Accra and Ho have limited knowledge of the causes and consequences of unhealthy dietary practices. Despite recognising that the consumption of unhealthy foods and beverages was an issue, the leadership and community members showed no immediate motivation to act. The overall low community readiness for both study sites highlights the need to increase awareness of the issue prior to implementing initiatives to improve diets.

**KEYWORDS:** Community readiness, interventions, unhealthy diet, Ghana, women

#### **DETERMINANTS OF FOOD SAFETY PRACTICES AMONG FOOD HANDLERS IN SELECTED FOOD ESTABLISHMENTS, IN DIRE DAWA CITY ADMINISTRATION, ETHIOPIA.**

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**BACKGROUND AND OBJECTIVE:** Knowledge and food safety practice of food handlers are important reasons for the global burden of foodborne illnesses. This study assessed food safety practice and associated factors among

food handlers in selected food establishments in Dire Dawa City administration.

**METHODS:** An Institutionally based cross sectional study was conducted among 356 food handlers among selected food establishments. The CODEX food safety questionnaire was used to assess food safety knowledge (23 questions in four domains), attitude (six questions) and practice using interview and observation checklist (15 points). Satisfactory practice was defined as those who practice 70% of correct food safety measures. Then data was analyzed using SPSS version 20 using frequency, percentage, mean, binary logistic regression was used with crude odds ratio and adjusted odds ratio. P-value less than 0.05 was used to declare statistically significant association.

**RESULTS:** Out of the total study subjects, a high response rates of 354 (99.4%) was observed. About 191 (54.0%) were female with an overall mean age of 29.5 (± SD 7.1) years. About 129 (36.4%) of the respondents had adequate knowledge on food safety practice, while 194 (54.8%) have positive attitude towards food safety practices (score above 70% of the knowledge and attitude questions respectively). Only 106 (29.9%) food handlers had satisfactory food safety practices. Having food safety training (AOR= 2.0 95% CI: 1.20 - 3.34), with adequate knowledge (AOR = 2.83 95%CI: 1.72-4.68), positive attitude (AOR= 2.09 95%CI: 1.24-3.51), presence of food safety guideline (AOR = 2.23 95%CI: 1.33-3.72) and supervision (AOR= 2.07 95%CI: 1.03-4.17) were significantly associated with satisfactory food safety practices.

**CONCLUSIONS:** Unsatisfactory food safety/hygiene practices were observed. Having adequate knowledge, positive attitude, presence of food safety guideline and formal food safety training were significant predictors of food safety practices. There should be improved technical capacity and close supervision of food handlers.

**KEYWORDS:** Food safety, food handlers, establishments, Dire Dawa



**SURVIVAL STATUS AND PREDICTORS OF MORTALITY AMONG CHILDREN AGED 0-59 MONTHS ADMITTED WITH SEVERE ACUTE MALNUTRITION IN DILCHORA REFERRAL HOSPITAL, EASTERN ETHIOPIA.**

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**BACKGROUND AND OBJECTIVE:** There is a high mortality among children admitted with complicated severe acute malnourished (SAM) ranging from 3.5 % to as high as 35 %. In Ethiopia, the mortality rate ranges from 6% to 29% and the predictors of this mortality are varying contextually. This study assessed the survival status and predictors of mortality among children aged 0-59 months with severe Acute Malnutrition admitted in Dilchora referral Hospital in March 07-16, 2016.

**METHODS:** A retrospective cohort study was conducted on a random sample of 617 Severe Acute Malnutrition (SAM) children treated in Dilchora referral hospital. The data was collected using a pretested data extraction format and entered to EpiData software and exported to SPSS version 20 for analysis for life table, Kaplan Meir test and Cox proportional hazard regression techniques.

**RESULTS:** Overall 47 (7.6 %) had died while 431 (69.9 %) recovered following treatment where the rest were defaulted and transferred out. Most cases of death had occurred during the first weeks of admission to hospital. Children with HIV/AIDS, pneumonia, diarrhea, dehydration and who took IV antibiotics and fluid had significantly lower mean survival time than counter parts. Failed appetite (AHR = 2.75), diarrhea (AHR = 2.52), malaria (AHR = 12.69), lower WFH

% (AHR = 0.95) and HIV sero positivity (AHR = 12.5) were found significant predictors of mortality of SAM children. Additionally, not taking F 100 (AHR = 3.26) and F 75 (AHR = 2.56) significantly increased hazards of death.

**CONCLUSIONS:** There was substantial mortality among SAM children. Presence of medical co morbidities, intravenous fluid and antibiotics intake and not being supplemented by nutritional therapy significantly increased the risk of death. Appropriate nutritional therapy and management of medical co-morbidity as per the national SAM management protocol will decrease the risks of death.

**KEY WORDS:** Survival status, predictors, mortality, Severe acute Malnutrition

**NUTRIENT ADEQUACY OF WOMEN OF CHILD BEARING AGE IN SOUTH -EAST NIGERIA**

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**BACKGROUND AND OBJECTIVES:** Inadequate nutrient intakes by women of child bearing age leads to reproductive health problems, resulting in maternal and infant mortality. The objective of this study was to evaluate the nutrient adequacy of women of child-bearing age in South-East Nigeria.

**METHODS:** The study was descriptive and cross sectional in design. Three states were selected from the South East geo-political zone of Nigeria using stratified random

sampling technique. There are nine senatorial zones in the three states and one local government area was selected from each of the nine senatorial zones using simple random technique. Subjects of the study were 1200 women of child-bearing age (15- 50years) with their under-5 children. A 24-hour dietary recall questionnaire was used as instrument for the study. Twenty-four-hour dietary recall data were analysed using adapted Total Dietary Assessment (TDA) Software. Nutrient Adequacy Ratio (NAR) was derived for energy and 11 nutrients by dividing the nutrient intake of each woman by her Recommended Dietary Allowance (RDA). Data was analysed using descriptive statistics, frequency counts and percentages.

**RESULTS:** Mean age of the women was 28.2±5.6 years and BMI were 26.8±4.8 kg/m<sup>2</sup>. Most (96.3%) Women were married, 41.7% were traders. The percentage of women that met their NAR values were 80.5% for energy, Carbohydrate (90.2%), protein (82.0%), Phosphorus (51.4%), iron (60.8%) and zinc (72.7%) while 54.9% for Fat, calcium (96.2%), vitamin C (83.1%), Sodium (79.4%), Potassium (96.3%), Magnesium (80.2%) did not met their NAR values.

**CONCLUSIONS:** Nutrient adequacy ratio indicated low in intake of some micro nutrients by many women and excess in intake of energy, Carbohydrate and protein which may predispose to obesity and its associated complications. Nutrition education aimed at improving proper nutrition, dietary diversification and increased micro-nutrients intake among women of reproductive age is recommended in South East Nigeria.

**KEY WORDS:** Women, South-east Nigeria, nutrient adequacy

#### **THE DIETARY KNOWLEDGE AND PRACTICES OF PREGNANT WOMEN IN POPOKABAKA HEALTH AREA, KWANGO PROVINCE, DRC: A QUALITATIVE STUDY**

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**BACKGROUND AND OBJECTIVE:** Adequate and healthy diet during pregnancy is essential for the health of both mother and baby. Poor dietary intake during pregnancy contributes to maternal malnutrition, particularly in less developed countries. In Kwango Province, in DR Congo malnutrition, including macro and micronutrient deficiencies in pregnant women remains a serious public health problem. The aim of this study was to explore dietary knowledge and practices of pregnant woman in this area.

**METHODS:** A qualitative approach was adopted in this study. Pregnant women attending antenatal care were selected to participate. Nine in-depth interviews with pregnant women, six key informant interviews with health workers and community health workers were conducted. Women custodians and husbands participated in four focus group discussions. Triangulation method and thematic analyses were conducted.

**RESULTS:** Overall, women had limited knowledge about diet during pregnancy. Hospital, health centers and the community were their main sources of information. Women's feeding practices were characterized by a very low animal proteins, maize, corn and fruits consumption. Cassava was the most common daily food. Food taboos, lack of interest in antenatal care and quality of nutritional education via care facilitators were identified as factors influencing dietary

practices. Education level, level of poverty and scarcity of crops also contribute to poor dietary knowledge and practices

**CONCLUSIONS:** Socio-environmental factors play an important role in pregnant women's dietary practices. Strengthening antenatal care and community health workers programs, farmers' livelihoods support and promoting variety of crops could improve women knowledge and dietary practices.

**KEYWORDS:** Diet, knowledge, practices, pregnant woman

#### **SAFETY OF *MUSA PARADISIACA* LEAF EXTRACT AND ITS LATENT VALUE ADDED ANTIOXIDANT POTENTIALS**

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**BACKGROUND AND OBJECTIVE:** *M. paradisiaca* L is a plant widely cultivated in the tropics and subtropical regions of the world for its carbohydrate food value and its medicinal attributes. There is however, a dearth of empirical information on the safety and antioxidant variables of the leaves.

**OBJECTIVES:** This study investigated the safety and antioxidant power of aqueous and ethanol extracts of *M. paradisiaca* leave extracts on animals.

**METHODS:** Fifteen Wistar albino rats were used for the study, made up of three categories of five rats each as

Control, and Test groups. Administration of extracts was through intraperitoneal routes for 28 days.

**RESULTS:** Ethanol extracts significantly ( $p < 0.05$ ) increased Nitric oxide ( $41.66 \pm 0.43\%$ ) and Hydrogen peroxide ( $13.04 \pm 1.12\%$ ) inhibitions in comparison with aqueous extracts. Malondialdehyde (MDA) and Total Antioxidant Capacity (TAC) were also significantly ( $p < 0.05$ ) high in ethanol extract ( $0.76 \pm 0.03$  mmol/g) and ( $20.10 \pm 1.29$ ) respectively. Total phenolic and total flavonoids demonstrated better extraction in aqueous than in ethanol media. DPPH scavenging activity and reducing power assays were concentration dependent with aqueous extract showing better free radical scavenging ability and electron reduction power. Aqueous and ethanol extracts significantly ( $p < 0.05$ ) reduced cholesterol, Triacylglyceride (TG) and High Density Lipoproteins (HDL-c). Ethanol extract treated group showed tissue sinusoids and hepatocytes with signs of necrosis.

**CONCLUSIONS:** Deduction from this is that there is a latent antioxidant potential in *M. paradisiaca* L which may be better harnessed from its aqueous extract.

**KEYWORDS:** Plantain, Oxidative Stress, Phytochemicals.

#### **PERCEIVED NUTRITION BENEFITS AND SOCIO-DEMOGRAPHIC FACTORS AFFECTING CONSUMPTION OF FOREST FOODS IN EASTERN AND SOUTHERN CAMEROON**

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**BACKGROUND AND OBJECTIVE:** African forests are a source of both crop and animal foods providing significant amounts of nutrients and health-boosting bioactive compounds. The relationship between knowledge, perceptions and socio-demographic attributes towards consumption of forest foods was established.

**METHODS:** A total of 279 female decision-makers with respect to food preparation were randomly selected from 12 villages in southern and eastern Cameroon and interviewed using researcher administered questionnaires. Multivariate logistic regression analysis was used to identify the socio demographic factors and perceptions and attitudes affecting consumption of forest foods.

**RESULTS:** *Baillonella toxisperma* (African pearwood) (98%), *Irvingia gabonensis* (bush mango) (81%) and *Trichoscypha abut* (Mvout) (70%) were identified as the most nutritious foods. Among the animal forest foods, bush meat (11%) and *Imbrasia spp* (edible caterpillars) (10%) were identified as the most nutritious. About 10% to 61% of the respondents expressed positive perceptions and attitudes towards the health benefits of forest foods. Consumption of forest foods was higher among polygamous families and also positively related to length of stay in the forest area and age of female respondents. Education had an inverse relationship with use of forest foods. Perception and positive attitude towards the nutritional value of forest foods were also found to positively influence consumption of forest foods.

**CONCLUSIONS:** Since negative perceptions and attitudes were found to influence consumption, there is need to invest in awareness campaigns to strengthen the current knowledge levels among the study population.

**KEY WORDS:** Indigenous foods, perceptions, attitudes and consumption

## **SHORT MESSAGE SERVICE (SMS) INTERVENTION METHOD FOR IMPROVEMENT OF BREASTFEEDING KNOWLEDGE IN SOUTHWESTERN NIGERIA**

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**BACKGROUND AND OBJECTIVES:** Short Message Service (SMS) is being used in communication and can be an important tool in public health messaging on issues such as breastfeeding. Our study employed the use of SMS to improve knowledge of breastfeeding amongst female undergraduate students of Obafemi Awolowo University, Ile-Ife, Southwestern, Nigeria.

**METHODS:** Respondents (120) were recruited into the study from three female hostels. Baseline data was collected on the personal characteristics and breastfeeding knowledge of respondents using a structured questionnaire. Knowledge was determined using a three point Likert scale. One message was sent daily for 32 days on benefits, skills, composition of milk and practices of breastfeeding. End of study data was collected after two months. Data was described using percentages, frequency counts and student T test.

**RESULTS:** The mean age was  $21.4 \pm 2.4$ . About 23.3% had no information about breastfeeding. Majority (98.3%) are willing to breastfeed, 34.2% are well informed that breastfeeding affects growth. Pre intervention report revealed that 79.2% agreed that breastfeeding should be initiated on the day of birth and this was increased to 98.3% after intervention. Knowledge about the protective benefit of colostrum increased from 64.2% to 90.8%. However the knowledge that breastmilk contained enough water for the baby did not record a major increase (77.5% and 80.0%) for pre and post intervention respectively. At pre-intervention, 57.5% agreed that herbs could be a source of contamination while at post intervention this was increased to 85.8%. Cross

tabulation shows that only course of study of respondents had significant relationship with knowledge ( $p=0.01$ ). T test analysis revealed a significant difference between knowledge at pre and post intervention ( $T=146.95$ ;  $p<0.000$ ).

**CONCLUSIONS:** Knowledge on breastfeeding improved with the receipt of SMS on breastfeeding. It is recommended that SMS be employed as a method of intervention in improving knowledge on breastfeeding.

**KEYWORDS:** SMS, intervention, undergraduate, breastfeeding and knowledge

#### **EFFECTIVE MULTI-SECTORAL ACTIONS IN NUTRITION: EXPERIENCES FROM THE AIM HEALTH PLUS PROJECT IN UGANDA**

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**BACKGROUND AND OBJECTIVES:** In Uganda, the Aim health plus project is being implemented in Busia District with a goal is to contribute to the reduction of neonatal and under-five mortality rates (NMR) by 20% and maternal mortality ratios (MMR) by 15% in the project area by 2021.

**METHODS:** The project is implementing the “7-11” strategy, a package of high-impact and low-cost interventions to reduce NMR and MMR. The 7-11 strategy employs three core project models to bring about 360-degree behavior change at individual, household, community and environmental levels. Actions implemented by stakeholders in various sectors focus at ensuring reduction in malnutrition prevalence's in Busia. The project has supported the functionalization of Nutrition coordination committees both at district and sub county level. These plan and monitor of all nutrition interventions at respective levels. The capacity of existing health government structures through the three

models have been strengthen; VHTs are conducting timed targeted Counseling during home visits, Health Unit Management Committees through the Community Health committees Model link communities to health facilities while opinion leaders and faith leaders in communities have been supported to advocate and hold government accountable on service delivery. In addition, grandmother inclusive approach in the care group model reaches groups of neighbor women with nutrition messages to improve the nutrition status of both mothers and children.

**RESULTS:** There is a 42% increase among pregnant women who eat more than before. Pregnant women who eat from three food groups most days in pregnancy is currently at 79% from 54%; Uptake of IPT during pregnancy is at 84% up from 68%; Exclusive breastfeeding for 6 months at 61%; Vitamin A supplementation at 72 %; and Continued breastfeeding till 1 year at 57% up from 34%.

**CONCLUSIONS:** Applying a multi-sectoral approach to push the nutrition agenda at various levels is currently showing promising results.

**KEYWORDS:** 7-11 strategy, project models, government structures, nutrition indicators

#### **EFFECT OF MORINGA OLEIFERA LEAF PROTEIN ON BODY WEIGHTS, HAEMATOLOGICAL AND SERUM BIOCHEMICAL PARAMETERS OF WEANING WISTAR ALBINO RATS**

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**BACKGROUND AND OBJECTIVE:** Malnutrition statistics in the developing world are grim. The nutritional properties of Moringa and its potential health benefit are now well known. Nonetheless, the outcomes of well controlled and well documented clinical studies are of great value. Thus, the study was designed to evaluate the effect of *Moringa oleifera* leaf protein on body weight, hematological and serum biochemical parameters of weaning wistar albino rats as a means of food diversification in terms of protein source.

**METHODS:** Proximate components of the leaf were determined. Twenty four rats of three weeks old obtained from the Animal House of the College of Health Sciences, University of Uyo were randomly assigned to a control and two dietary treatment groups. Each treatment group had 8 rats per group. The pelletized test diets were formulated to provide similar levels of energy and protein (390/kcal and 10 % protein per 100g) with SD and MD having casein and *Moringa oleifera* leaf powder as the sole protein sources respectively while PF served as the basal diet. The feeding trial lasted 21 days during which weight changes, haematological and biochemical parameters were monitored.

**RESULTS:** Proximate composition of the leaf revealed protein content of 29.6% and dietary fiber 22.6%. Food intake rate of rats fed with casein based diet were significantly higher ( $p < 0.05$ ) than that of the rats fed moringa diet. Effect of the diets on average daily weight gain showed a significantly ( $p < 0.05$ ) higher weight in the casein diet group. Results showed no significant differences in WBC, RBC, HGB, PCV, MCV, MCH, and MCHC of rats on moringa diet and control diet. Moreover, platelet count was significantly ( $p < 0.05$ ) higher in control group. All blood parameters were significant ( $p < 0.05$ ) against the basal diet group. Results also revealed no significant differences in serum total protein, albumin and globulin between MD and SD.

**CONCLUSIONS:** The results show that *Moringa oleifera* leaf protein is of high biological value and could serve as a protein source to enhance protein intake and nutritional status improvement of young children.

**KEY WORDS:** Moringa, proximate, protein deficiency, biochemical, haematological

#### **ASSESSMENT OF MOTHERS' KNOWLEDGE AND PRACTICE TOWARDS AFLATOXIN CONTAMINATION IN COMPLEMENTARY FOODS IN ETHIOPIA: FROM PRE-HARVEST TO HOUSEHOLD**

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**BACKGROUND AND OBJECTIVE:** Good pre-harvest and post-harvest knowledge and practices are important in preventing the risks of mold and aflatoxin contamination. This study assessed the knowledge and practices of the mothers in Ethiopia on issues related to aflatoxin in complementary foods (CFs).

**METHODS:** The study involved 195 mothers from Amhara, Tigray, Oromia, and Southern Nations Nationalities and Peoples (SNNP) regions and addressed a range of issues used to prevent the risks of mold and aflatoxin contamination from farm-to-table using structured questionnaires.

**RESULTS:** Of the 195 mothers who responded, 186 (95%) were ploughing their land before growing the next crop, 177 (91%) used the crop rotation schedule, 157 (81%) reported the practice of removing old seed heads and stalks used as

an inoculum for aflatoxin contamination, 185 (95%) harvested the crops as soon as the crops were matured, 138 (70%) used a threshing method known as 'trampling by hoofed animals'. After threshing, 124 (64%) respondents had the knowledge and practice of drying cereals and legumes to decrease the moisture content, 134 (68%) used solar drying on a bare ground, 184 (94%) cleaned and disinfected the storage structures before storage. Almost all respondents practiced the CFs processing steps properly and they used color, type, odor, insect infestations, moldiness and all these criteria to select the CFs ingredients. A total of 78 (40%) respondents had the practice of feeding moldy cereals and legumes to animals, and 89 (46%) of the respondents erroneously believed that roasting can decontaminate the aflatoxin produced from moldy cereals.

**CONCLUSIONS:** The majority of respondents undertake good agricultural practices, but use poor post-harvest practices which are susceptible to mold and aflatoxin contamination. Besides, they lack awareness about the toxic effects of aflatoxin on human and animal health.

**KEY WORDS:** Mothers, Complementary food, Aflatoxin, Mold

#### **CARING BEHAVIOUR AND FEEDING PRACTICES OF MOTHERS/CAREGIVERS ON THEIR CHILDREN (0-36 MONTHS) IN EHIME MBANO L.G.A, IMO STATE NIGERIA**

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**BACKGROUND AND OBJECTIVE:** Caregivers caring behaviours and feeding practices vary tremendously by culture and perhaps even more among families within cultures. Objective: The study assessed the caring behaviour and feeding practices of mothers/caregivers on their children (0-36months) in Ehime Mbanu L.G.A, Imo State.

**METHODS:** Descriptive survey using multistage sampling technique was adopted to select a total of 200 mother/caregiver and child pair from Ehime-Mbanu L.G.A. A validated and semi-structured questionnaire was administered to the caregivers to capture information on caring behavior and feeding practices of their children. Data were analyzed using descriptive and inferential statistics with a significant level of  $p=0.05$ .

**RESULTS:** Most (87.5%) of the caregivers were female, 31.5% were aged 30-39yrs, 54.0% were married, 35.5% belief that child crying is a sign of hunger, 43.5% fed the child 8 times and on demand, 38.4% of 49.5% the children who were exclusively breastfed with a duration of 5 to 6 months, 50% introduce other foods before 4 months, 32.5% of the child refuse food, 30.8% practice force feeding. There is strong positive significant ( $r= 0.244$ ;  $P=0.001$ ) correlation between number of feeding the child per day and caregiver being the biological parents of the child, ( $r= 0.143$ ;  $P=0.045$ ) knowledge of child hunger clues.

**CONCLUSIONS:** This study observed a prevalence of poor caring behavior among caregivers which influences the child feeding practices and the nutritional status of the children.

**KEYWORDS:** Caring-Behavior, Child-feeding, Child, Caregiver.

**Check – repeated from previous abstract**

**CHANGE IN FOOD HABITS: RETAIL AND EATING IN MOROCCAN CONSUMERS AND THEIR EFFECTS ON HEALTH (OVERWEIGHT)**

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**BACKGROUND AND OBJECTIVE:** Moroccan food retail transition and Eating, introducing changes in habit food. The aim is to study this significant impact on the food eating habits and indirectly on health of Moroccan.

**METHODS:** An exploratory survey with a 264 people (131 men and 133 women, old of  $35.5 \pm 9.3$  years) in Casablanca; a questionnaire bringing socioeconomic and demographic data; some elements of preferences in food supply, as well as their dietary habits, food eating an anthropometric measures (the weight, the size and the calculation of BMI)

**RESULTS:** Biological data shows that 76 participants were overweight. The use of food stores and the purchase rates are significantly different between overweight and normal weight participants ( $p=0.001$  and  $p=0.05$ , respectively). The most frequent combinations are supermarkets / traditional markets with or without convenience store. Furthermore, overweight participants prefer shopping food before the meals, while those with normal weight after the meals ( $p=0.01$ ). A significant difference ( $p < 0.001$ ) between overweight and normal-weight participants using food service (fast-food, gourmet restaurant) An increase of overweight according to: The use of supermarkets (OR): 3.77; 95 % IC: 1.63-8.74,  $p=0.002$ ; Shopping before meals (OR): 2.44; 95 % IC: 1.28-4.67,  $p=0.01$ ). A reduction of this risk according to: Habits of supermarkets purchase: by comparison with those who never go to supermarkets (OR): 0.23; 95 % IC: 0.09-0.56),

**CONCLUSIONS:** Fast foods and retail stores are encouraging changes in habit foods which may lead to overweight in Morocco.

**KEY WORDS:** Food retail, overweight, eating out of home

## **NUTRITIONAL HIDDEN HUNGER: PERSPECTIVE ON AFRICAN MODELS**

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Nowhere are the linkages between hidden hunger and nutritional food security stronger than in Africa, where per capita food production, vegetable intake and micro nutrient requirements have steadily declined for the past three decades. In Africa, abuses and mismanagement in the field of nutrition often lead to low quality of life, low life expectancy, high infant and maternity mortality rate among other vices. Most of the endemic diseases caused by nutritional hidden hunger; blindness, anemia, pneumonia, scurvy and malaria are still rife with resulting high rural under-development, under-employment and rural urban migration. Rapid population growth, economic and social decline are brutal driving forces behind the brain drains in Africa. This has led to the explosion of city populations at a rate faster than social services, essential nutrition, infrastructures and employment opportunities can be provided. The ranks of the urban unemployed are filled with unemployable job seekers. Cultures are lost, as dignity and identity are washed away in the hidden nutritional food insecurity tribulations sweeping over the continent. Too seldom do we consider this nutritional hidden hunger as causes of these factors in Africa. Summarized are our six different intelligent agronomic model studies spanning over three decades that significantly improved vegetable productivity, intakes, income, health, employment and could solve nutrition hidden hunger menace for food security purposes in the Continent. What is needed is commitment to



utilize these findings. Governments must come to understand that if they are to succeed against this hidden hunger nutrition food insecurity war, they must enlist the understanding, then the active co-operation and the assistance of the people who are most affected by the crisis, not only on the international levels, but on local villages and most importantly on individual family units

**KEY WORDS:** Hunger, alleviation, Africa, nutrition, models

#### **EFFECT OF AFLATOXIN EXPOSURE ON HEALTH AND LINEAR GROWTH OF UNDER-FIVE YEARS OF AGE CHILDREN IN SUB-SAHARAN AFRICA (REVIEW ARTICLE)**

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**BACKGROUND AND OBJECTIVE:** Fungi provide valuable contributions to the diet, medications, food preservation and fermentation, and support complex chemical synthesis of novel compounds. However mycotoxins are structurally diverse fungal metabolites that can contaminate the ingredients of animal feed and human food. The objective of the present review was to examine present evidence and suggest/recommend relevant prevention approach to Ethiopian context.

**METHODS:** Systematic search was conducted in major databases including Medline (PubMed) and Google Scholar. Search words like mycotoxin, aflatoxin, health, growth, stunting, wasting, underweight and malnutrition were used. In addition to this, relevant recent reviews conducted on related topics were identified and their reference lists manually searched.

**RESULTS:** A total of 38 related studies were initially identified. From this 12 studies were incorporated in this review. Study showed that Aflatoxin M1 intake contributed negatively to HAZ of children. Another study reported that aflatoxin, could be among the contributing factors for impaired growth at early childhood and the observed high prevalence of stunting among children. In rural Tanzania, fumonisin exposure through corn (maize) in complementary foods was negatively associated with linear growth in infants. A dose-response relation was seen between aflatoxin exposure and the degree of stunting and underweight in children <5 y old in Benin and Togo. There is also sessional variation in aflatoxin concentration secondary to food intake. Different studies in Ethiopia showed high level of aflatoxin exposure to food and food products. However; there is no published article about the effect of aflatoxin exposure on child growth.

**CONCLUSIONS:** Effect of mycotoxin exposure on the development and severity of other undernutrition-related diseases need to be addressed; additionally, effect of mycotoxin exposure on the development and severity of diseases related to physical and cognitive development such as neural tube defects need elucidation. Awareness in health seeking behavior of the community when the need comes and maintaining the standard of diagnostic and treatment facilities with affordable prices need to be addressed.

**KEY WORDS:** Aflatoxin, growth faltering, complementary food, health hazard

#### **LOW DIETARY DIVERSITY IS ASSOCIATED WITH STUNTING AMONG CHILDREN WITH SICKLE CELL DISEASE**

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**BACKGROUND AND OBJECTIVE:** Diversity of diet is well recognized to reflect nutrient adequacy and improved nutritional status. The aim of the study was to determine association between dietary diversity and stunting among children with SCD.

**METHODS:** This was a cross-sectional survey of children aged 3 to 12 years diagnosed with SCD at the Princess Marie Louise hospital (PML), Accra, Ghana. We examined the consumption of food in the 24 hours preceding the survey. Dietary diversity was determined from 24-hour dietary recall using nine food groups according to Food and Agriculture Organisation guidelines. Anthropometric measurements (weight and height) were taken to assess malnutrition.

**RESULTS:** All the children (100%) consumed food from starchy food group followed by meat and fish (79.2%). Less than half (45%) of the children consumed food from other food groups. The mean dietary diversity score was  $3.7 \pm 1.27$  with more than half (53%) of the children having low dietary diversity (consumed food from  $\leq 3$  food groups). The prevalence of stunting was 25.8%. In a multivariable model, children with low dietary diversity score were 2.4 more likely to be stunted (aOR, 2.41, CI: 0.90-6.48).

**CONCLUSIONS:** Consumption of a less diverse diet was associated with stunting and may contribute to nutrient deficiencies as well as increase morbidity and poor survival. Health care practitioners should emphasize on dietary diversity as an important mainstay in dietary recommendation to caregivers with children affected with SCD.

**KEY WORDS:** Dietary diversity, sickle cell disease, stunting, Ghana

## **NUTRIENTS INTAKE, ANTIOXIDANT MICRONUTRIENTS STATUS AND VISION DISORDERS AMONG DIABETICS ATTENDING A TEACHING HOSPITAL IN GHANA.**

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**BACKGROUND AND OBJECTIVE:** Complications such as retinopathy, cataract, macular oedema and dry eye syndrome are rising and high levels of serum antioxidant status may delay or prevent these complications. This study assesses the relationship between food intake, serum status of antioxidant micronutrients and vision disorders among diabetics.

**METHODS:** A cross-sectional study design involving 100 outpatient diabetics at the Cape Coast Teaching Hospital, Ghana was employed. Glycated haemoglobin (HbA1c), twenty four (24) hour dietary recall and food frequency questionnaires were used to assess dietary intakes of antioxidant nutrients. Serum concentrations of vitamin A, C and total antioxidants were determined. Visual acuity (VA), intra-ocular pressure (IOP), and funduscopy were conducted on the subjects. Data was analyzed by IBMS-SSPS (version 23).

**RESULTS:** Majority of the subjects consumed antioxidant-rich foods such as fruits (68%), green leafy vegetables (65%), oily fish (47%) and nuts (22%) 1-3 times per week. However, dietary intakes of vitamin A (16.8%), E (41.7%), and Zinc (65%) were low based on Recommended Daily Allowances (RDA), while vitamin C and selenium intakes were in excess by 5.7% and 100.9% respectively. Moreover, serum vitamin A ( $0.023 \pm 0.01 \mu\text{mol/L}$ ) and vitamin C ( $0.26 \pm 0.1 \mu\text{mol/L}$ ), and the overall total antioxidant status

(TAS) (mean=24.4±5.3 µmol/L) were low (24%). Subjects with low vitamin C (31%, p=0.046) and zinc intakes (44%, p=0.0013) (10%, p=0.028) were more likely to have cataracts and DR respectively. Low selenium status was related to DME (2%, p=0.002), while high selenium intakes was related to cataracts (36%, p=0.041). High dietary fibre intake was related to reduce risk of diabetic vision disorders (OR= 0.2; 95%CI, 0.1-0.8, P = 0.024).

**CONCLUSIONS:** Lower intake, serum status of antioxidant micronutrients and dietary fibre intakes were observed among the diabetics and these were associated with vision disorders.

**KEY WORDS:** Diabetes, antioxidants, micronutrients, Retinopathy, vision

#### **IMPACT OF BABY FRIENDLY INITIATIVES ON TRENDS IN BREASTFEEDING INITIATION: EXPERIENCE FROM KARAMOJA SUB-REGION, NORTHERN UGANDA**

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**BACKGROUND AND OBJECTIVE:** Baby Friendly Health Facility Initiative (BFHI) is a global initiative by WHO and UNICEF aimed at creating health care environments that support breastfeeding and promote optimal Infant and Young Child Feeding (IYCF). In a bid to improve quality of maternal and child health, UNICEF through CUAMM started implementing BFHI in 2015/2016 under its health project of Improving Maternal, Neonatal, Child and Adolescents

Health in seven districts of Karamoja sub-region of. This study used country-level data to examine the impact of BFHI programming on trends in initiation of breastfeeding in the first hour of birth for a period of five years.

**PROGRAM INTERVENTIONS:** Built capacity among 40 health workers through mentorships and trained community-mother support groups on BFHI, equipped facilities with IEC materials and breastfeeding corners, instituted systems for monthly self-appraisals in all facility departments.

**METHODS:** The data on infants breastfed within the first hour of birth from 2014 to March, 2018 were obtained from the Uganda District Health Information System (DHIS-2), an electronic system managed by the Ministry of Health where all health facilities in Uganda report on health and nutrition indicators on a monthly and quarterly basis.

**RESULTS:** As a result of integrating baby friendly initiatives in maternity services in 2015/2016, the percentage of infants breastfed within the first hour of birth increased from 5% in 2014 to 90% in March 2018 in Karamoja region.

**CONCLUSIONS:** Increase in Breastfeeding rates was at least partly attributed to the integration of baby friendly services in routine health facility maternity services. Capacity building of health workers, identifying baby friendly corners and continuous health education in postnatal wards and YCC are important in promoting BHFI.

**KEY WORDS:** Breastfeeding initiation, baby friendly, infant and young child feeding

#### **A SYSTEMATIC REVIEW AND META-ANALYSIS OF DIETARY BEHAVIOURS IN URBAN GHANA AND KENYA: THE TACLED PROJECT**

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**BACKGROUND AND OBJECTIVES:** The increasing prevalence of overweight, obesity and non-communicable disease in urban African populations has been attributed to changes in dietary behaviours associated with the dietary transition. However, evidence for the dietary transition in urban adolescents and adults in Africa has not been systematically reviewed. This study systematically reviewed the dietary behaviours of adolescents and adults in urban Ghana and Kenya since 1971. We aimed to examine changes in the healthiness of dietary behaviours and identify differences between countries.

**METHODS:** A systematic search of online databases and grey literature was carried out from April-Nov 2017. Data were extracted across five dietary behaviours: energy and macronutrient intakes; food items consumed; dietary diversity or variety; dietary patterns; and dietary practices (Prospero protocol CRD42017067718).

**RESULTS:** 53 studies dating from 1988 to 2017 were included. A meta-analysis of energy and macronutrient intakes yielded mean energy intakes of 1855kcal/day (95% CI: 1714, 1996) in Ghana, and 1885kcal/day (95% CI: 1749, 2030) in Kenya (n=10 and n=5 studies respectively). Energy intake from fat was 23.9% (95% CI: 18.7, 29.0) in Ghana and 25.3% (95% CI: 22.2, 28.4) in Kenya. Protein comprised 13% of total energy intake in both countries. Eight studies from the two countries reported dietary diversity, of which four employed the 9-point scale food groups, with scores ranging from 4.1 to 4.8. Further analyses will synthesise foods items; dietary patterns and practices.

**CONCLUSIONS:** Dietary behaviours are similar in urban Ghana and Kenya in terms of macronutrient intakes and dietary diversity, and within the normal range of WHO

nutrient intake goals. Assessment of the healthiness of diets and changes over time was hindered by limited numbers and high heterogeneity between studies. Further studies of dietary behaviours using standardised methodologies are needed to understand the extent of the nutrition transition in urban Kenya and Ghana.

**KEY WORDS:** dietary behaviours, urban, meta-analysis  
Ghana, Kenya

#### **PUBLIC HEALTH IMPLICATIONS OF HEAVY METALS LEVELS IN LOCALLY PRODUCED RICE IN SOUTH WEST PARTS OF NIGERIA.**

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**BACKGROUND AND OBJECTIVE:** Rice is the most consumed cereal worldwide. It is a rich source of energy and vital food nutrients. Heavy metals contamination of foods is of public health concern as they are not easily degraded by cooking and can bioaccumulate in the human body, leading to heavy metals toxicity and its resultant health conditions. This study evaluated the levels of heavy metals in some locally produced rice from the south west parts of Nigeria.

**METHODS:** Five rice samples were collected from various locations in the south west parts of Nigeria and heavy metals (As, Cd, Cr, Pb and Hg) were analyzed using standard methods. Means and standard deviations were calculated

using the Statistical package for social sciences (version 17).

**RESULTS:** Lead was the only heavy metal found in the samples. Mercury (Hg), Chromium (Cr), Arsenic (As) and Cadmium (Cd) were not detectable at less than 0.001mg/kg detectable limit. The lead content of samples ranged from 0.229-0.812mg/kg. The quantity of lead in the rice samples surpassed the WHO tolerable weekly lead intake of 0.0025mg/kg. This shows that people who consume these rice samples are vulnerable to health problems associated with heavy metals toxicity.

**CONCLUSIONS:** Nigerians are beginning to appreciate locally produced rice. However, rice produced in this area is contaminated with high levels of lead and may not be safe for consumption. Sensitization of farmers and the general public on the need to discontinue farming practices and other human activities that facilitate heavy metal contamination are needed.

**KEY WORDS:** Heavy Metals, Rice, Food Safety, Nutrition Security

#### QUALITATIVE AND QUANTITATIVE EVALUATION OF THE PHYTOCHEMICAL CONTENTS IN SOME SELECTED GREEN LEAFY VEGETABLES IN THE EASTERN PARTS OF NIGERIA.

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**BACKGROUND AND OBJECTIVE:** Phytochemicals are bioactive, non-nutrient chemical compounds found mostly in fruits and vegetables. They contain health protecting properties and vital antioxidants. Studies have shown that they possess anti-oxidative, anti-inflammatory, anti-atherosclerotic, anti-tumor, anti-mutagenic, anti-carcinogenic, antibacterial and antiviral activities. These health benefiting properties of phytochemicals can be explored through the medicinal use and dietary consumption of vegetables. This study evaluated the quantitative and qualitative levels of phytochemicals in some selected green leafy vegetables in the eastern parts of Nigeria.

**METHODS:** Three kg each of the fresh green leafy vegetables were handpicked, sorted and cleaned with deionized water. Each of the vegetables was then divided into three equal parts of one kg each. One part was washed, drained and shade dried at room temperature for 10 days. After drying the vegetables, the dried samples were pulverized in air tight containers for chemical analysis using standard AOAC methods.

**RESULTS:** The result shows that the phytochemicals analyzed in the study were present in all of the vegetable samples except glycoside which was not present in Tree Spinach (*Cnidioscolus aconitifolius*) and Ugu (*Telfaria occidentalis*). Ahihara (*Corchorous olitorius*) had the highest levels of alkaloid (1.6g/100g), anthocyanin (0.11g/100g), flavonoid (0.17g/100g), glycoside (0.006) and oxalate (0.31g/100g) while *Telfaria occidentalis* had the least values of alkaloid (0.04g/100g) and tannin (0.01g/100g). Carotenoid ranged from 0.02-0.09g/100g in the samples. The phytochemical values of the vegetable samples were affected by processing in their cooked, raw and shade dried forms. Phytochemical contents increased in the shade dried forms and either reduced or remained constant in the cooked forms.

**CONCLUSIONS:** Awareness of the value of phytochemicals in vegetables can increase their consumption and encourage their use in pharmaceutical industries.

**KEY WORDS:** Phytochemicals, Health Benefits, Leafy Vegetables, Food Security

**TRACKING FUNDING FOR NUTRITION IN ETHIOPIA ACROSS SECTORS: TRANSLATING EXPENDITURE DATA INTO EVIDENCE TO INFORM POLICIES AND PROGRAMMES**

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**BACKGROUND AND OBJECTIVES:** Despite marked progress towards improved nutrition in Ethiopia, indicators for stunting, wasting, and anemia remain high and more action is needed to end malnutrition. The Government of Ethiopia is committed to improving nutrition through the Seqota Declaration and the multi-sectoral National Nutrition Program 2016-2020 (NNP-II). Data on expenditures and commitments across sectors are needed to design forward-looking plans, coordinate across partners, and improve allocative efficiencies towards the most impactful interventions. Multi-sectoral nutrition resource tracking is essential to monitor and scale-up progress towards NNP-II objectives.

**METHODS:** This multi-sectoral resource tracking exercise collected on- and off-budget funding data for NNP-II activities in Ethiopia, including both public revenue and external sources of funding. Respondents reported funding across Ethiopian Fiscal Years (EFY) 2006 to 2008 (2013/14 to 2015/16). Currently, the FMOH is routinizing multi-

sectoral resource mapping for nutrition within their annual resource mobilization process to ensure data is available during the planning period each year.

**RESULTS:** Findings showed an increase in nutrition funding over years from government and development partners, largely driven by large-scale nutrition-sensitive programs including the national Productive Safety Net Program IV becoming more nutrition-sensitive and the ONE WASH National Program starting in EFY 2007 (FY2014/15). In contrast, funding for nutrition-specific interventions represented a small fraction of total annual investments relative to other areas and growth has been slow over time.

**CONCLUSIONS:** There is a need to maintain focus on scaling-up high-impact nutrition interventions while at the same time enhancing the nutrition-sensitivity of large-scale programs in agriculture, education, WASH. Monitoring nutrition components within programs across sectors is important to track progress and identify opportunities for enhanced nutrition-sensitivity and improved allocative efficiency. Lessons learned can be applied to other countries looking to implement a similar process.

**KEY WORDS:** Nutrition financing, multi-sectoral, resource tracking, coordination, planning

**COMPLEMENTARY FEEDING PRACTICES AND NUTRITIONAL STATUS OF CHILDREN 6-23 MONTHS IN LUALABA PROVINCE, DEMOCRATIC REPUBLIC OF THE CONGO, 2017**

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**BACKGROUND AND OBJECTIVE:** Malnutrition is in high prevalence in some developing countries, like Democratic Republic of the Congo (DRC) mostly among children from 6 to 23 months. Complementary Feeding (CF) is among the main causes of malnutrition worldwide. The present study aimed to assess the association of nutritional status with CF practices in DRC.

**METHODS:** The method was a community-based cross-sectional study from October, 23<sup>th</sup> to November, 25<sup>th</sup> 2017 in DILALA Health Zone (HZ), using a three-stage stratified cluster-sampling technique. In the 10 Health Areas, children 6-23 months were assessed on nutritional status and their mothers interviewed on CF practices. Household questionnaire pretested and revised, standardized anthropometry equipment and World Health Organization (WHO) recommendations were used with trained data collectors. Logistic regression on SPSS 23 was used to data analyze.

**RESULTS:** About 32.4% of children were stunted, 14.9% underweight and 8.2% wasted. Severe form represented 15.3%, 4.3% and 2.7% for stunting, underweight and for wasting. Timely introduction of semi solid food, Minimum meal frequency (MMF), Minimum dietary diversity (MDD), minimum acceptable diet (MAD) and appropriate CF practices were observed respectively in 29.4%, 29.2%, 11.6%, 6.3% and in 3.0% of mothers' children. Hands washing practice, use of improved toilet facility and protected source of drinking water were practices of respectively 57.4%, 58.0% and 61.6% of mothers. We observed association of wasting with lack of knowledge on MMF adjusted odds ratio (AOR) 2.4(1.14, 5.11), MDD AOR=0.23 (0.055, 0.981) and protected source of drinking water AOR=0.50 (0.267, 0.938).

**CONCLUSIONS:** Wasting was more common among children whose mothers without knowledge on MMF of CF, but more prevented in children having met MDD and in children from household (HDD) with protected source of

drinking water. Local food product mixtures and source of drinking water could be improved in the Province to prevent malnutrition.

**KEY WORDS:** Nutritional status; malnutrition; complementary feeding practices; children, Democratic Republic of Congo.

#### **DETERMINANTS OF CONSUMPTION AND EXPENDITURE ON FOOD WITH FOCUS ON ANIMAL SOURCE FOODS AMONG RWANDAN HOUSEHOLDS**

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**BACKGROUND AND OBJECTIVE:** Social, economic and demographic factors significantly influence household expenditure on food and consumption. Economic uncertainty and insecurity may push a households to take certain decisions to minimize costs and this may affect the quality and quantity of food consumed especially animal source foods (ASFs). Although studies on the determinants of food consumption and household expenditure have been carried out elsewhere, similar studies are lacking in Rwanda.

The objective of this work was to not only looking at consumption and expenditure on ASFs but also establishing the main determinants of this among Rwandan households.

**METHODS:** Using cross-sectional data collected from 490 households from Bugesera, Gatsibo, Nyagatare, Kayanza, Kirehe, Karongi, Nyabihu and Rubavu districts of Rwanda. Ordinary Least Squares regression analysis was used to estimate coefficients of determinants of households' expenditure on and consumption of animal source foods (ASFs).

**RESULTS:** Household size and participation in community innovation platforms positively and significantly influenced consumption of ASFs. Expenditure on ASFs was also positively and significantly influenced by; number of livestock kept, household-head education level, household size, land held, price of ASFs and participation in innovation platform activities.

**CONCLUSIONS:** These results reaffirm and validate economic theory on food expenditure and consumption. Household characteristics such as family size, asset ownership (land, livestock) and enhanced social capital positively influence expenditure on and consumption of ASFs. Policy implications are that community level multi-sectoral or innovation platforms can be a critical vehicle through which consumption and expenditure patterns of target communities can be positively influenced.

**KEY WORDS:** Animal source foods, expenditure, consumption, households, Rwanda

**BIOFORTIFICATION PROMOTION IN ZIMBABWE: LESSONS FROM THE ZIMBABWE LIVELIHOODS AND FOOD SECURITY PROGRAMME (LFSP).**

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**BACKGROUND AND OBJECTIVE:** Poor diets deficient in key micronutrients are the major cause of widespread morbidity and mortality. In Zimbabwe, 27% of children under five are stunted, 23% are vitamin A deficient (VAD) and 31% are anaemic. Similarly, 23% and 26% of women of child bearing age are VAD and anaemic respectively.

**PROGRAM INTERVENTION:** The United Kingdom, through its Department for International Development (DfID) is funding the Zimbabwe Livelihoods and Food Security Programme (LFSP) aimed at reducing poverty and improving food and nutrition security. To address malnutrition, the LFSP is promoting the production and consumption of biofortified crop varieties – vitamin A orange maize (VAM) and high iron beans (HIB). The LFSP is implemented in 11 selected districts but the biofortification campaign, which started in 2015 has taken a national approach.

**METHODS:** The LFSP followed a systematic, multisectoral approach to introduce biofortification in Zimbabwe. This entailed supporting: the national crop breeding institute to officially release varieties for production; licensing of varieties with private seed companies for sustainable seed production; marketing and nationwide seed distribution including the use of agro-dealers; farmer training on production through crop demonstrations and to showcase agronomic performance of the varieties and social marketing to promote consumption.

**RESULTS:** More than 200,000 households are producing and consuming VAM and HIB, four seed houses are producing and marketing VAM and HIB, one private company is off-taking HIB from farmers for processing. Farmers' acceptance of the varieties surpassed expectation.



**CONCLUSIONS:** Farmers will adopt practices they perceive as beneficial to them. Families are concerned with the health of their children and nutrition education is key to adoption of biofortification. Biofortification is associated with genetic modification and myths should be dispelled from the beginning. National policy and government support is key to success of key interventions.

**KEY WORDS:** Biofortification, diet, nutrition, program, multisector.

#### **KNOWLEDGE, ATTITUDE AND PRACTICES AMONG CAREGIVERS USING DIFFERENT COMMUNITY INFANT AND YOUNG CHILD FEEDING (C-IYCF) APPROACHES**

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**BACKGROUND AND OBJECTIVE:** To improve survival, growth and development of children, United Nations International Children's Emergency Fund (UNICEF) and the Ghana Health Service (GHS), initiated the Community-Infant and Young Child Feeding (C-IYCF) programme as an intervention in selected communities in the Volta Region of Ghana. The C-IYCF program used different approaches, Healthy at Two (HAT), Model Mother, IYCF based on information in Child Health Record Booklet, Smart School and Action-Oriented. It was aimed at improving infant and young child feeding at the community level during the first 1000 days of life by improving the caregivers' knowledge, attitude and practices of caregivers.

**METHODS:** This study aimed to assess the knowledge attitude and practices (KAP) of caregivers of children who

had been enrolled in the programme over a period of two years. The study was a cross sectional study conducted using questionnaires to assess the knowledge, attitude and IYCF practices of IYCF of the caregivers of the children in the study based on content of the various approached in the programme.

**RESULTS:** The study found that caregivers had knowledge of breastfeeding as the best nutrition for their children. All the caregivers had knowledge on the advantages of breastfeeding for children while most of the caregivers (95.7%) knew key complementary feeding information and the appropriate time of complementary food initiation. Majority (79%) of the caregivers practiced exclusive breastfeeding. There was no significant difference between gender of children, caregiver's knowledge of IYCF practices and nutritional status of children. Action-oriented approach of the C-IYCF programme was indicated as the approach that gave better knowledge and understanding of C-IYCF practices and attitude.

**CONCLUSIONS:** Caregivers had good knowledge about IYCF practices, which reflected in their children having better nutritional status.

**KEY WORDS:** Community-IYCF, caregivers, children, KAP, nutritional status

#### **EFFECTIVE USE OF NEAR REAL TIME MONITORING (NRTM) SYSTEM FOR MONITORING OF THE MULTI-SECTORAL COMMUNITY BASED PROGRAMME TO REDUCE STUNTING IN ZIMBABWE**

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**BACKGROUND AND OBJECTIVES:** Despite a sharp decrease between 2010 and 2018 from 33% to 26%, chronic malnutrition remains of public health concern in Zimbabwe.

The government of Zimbabwe has been implementing a multisector community based model (MCBM) to stunting reduction since 2015. A near real time monitoring (NRTM) system was developed to improve coordination, help monitoring and inform decision making within the stunting reduction programme. In this paper, we seek to describe the design, implementation, progress over time and challenges of using NRTM system as a monitoring tool.

**METHODS:** UNICEF supported the government to develop an Information and Communication Technology (ICT)-based NRTM system using open source technology called open-data kit (ODK). The system took into account the need for vertical coordination, horizontal coordination, effects of interventions on drivers of stunting, community empowerment and community feedback on service quality. While all the components of data are self-contained in one system, visualization dashboards were developed to reflect different types of data summaries from different modules. The system design allows for aggregation of data by ward, district, provincial or national level. Data collection has been taking place in the 4 participating districts, covering 110 wards and 1,236 villages since October 2015.

**RESULTS:** Significant improvements in ward level data flows through the system were noted. The system brought together several types of data, concepts, stakeholders and multi-sector energies into focused programming, thus improving coordination. A comprehensive analysis of data collected through the NRTM system underway. Several challenges including conceptual issues, initial coordination, multi-sectorality of interventions, financial resources and missed partnership opportunities were documented.

**CONCLUSIONS:** The system has the potential for application in initiatives that involve multiple actors, capture citizen's demands, report user service satisfaction ratings and highlight accountability of service providers.

**KEY WORDS:** NRTM, stunting, decision-making, UNICEF, Zimbabwe

## **ASSESSMENT OF THE RELATIVE CARDIOVASCULAR RISK FACTORS BETWEEN FIELD AND OFFICE POLICE PERSONNEL IN THE HO MUNICIPALITY OF THE VOLTA REGION OF GHANA.**

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**BACKGROUND AND OBJECTIVE:** Perceptions of high physical activity levels in police personnel makes their cardiovascular risk considerations likely to be ignored. Detail of job descriptions can affect lifestyles behaviours that promote the onset of cardiovascular risk factors and diseases. A police force at risk of health challenges will fail in providing adequate security. This study sought to assess the relative cardiovascular risk factors between field and office police personnel in Ho Municipality.

**METHODS:** A stratified-sampling technique was used to collect data among 130 police personnel residing in the municipality. Anthropometric indices of weight, height, waist circumference, and waist to hip ratio were measured. Smoking, alcohol intake, physical activity level and blood pressure was also measured. Information on dietary habits were also obtained using a pretested questionnaire.

**RESULTS:** There was a high prevalence overweight and obesity 74 (56.9%), considerably relevant risk and presence of hypertension 55 (42.3%) among the police personnel. Field personnel who had higher physical activity levels had better CVD risk factors (smoking, nutritional status, blood pressure levels, physical activity) and were younger than their office counterparts. Poor dietary habits showed as skipping of breakfast and lunch at least one-three times every week in both groups.

**CONCLUSIONS:** Cardiovascular risk factors of Overweight and obesity, hypertension, alcohol intake, poor dietary habits are high among police personnel in Ho municipality despite perceptions of a high physical activity level. Higher ranked police personnel may be at a significantly higher risk than the lower ranked officers not just due to their increased age but also because of low physical activity associated with

their job description. Rotation of schedule for field and office police personnel, dietary education and frequent health screening should be done to ensure their optimum health.

**KEY WORDS:** Police personnel, physical activity, cardiovascular risk, hypertension, Ho municipality.

### **Mothers' perceptions of maternal undernutrition and interventions TO FIGHT**

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**BACKGROUND AND OBJECTIVE:** Undernutrition affects a quarter of women in Madagascar. To fight against maternal undernutrition, knowing mothers' opinions help to adjust the strategy. The purpose of this study is to assess mothers' perception of maternal undernutrition and interventions to fight it.

**METHODS:** A qualitative study was conducted with mothers living in the Amoron'i Mania region, Madagascar. To collect the data, six focus groups (6-8 women per group) were conducted among pregnant women and mothers with a child under 5. Thematic analysis was used and focused on knowledge and perception on maternal undernutrition and on interventions to fight it.

**RESULTS:** Mothers defined undernutrition by food insufficiency in quantity or quality. Undernutrition refers to stereotyped external somatic and physical signs (thinness, weakness, tiredness, feeling bad...). They thought that undernutrition would affect many women in their

communities, especially those who have many children. The situation would be more serious during the lean season and the basic problem would be low agricultural productivity and financial difficulty. Mothers mentioned as actors working in the fight against maternal undernutrition those that offer services to improve nutrition (food aid, nutritional counselling) and production. Health center was not spontaneously mentioned as among the actors. The mothers thought that the existing interventions did not entirely solve the problem of undernutrition. They noted the low coverage of interventions, the lack of resources to apply nutritional counselling and the problem of sustainability.

**CONCLUSIONS:** Mothers have confused malnutrition with inadequate diet, which is an immediate cause of undernutrition. As the beneficiary of interventions to fight maternal undernutrition, they thought that the interventions were not sufficient. They should be consulted and should be considered as actor in the future.

**KEY WORDS:** malnutrition, mother, intervention, actor

### **ASSESSMENT OF FRUIT AND VEGETABLE CONSUMPTION AMONG PREGNANT WOMEN ATTENDING ANTENATAL CARE AT BWERA GENERAL HOSPITAL, UGANDA**

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**BACKGROUND AND OBJECTIVE:** The widespread prevalence of micronutrient deficiency in pregnant mothers is a major cause of poor human health in many developing



countries. Integrating micronutrient-rich foods such as fruits and vegetables, and livestock products into diets is the most practical and sustainable way to alleviate micronutrient deficiency. The objective of the study was to determine fruit and vegetable consumption patterns of pregnant women in Kasese district.

**METHODS:** An interviewer administered questionnaire was filled by 115 pregnant women attending Antenatal Care at Bwera General Hospital to elicit information on social demographic data and economic status among pregnant mothers, while the food frequency questionnaire and 24 hour recall was used to assess fruits and vegetable consumption patterns. Participants were also requested to report on the reasons for not eating fruits and vegetables and their preferred methods of preparing fruits and vegetables.

**RESULTS:** Most of the respondents were upper primary school dropouts. The frequency of fruit and vegetable consumption was very low (Mean frequency = 2 times). Most of the participants consumed fruits and vegetable once a month and the mean servings of fruits and vegetables combined was 4 time per day which is far below the minimum recommendation consumption of nine (9 servings) per day. Frying was the most preferred method of preparation for vegetables (78.3%) and fruits were mostly preferred whole freshly ripe (83.0%).

**CONCLUSIONS:** pregnant women should be educated to adopt healthy eating habits by including more fruits and vegetables in their diets daily.

**KEY WORDS:** Deficiency, Micronutrient, serving, prevalence, Frequency.

#### **NUTRIENT COMPOSITION, PHYTOCONSTITUENTS AND ANTIOXIDANT PROPERTIES OF SOLANUM MACROCARPON FRUIT STALK**

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**BACKGROUND AND OBJECTIVE:** Vegetables are useful components of the diet due to their contributions to a balanced diet and their usage as medicament for weight loss. The efficacies of various herbs have been widely explored, but the explosion in population has necessitated an extensive research into undiscovered or underexploited herbs and fruits. *Solanum macrocarpon* is a species of *Solanaceae* family or eggplant indigenous to Africa. The fruit and leaves of egg plants have been extensive researched, but no information is available in the literature on the nutritional properties of the stalks of the fruit which are usually discarded. This study was carried out to explore the nutrient density of the eggplant stalk.

**METHODS:** Proximate composition, vitamins, minerals, amino acid profile, phytochemical constituents and antioxidant properties of the stalks were determined using standard methods of AOAC.

**RESULTS:** Hundred grammes of eggplant stalks contained 27.70g carbohydrates, 22.94g fibre, and 18.83g ash, while the phytochemical composition showed higher ribalinidine, catechin, and phenol contents. Vitamin B6, C, A, and B12 were found in higher concentrations, while lysine (9.48 mg/100g), phenylalanine (6.86 mg/100g), leucine (6.59 mg/100g), and arginine (5.66 mg/100g) were the predominant essential amino acids. Results for the free radical scavenging potentials showed higher DPPH, nitric oxide, hydrogen peroxide, and ABTS radical scavenging potentials for the eggplant stalk.

**CONCLUSIONS:** This study has shown that the eggplant stalks had high nutrient density; hence, its inclusion in dietary intakes should be encouraged and popularised.

**KEY WORDS:** *Solanum macrocarpon*, Nutrient composition, Phyto-constituents, Antioxidants properties

**ASSOCIATION OF PARAGA CONSUMPTION AND DIETARY LIFESTYLE ON THE NUTRITIONAL STATUS OF COMMERCIAL DRIVERS IN IBADAN MUNICIPALITY, NIGERIA**

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**BACKGROUND AND OBJECTIVE:** The use of herbal products to prevent and cure ailments and diseases is increasing in trend globally. In Nigeria, these products are popular in many neighbourhood and sold by vendors in form of herbal drinks (*Paraga*) which are alcoholic in motor parks where commercial drivers have direct access to them. Though they may have some health benefits, they are not completely harmless. Objective: The study was carried out to assess the association of *paraga* consumption and dietary lifestyle on the nutritional status of commercial motor drivers in Ibadan municipality, Nigeria.

**METHODS:** This descriptive cross-sectional study was carried out among 422 commercial drivers randomly selected from the five Local Government Areas of Ibadan Municipality. A pre-tested, interviewer-administered semi-structured questionnaire was used to collect information from the respondents. Data were analysed using descriptive statistics and Chi square test at  $p < 0.05$ .

**RESULTS:** There was high prevalence of *Paraga* consumption among the respondents, and the nutrient intake of the respondents for most nutrients was inadequate. About five percent (4.5%) of the respondents were

underweight, 59.6% had normal weight, 26.8% overweight, 8.5% obese I and 0.6% obese II. There was no significant association between *paraga* consumption and nutritional status of respondents ( $p > 0.05$ ). However, a significant association existed between dietary lifestyle pattern and nutritional status of respondents ( $p < 0.05$ ).

**CONCLUSIONS:** There is need for regular public enlightenment programme on importance of good nutrition and healthy lifestyle to health and well-being among the commercial drivers in Ibadan municipality. The period of their association meeting can serve as a good avenue to pass nutrition information across to these drivers.

**KEY WORDS:** *Paraga* consumption, Dietary pattern, Lifestyle, Nutritional status

**THE CURRENT LANDSCAPE OF RESEARCH ON WORLD HEALTH ASSEMBLY INDICATORS IN WEST AFRICA: A SYSTEMATIC MAP TO GUIDE DECISION-MAKING**

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**BACKGROUND AND OBJECTIVE:** To identify and catalogue peer-reviewed research on the indicators for the World Health Assembly (WHA) 2025 nutrition targets in West Africa, and create a map of recent research evidence to inform decision-making for nutrition policies and programs in the region.

**METHODS:** This study generated a systematic map to describe and catalogue the key characteristics of the evidence base relating to stunting, wasting and overweight in children under 5, low birth weight, exclusive breastfeeding up to 6 months, and anaemia in women of reproductive age.

The MEDLINE database was searched for research published from 2010 to April 2018. Search terms were developed to capture evidence on the prevalence, drivers, programs, and policies related to the WHA indicators. A systematic approach was applied to literature searches, developing inclusion criteria, screening, coding, taxonomy, data extraction, and study synthesis. No quality appraisal of publications was undertaken.

**RESULTS:** The search retrieved 6,630 studies, out of which a total of 340 studies from 15 West African countries were included in the systematic map. The majority of studies reported were conducted in Nigeria (42%) and Ghana (23%). Ninety-eight percent of studies were written in English. The majority (78%) reported on the prevalence and drivers of WHA indicators, while only 13% reported on programs evaluated by randomised controlled trial studies, and 9% on policy. However, this distribution varied across WHA indicators and within countries.

**CONCLUSIONS:** This systematic map identifies trends and gaps in research that cover the WHA indicators across West Africa. This 'living map' will be available online and updated annually to supply an accessible evidence base for informed decision-making in the region.

**KEY WORDS:** systematic map, nutrition research, West Africa

#### **DEMONSTRATION PROJECT IDENTIFYING DELIVERY MODALITIES TO REACH IN SCHOOL ADOLESCENT GIRLS WITH WEEKLY IRON AND FOLIC ACID SUPPLEMENTATION AND NUTRITION EDUCATION IN ETHIOPIA.**

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**BACKGROUND AND OBJECTIVE:** Nutrition international and its partners, designed & implemented a demonstration project on adolescent nutrition in Ethiopia. This project was implemented from October 2016 to December 2017 in both agrarian and pastoralist contexts, with objectives that include identifying effective delivery modalities to reach in school adolescent girls with Weekly Iron Folic Acid Supplementation (WIFS) and nutrition education.

**METHODS:** Implemented activities included, direct program & on-site trainings, distribution of training manuals for 272 key intermediaries, approximately 235 supportive supervision visits in 74 schools, and eight district level learning sessions. These activities were guided using pre-structured tools, including tools for understanding program beneficiaries and others and for exploring their experiences and perspectives to learn which set of interventions and services can best respond to their needs. Periodic fidelity monitoring activities, followed by documentation and account for potential change over time was done to guide the program implementation as intended and to assure quality

**RESULTS:** A total of 14,614 in-school adolescent girls were reached with WIFS with 92.1% adherence during the six months supplementation period, using a combination of practical delivery modalities. Identified effective delivery modalities included: **(a) Observed delivery modality** during the whole school calendar; girls' regular attendance at school was highly encouraged; **(b) Take home delivery modality** as an alternative modality during semester break and fasting seasons; & **(c) Girls to Girls delivery modality** for those girls with irregular attendance to be reached by their class mates with regular attendance and good program uptake. Program elements required for efficiency and effectiveness of these delivery modalities were identified for replication and adaptation to different local contexts and seasonal settings of the country.

**CONCLUSIONS:** School based WIFS program in Ethiopia can be effectively implemented by a combination of delivery modalities as identified by this demonstration project; however, additional modalities are needed for girls not attending regularly.

**KEY WORDS:** Combination of delivery modalities, Program Fidelity

#### **CONTRIBUTION OF BIO FORTIFIED BEANS IN PREVENTING STUNTING IN BURUNDI: CASE STUDY OF ECONOMIC DEVELOPMENT AND VALUE PROJECT IN MUYINGA PROVINCE.**

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**BACKGROUND AND OBJECTIVE:** Burundi has the highest prevalence of stunting in Africa where more than one in two children are stunted (56%). Through ECONOMIC DEVELOPMENT AND VALUE PROJECT, World Vision International Burundi supported the Community members with Bio fortified Beans which helped them to generate income and manage to alleviate the stunting among the children under five of age. The purpose of this article is to share how Biofortified Beans contributed to the prevention of malnutrition (stunting) in Burundi.

**METHODS:** A quasi-experimental design with a mixed methods approach was employed. Data collection was sequential, where quantitative data was collected first from randomly selected 1,361 project Households and 383 comparison site households. Key informant interviews and

22 focus group discussions were undertaken involving various purposively selected stakeholders. Quantitative data collection was digital, using Open Data Kit. Statistical Package for Social Sciences (SPSS) was used to analyse quantitative data. Descriptive and inferential statistics were used to calculate changes in various indicators. Qualitative data analysis was undertaken using the basic principles of thematic analysis.

**RESULTS:** By the end of 4 years of project implementation, we assist on the reduction of 3.6% for stunting [from 62.1 %( baseline) to 58.5 %( End line)], Reduction of 9.3% for underweight (baseline: 35.1% and Endline: 25.8%) and lastly not least we assisted on the reduction of 1.7% for wasting (Baseline: 7% and Endline: 5.3%)

**CONCLUSIONS:** Biofortified Beans can contribute to the prevention of malnutrition and reinforce the resilience of HHs when all key stakeholders are capacitated and followed up.

**KEY WORDS:** Stunting, children, reduction, Burundi.

#### **FACTORS THAT INFLUENCE STUNTING IN CHILDREN AGED 6 – 59 MONTHS IN KAPIRI-MPOSHI DISTRICT, ZAMBIA**

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**BACKGROUND AND OBJECTIVE:** Stunting has remained a challenge in Zambia. Poor nutrition in early life of children below the age five has a great effect on stunting. This paper

looked at other factors that can influence stunting among children aged 6 – 59 months.

**METHODS:** A cross-sectional survey was conducted in Kapiri-Mposhi district among 100 children aged 6 – 59 months. This study was part of the macro study Implementation of Nutrition-sensitive Agriculture in the Central Province of Zambia." We looked at four factors, which included, the Mothers age, level of mother's education, Family size and marital status. These factors were compared to the nutrition status of children (Stunting).

**RESULTS:** We used descriptive and binary logistic regression analysis to assess the factors that influence stunting. The prevalence of stunting was found to be 21%, wasting was 9% and underweight was 2%. This study found that Children who were born from teenage mothers were likely to be stunted ( $P<0.02$ ) than those from older mothers. In addition, we also found that there was a significant relationship between family size and stunting ( $P<0.01$ ). Most families that had over eight member were likely to have stunted children than those we had less. This study did not find any association between the mothers's level of education or marital status and stunting in Kapiri-Mposhi district.

**CONCLUSIONS:** Family size and mother's age are associated to stunting in Kapiri-Mposhi district.

**KEY WORDS:** Stunting, factors, children

**THE SUSTAINABLE UNDER-NUTRITION REDUCTION IN ETHIOPIA (SURE) PROGRAMME: A PROCESS EVALUATION STUDY TO ASSESS THE FIDELITY AND DOSE OF THE INTERGRATED SERVICES DELIVERED TO MOTHER-FATER PAIRS BY HEALTH AND AGRICULTURE EXTENSION WORKERS.**

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**BACKGROUND AND OBJECTIVE:** Multi-sectoral nutrition programmes implemented at scale often layer intervention components for vertical delivery by sector. By contrast the Sustainable Undernutrition Reduction in Ethiopia (SURE) programme, implemented by the Federal Ministries of Health (FMOH) and Agriculture and Natural Resources (FMOANR) in 50 districts, aims to improve complementary feeding and dietary diversity through integrated services delivered by health and agriculture extension workers to households with children under 24 months. Services comprise: home-based counselling of mother-father pairs on infant and young child feeding (IYCF) and nutrition-sensitive agriculture; and community-based services including men's and women's group dialogues and cooking demonstrations. The objective of the study was to assess the fidelity (delivered as intended) and dose (amount delivered) of the SURE programme implemented.

**METHODS:** A pre-planned qualitative process evaluation study was conducted. Data were collected from 18 intervention districts from October-November 2017 comprising: observations of home-based counselling sessions ( $n=27$ ) and of men's or women's group dialogues ( $n=9$ ); semi-structured interviews with mothers or fathers ( $n=27$ ); and focus group discussions with men's or women's group dialogue participants ( $n=9$ ) and with groups of health or agricultural extension workers ( $n=18$ ).

**RESULTS:** Extension workers from both the health and agriculture sectors held positive views of delivering selected nutrition services in an integrated manner. Household visits to provide age-appropriate complementary feeding counselling and nutrition-sensitive advising were conducted jointly in areas with good political commitment and civil service administration. We observed variability in the quality of counselling provided. Some fathers were not present to attend counselling sessions. Men's and women's group dialogues were used to educate participants but not to facilitate community-based action. Mothers and fathers reported exposure to key radio messages. Awareness of

gender roles in agriculture, nutrition and health was high among extension workers and moderate among fathers and mothers. We were unable to determine the frequency of services provided.

**CONCLUSIONS:** We found that in the context of good local administration, integrated delivery of key nutrition services by multiple sectors is practicable. Health and agriculture extension workers can combine effectively to provide complementary counselling, facilitation and demonstration services. Skills gaps were persistent and new strategies are required to address them.

**KEY WORDS:** Health, agriculture, nutrition

#### **DIETARY HABITS AND ANTHROPOMETRIC INDICES OF PRE-SCHOOL CHILDREN AGED 2-5 YEARS IN RURAL AND URBAN COMMUNITIES OF IDEATO NORTH LOCAL GOVERNMENT AREA, IMO STATE NIGERIA**

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**BACKGROUND AND OBJECTIVE:** Anthropometric measurements of pre-school children is one of the most widely used indicators to assess the nutritional, growth and health status of children. The WHO recommends weight-for-age, weight-for-length/height, length/height-for-age and Body mass index for age (BMI for age). The assessment allows for early detection of both nutritional deficiencies and excesses. The study aims at assessing the dietary habits in relation to the anthropometric indices of pre-school children (2-5 years), in the rural and urban communities of Ideato North, Imo State, Nigeria.

**METHODS:** A simple random sampling method of balloting without replacement was used in selecting the subjects for the study. 388 Pretested questionnaires were distributed equally among 360 preschool children, residing in the rural and urban communities of Ideato North, respectively. A height meter was used to measure their height to the nearest 0.1cm while, standard bathroom scale was used in weighing the children on light clothing, to the nearest 0.1cm. The body mass index were determined and the readings were compared with W.H.O child growth reference standard. Data was analyzed, using descriptive statistics like frequency, percentage, means and standard deviation Chi square test was used to determine significant difference and association between variables.

**RESULTS:** The study revealed 21.5% stunted children in the rural area, in relation to 12.3% in the urban. About 14.2% and 74% were overweight in the rural and urban areas respectively. Underweight and Malnutrition were more prevalent in the rural area than urban. Also, children in the rural area, eat more vegetables, fruits and whole grain than those in urban areas.

**CONCLUSIONS:** Under- weight malnutrition is more prevalent in rural communities. Efforts should be made to improve the nutritional knowledge of parents /guardians. There is need for nutritional awareness campaign in the communities.

**KEY WORDS:** Nutritional status, preschool children, dietary habits, anthropometric indices.

#### **LINKAGE BETWEEN ENVIRONMENTAL ENTERIC DYSFUNCTION AND LINEAR GROWTH FROM 12-15 MONTHS OF AGE AMONG RURAL KENYAN CHILDREN WITH**

#### **POOR ACCESS TO SANITATION FACILITIES**



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**BACKGROUND AND OBJECTIVE:** Stunting develops in the first 1000 days of life, affects 161 million <5years and is irreversible without appropriate interventions. Environmental enteric dysfunction (EED) affects nearly all children <5years in poor settings linked to compromised sanitation, retarded growth, altered gut microbiota and decreased vaccine responsiveness. In Kenya, 64% have unimproved toilet facility and 26% <5years stunted. This study aims to investigate link between EED and how it affects linear growth among rural Kenyan children using a novel, non-invasive stable isotope technique.

**METHODS:** A prospective cohort study exploring how EED affects linear growth trajectory in infants 12-15 months in MCH clinics in western Kenya. A convenient sample of 100 infants. Due the absence of data on EED and stunting, a difference of at least +0.2 in LAZ between EED+ve and EED-ve groups to be considered biologically relevant.

**INCLUSION CRITERIA:** non-stunted Infants (HAZ  $\geq$  -1 to +2 SD) or at risk of stunting (HAZ  $<$  -1 to  $\geq$  -2 SD) will be included. Only infants who are EED+ or EED- will be followed up.

**DATA MANAGEMENT AND ANALYSIS PLAN:** The data entry format will allow for immediate data checks for compliance. There will be two primary analyses which will compare stunting in individuals previously identified as EED+ or EED- and investigate predictors of change in stunting since baseline in children previously initially EED+ or EED-

**KEY WORDS:** Environmental enteric dysfunction, stunting, hygiene, sanitation, 13 Carbon sucrose breath test

## **FOOD SAFETY AND BEST PRACTICES: A CASE STUDY OF NIGERIAN WOMEN**

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**BACKGROUND AND OBJECTIVE:** This study determined the food safety practices of rural women in Abuja, Nigeria from all chains of food production to the table.

**METHODS:** Data were collected from 100 females from six Area councils in Abuja by use of questionnaires and oral interview.

**RESULTS:** Findings from the study revealed that 50% of women still practice old methods of food safety; 30% use modern methods of food safety. Fifty-six percent confirmed that information about food safety practices are not easily available.

**CONCLUSIONS:** There is need for Federal Government agencies like National Agency for Food and Drug Administration and Control (NAFDAC) and others to bring about aggressive campaign on how to help rural women on food safety practices and create awareness on food safety policy.

## **HYPOCHOLESTEROLEMIC EFFECT OF ORIENTIN ISOLATED FROM *BOMBAX COSTATUM* CALYXES IN ALBINO RATS**

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**BACKGROUND AND OBJECTIVE:** Hypercholesterolemia often occurs in conjunction with glucose intolerance, obesity, diabetes and metabolic syndrom. Orientin has been used in various bioactivity studies due to its extensive medicinal properties. We investigated effect of orientin administration on body weight (BW), fasting blood glucose (FBG) and lipid profile of poloxamer-407 (P407) induced hypercholesterolemic albino rats.

**METHODS:** Thirty albino rats were divided into 6 groups of 5 rats each based on body weight and followed for 21 days. The normal diet of all the rats was constituted of chow (purchased) and water. Rats in group 1 did not receive any particular treatment and acted as a control group. Besides their diet, groups 2 to 6 received intraperitoneal injection of P407 in the form of a saline solution (1g/ml of NaCl) at 1g/kg body weight on days 1 and 3 of follow-up to induce hypercholesterolemia. On induction of hypercholesterolemia, group 3 rats received 20mg of atorvastatin orally while groups 4 to 6 received 50, 100 and 200mg/day of orientin, respectively. Blood samples were obtained from rats by cardiac puncture at baseline and endline, and used to determine FBG, total cholesterol (TC), triglyceride (TG), low density lipoprotein cholesterol (LDL-c) and high density lipoprotein cholesterol (HDL-c).

**RESULTS:** Orientin significantly decreased body weight, FBG, TC, TG and LDL-c but increased HDL-c in the rats. The 50mg orientin group had highest decrease in TC (38.56%) relative to atorvastatin (17.21%) group. The 100mg orientin group had the highest decrease in body weight (49.79%) and TG (18.84%) compared to atorvastatin (49.27% and 12.10%) while the 200 mg orientin group had the highest decrease in FBG (26.26%) and LDL-c (40.13%) relative to atorvastatin (5.21% and 16.53%) treated group.

The standard drug atorvastatin had the highest increase in serum HDL-c (2.78%) compared to 200mg orientin (2.21%) group.

**CONCLUSIONS:** The different doses of orientin had more hypocholesterolemic, hypoglycemic and weight reduction effect in albino rats than atorvastatin standard drug.

**KEY WORDS:** Orientin, *Bombax costatum*, hypercholesterolemia, lipid profile, flavonoids

## **ROLE OF PARTICIPATORY POTATO (SOLANUM TUBEROSUM) INNOVATION SYSTEM DEVELOPMENT: FROM HUNGER TO FOOD SECURITY IN NORTHWEST ETHIOPIA.**

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**BACKGROUND AND OBJECTIVE:** Potato plays an important role in addressing the seasonal food deficit experienced during the months of August through September because of its short crop cycle (90-120 days). Potato has high yield potential, huge demand for local market and high nutritional value. However, several constraints including traditional potato production system, and utilization and poor innovative technology transfer systems are some of the major ones. Capacity building for scaling up of evidence based best practices for Ethiopia (CASCADE) project, funded by The Royal Netherlands Embassy, focused on developing potato innovations systems (2011-2014) which has been scaled up since 2015.



**METHODS:** The logical processes included seven major steps. 1) Participatory evaluation and demonstration of improved potato technologies. Seven different released varieties against a local check were evaluated in a field experiment by men and women farmers and researchers in South Achefer and Burie districts. Based on yield and cooking quality, *Belete* variety was selected. 2) Participatory informal seed multiplication and dissemination. Based on the first year result of evaluation, seed of *Belete* variety was multiplied since the tuber seeds are not multiplied by government and private firms. 3) Pre-extension demonstration. Farmers' practice and the improved package were compared side by side to convince farmers that the later was better than the former. 4) Scaling-up the potato production package to other farmers' fields. The multiplied seed was distributed to selected larger group of farmers in the two districts. Around each farmer, 20 famers were organized. 5) Construction of diffused light store (DLS). Farmers received training and constructed DLS to store seed tubers. 6) Training on food preparation. Farmers were given training on balanced food preparation from potato by trained development agents. 7) Linking with the market. Large tubers were sold to the market or consumed by farmers themselves while small sized tubers were stored in DLS for next year panting.

**RESULTS:** Following this approach potato production expanded, its yield raised from 7 tons with farmers' practice to 50 tons ha<sup>-1</sup> using improved package, and their livelihoods improved.

**CONCLUSIONS:** This approach can be scaled up to other similar agro-ecologies and farming systems.

**KEY WORDS:** Improved package, innovation, farming systems, livelihood, potato

**PROXIMATE ANALYSIS OF NILE TILAPIA, (*Oreochromis niloticus*), FISH FILLET HARVESTED FROM FARMERS POND AND LAKE HAWASSA, SOUTHERN ETHIOPIA**

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**BACKGROUND AND OBJECTIVE:** Despite farmers have started producing fish ponds in the southern Ethiopia, there is little evidence on whether the proximate composition of fish products from ponds differs from that of lake counterparts.

**METHODS:** This study compares the proximate composition of Nile tilapia (*Oreochromis Niloticus*), fish collected from central fish markets at Lake Hawassa and Farmers pond between June to August, 2016. Collected Nile tilapia (*Oreochromis niloticus*) fish samples were brought and composite dried samples were prepared for the proximate composition analyses. Moisture, crude protein, crude fat and total ash percentages were determined following the AOAC procedures.

**RESULTS:** Our result showed a mean differences in proximate nutrient composition of fish fillet from the pond and the lake. The moisture percentages (MC) of pond and Lake Hawassa Nile tilapia fish fillet were 73.62±3.02 and 66.77±4.71 respectively. The crude protein percentages (CP) of pond and Lake Hawassa Nile tilapia fish fillet were 14.77±1.82 and 18.87±4.24 respectively. The crude fat percentages (CF) of pond and Lake Hawassa Nile tilapia fish fillet were 2.39±0.34 and 3.98±0.55 respectively while the total ash percentages were 1.51±0.23 and 1.89±0.26 respectively. There were statistical significant differences (p<0.05) in Moisture, Crude Protein, Crude Fat and Ash percentages between pond and Lake Hawassa fish fillet.

**CONCLUSIONS:** The wild fish from Lake Hawassa had better crude protein, crude fat and total ash percentages compared with the fish from the pond. This study suggests that strengthening the efforts of pond fishing households through provision of education, local fishing technologies and feeds so as to increase the proximate nutrient composition of Nile tilapia, *Oreochromis niloticus*, fish fillet.

**KEY WORDS:** Fillet; Lake Hawassa; Nile tilapia; pond fish; proximate composition

#### **FARMER BASED ORGANIZATIONS OFFER OPPORTUNITIES FOR IMPROVING RURAL NUTRITION IN UGANDA**

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**BACKGROUND AND OBJECTIVE:** Of the 39 million people in Uganda, more than three quarters of them live in rural areas and depend on agriculture as a source of livelihood. The Uganda Forum for Agricultural Advisory Services (UFAAS) with support from USAID through INGENAES project has been conducting an action - oriented research on the extent to which farmer organizations influence nutrition status of communities while empowering women and men farmers.

**METHODS:** During this, 30 Farmer Based Organizations (FBOs) were selected from 15 districts in Uganda. These FBOs were trained on value chain development, nutrition and gender sensitive agriculture among other topics. During these trainings, the FBOs developed action plans on gender and nutrition integration within their work plans. They were

also assisted in selecting enterprises that would ensure profit maximization while improving nutrition within communities. Comparison was made between FBOs subjected to trainings on gender and nutrition within agricultural extension with FBOs not trained.

**RESULTS:** After eight months of implementation, more than three quarters of the households within FBOs trained had changed the way they handle and prepare food. In the same areas, 60% of the women and men farmers started farming as family business which enhances household income for purchase of nutritious food.

**CONCLUSIONS:** There is need to optimize conditions for participation of AEA S in contributing to improved nutrition within communities. FBOs should be empowered in terms of information and materials to enhance their capacity in improving nutrition.

**KEY WORDS:** Nutrition, agriculture, extension, gender

#### **NUTRITION EDUCATION IMPROVES IN-SCHOOL ADOLESCENT NIGERIAN GIRLS' KNOWLEDGE AND ATTITUDE TO IRON DEFICIENCY RISK FACTORS**

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**BACKGROUND AND OBJECTIVE:** Iron deficiency anaemia (IDA) remains the most common micronutrient deficiency and adolescent girls are particularly vulnerable. Though several studies have reported poor knowledge, attitude and practice on risk factors to iron deficiency anaemia among adolescents, targeted interventions are few. This study was designed to evaluate the influence of nutrition education on knowledge and attitude to iron

deficiency anaemia risk factors among in-school adolescent girls in Ibadan, Nigeria.

**METHODS:** This quasi-experimental study involved 320 in-school adolescent girls (experimental: 160; control: 160) from two public schools. Baseline and endline data were obtained using semi-structured, interviewer-administered questionnaires including socio-demographic characteristics, FAO's IDA knowledge, attitude and practice questionnaire and multiple pass 24-hour dietary recall to calculate dietary diversity classified as low (1-3), medium (4-6) and high (7-9). A five-week interactive nutrition education was conducted for experimental group respondents. Data were analysed using descriptive statistics and analysis of variance at  $\alpha_{0.05}$ .

**RESULTS:** Age of respondents in control ( $15.42 \pm 1.31$  years) and experimental group ( $16.28 \pm 1.09$  years) was not significantly different. Baseline knowledge score of experimental ( $8.03 \pm 2.80$ ) and control group ( $8.33 \pm 3.42$ ) was similar. Endline knowledge score was significantly higher in experimental ( $11.79 \pm 2.31$ ) than control group ( $8.85 \pm 2.91$ ). Baseline positive attitude score was higher in experimental (68.6%) than control group (59.4%). Endline positive attitude score was significantly higher in experimental (81.2%) than control group (60.6%). Mean Dietary Diversity Score (DDS) increased from  $4.88 \pm 0.88$  to  $4.94 \pm 0.81$  and  $5.0 \pm 0.74$  to  $5.30 \pm 1.01$  in control and experimental groups respectively. In-School adolescents with high DDS remains 1.3% at baseline and endline for the control group and increased from 1.9% to 9.4% in the experimental group.

**CONCLUSIONS:** Interactive nutrition education enhances the knowledge and attitude of in-school adolescent girls on risk factors of iron deficiency anaemia. Nutrition programs should be extended to the community in order to incorporate good nutrition practices among household as a whole.

**KEY WORDS:** Iron deficiency anaemia, dietary diversity, adolescent girls, Nigeria

## **UPGRADING NUTRITIONAL CONTENT OF FOOD PRODUCTS OF ENSET (ENSET VENTRICOSUM WELW.CHEESMAN)**

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**BACKGROUND AND OBJECTIVE:** Inadequate agricultural technology, population growth, consequence of drought, occasional flooding, increase pests and diseases, land scarcity and poor market access worsen the food situation in sub-Saharan Africa. On the other hand, infants and nursing mothers those who depend on enset- while cereal crop exhaustion – become malnourished due to enset's low content of protein, Vitamin A, Vitamin C, Zinc and Calcium. Therefore, there remains the need to upgrade existing nutritional content of its food products, improves traditional methods of enset processing and practical implementation of sustainable utilization of natural resource.

**METHODS:** In this work, Kocho dough extraction and sedimentation method has been employed by using "Fermented kocho washing basin and By-product Reserving Device" (utility model certificate has been already granted from Ethiopian intellectual property office for **this device**). Finally, nutritious kocho powder with ingredients kocho powder, bulla powder, Soya flour and moringa leaves powder packed and provided to consumer.

**RESULTS:** Field test from the device revealed that, the basin improves both traditional methods of enset processing rate- fermented kocho washing by 800% and fermented kocho squeezing and chopping by 1,400%; and it would save about 1,371m<sup>3</sup> of pure water annually for estimated 432tonne of fresh fermented kocho washing as 147% of pure water reused back for each volumetric kocho processing. In terms of 100gms of edible portion kocho powder can provide 211cal. of energy whereas bulla powder 180.50 cal. Soya flour has 50% protein and 5% fiber. Moringa *Stenopetala* leaf powder is rich in Fe, Ca, Zn, Cu, P, K, Na; and vitamin c, provitamin A as beta-carotene, sulfur containing amino acids and aromatic amino acids.

**CONCLUSIONS:** Thus, nutritious kocho powder would help alleviate the food situation.

**KEY WORDS:** Kocho washing basin ; Malnutrition, Nutritious kocho powder

## **DEVELOPING A SHELF-STABLE MANGO BEVERAGE FERMENTED WITH *LACTOBACILLUS RHAMNOSUS***

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**Background and objective:** Vitamin A is the most deficient micronutrient in Sub-Saharan Africa; which leads to preventable blindness in children and increases the susceptibility to infectious diarrhoeal infections. This is particularly noted in children less than five years and is a determinant factor for stunting. Mangoes are a rich source of vitamin A and polyphenolic compounds. *Lactobacillus rhamnosus* GG is one of the most researched probiotic and is known for its protective effect against diarrhoea in adults and children. Nutrient-rich beverages on the African market are limited. Most drinks contain high amounts of sugar, and regular consumption contributes to obesity and diabetes. We propose a mango beverage fermented with *Lactobacillus rhamnosus* GG could address vitamin A deficiency and diarrhoeal infections. Hence the aim of this study will be to develop a shelf-stable fermented mango beverage containing *Lactobacillus rhamnosus*. The specific objectives are to determine: (1) the growth rate of *Lactobacillus rhamnosus* GG in mango puree substrate, (2) the protective effect of fermented mango puree against microbial E.Coli infection in-vitro, (3) the vitamin A and polyphenolic (anthocyanin) content of mango pulp/puree fermented with *Lactobacillus rhamnosus* GG, (4) the probiotic cell count in fermented mango puree at room-temperature

**Proposed Methodology:** *Lactobacillus Rhamnosus* GG strains will be inoculated with pasteurized mango juice.

Fermented mango extract and colonies of *Escherichia coli* will be incubated overnight and input levels for bacterial adherence test calculated. Fermented mango/*E.coli* mixture will be added to HT-29 cells and co-cultured. Colony-forming units will be read, and mean cfu/mL values and Adhesion Ratio calculated. Anthocyanin content will be determined using the Ferric reducing antioxidant power (FRAP) assay, and antioxidant activity measured by inhibition of lipid oxidation. Carotenoid content will be determined by HPLC analysis. Reducing sugars will be determined by measuring absorbance at 546 nm with a UV spectrophotometer. The Student's t-test for dependent variables will be used to test significant differences in cfu/mL before and after incubation.

**Keywords:** stunting, diarrhoea, Vitamin A, Mango, probiotics, lactic acid bacteria, fermentation

## **SUGAR SWEETENED BEVERAGE CONSUMPTION IN THE EARLY YEARS IN SUB-SAHARAN AFRICA**

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Sugar-sweetened beverages including carbonated drinks and fruit juices play a contributory role in the development of obesity and associated non-communicable diseases, including type-2 diabetes.

Sub-Saharan Africa is an attractive market for beverage companies owing to its rapid economic growth, growing middle class and youthful populations. Sugar-sweetened beverages already contribute significantly to total sugar and energy consumption in Sub-Saharan Africa; and aggressive marketing targeted at younger people are utilised to ensure brand recognition and purchasing. Coupled with a lack of nutritional knowledge this can lead to frequent consumption of sugary drinks at a very young age.

In public health efforts to address obesity and type-2 diabetes, high-income countries are making considerable efforts to reduce sugar consumption via policy and public education campaigns; however similar efforts are not as forthcoming in low-income countries. Health care systems across Sub-Saharan Africa are ill-prepared to cope with epidemic proportions of non-communicable diseases, particularly when contextualized with the ongoing battle with infectious diseases. This review aims to explore trends of early consumption of sugar-sweetened beverages in Sub-Saharan Africa, within the context of growing childhood obesity and escalating type-2 diabetes prevalence and efforts to mitigate these, drawing on examples from elsewhere.

We conclude that greater efforts by governments and the nutrition community to educate the public on the negative effects of increased consumption of sugar-sweetened beverages are necessary to help address this issue.

**Keywords:** sugar-sweetened beverages, Sub-Saharan Africa, type-2 diabetes, obesity

#### **INFANT AND YOUNG CHILD FEEDING PRACTICE OF CHILDREN 0-23 MONTHS IN FUNTUA LOCAL GOVERNMENT AREA, KATSINA STATE, NIGERIA**

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A cross-sectional descriptive study was carried out to assess the infant and young child feeding practices in Funtua Local Government Area (LGA), Katsina State, Nigeria. Multistage sampling technique was used with data obtained using pretested semi-structured questionnaire. Results obtained shows early initiation of breastfeeding was practiced by 82.4%, whereas exclusive breastfeeding was very low (5.1%). Continued breast feeding at one and two years was practiced by 93.4% and 60.6% of the respondents respectively. Only 5.3% of the children had minimum dietary

diversity while minimum meal frequency was breastfed (38.8%) and non-breastfed children (5.3%). Iron rich or iron fortified foods were consumed by 21.2% and minimum acceptable diet for breastfed and non-breastfed was 4% and 8.3% respectively. There is need to strengthen programs on promotion of IYCF practices.

**Keywords:** complementary feeding, breastfeeding, Nigeria

#### **DRIVERS OF MICRONUTRIENT POLICY CHANGE IN GHANA: AN APPLICATION OF THE KALEIDOSCOPE MODEL**

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**Background and objective:** Vitamin A and iron deficiencies in Ghana have declined over the years, a large number of people still suffer from micronutrient malnutrition. Nutrition policies changed over time to find effective tools for combating these deficiencies. The aim of this study is to provide insights on national policymaking processes relating to micronutrient deficiencies and identify key drivers of micronutrient policy change in Ghana.

**Methods:** Information from semi-structured interviews with key stakeholders and data from published sources were used to test a set of hypotheses using the recently developed Kaleidoscope Model of policy change.

**Results:** Strong empirical evidence on the need of a particular micronutrient in the population triggered the inception of most policies in Ghana. However, these empirical evidences weren't treated in isolation. They were usually backed by baseline survey in the population and continuous monitoring of the nutritional status of the



population. The design for Ghana's micronutrient programs/policies was generally based on successful experience from other developing countries, contextually modified to fit Ghana's need. Usually decision on policies is made by the relative powers on proponents and opponents as well as veto players. Ghana Health Service is responsible for implementing micronutrient policy. Monitoring these policies is minimal however there has been strong evaluation to know that these policies have huge and positive implications on the affected population.

**Conclusions:** Ghana's micronutrient policy is largely donor driven with minimal opposition from public agencies. The policies were usually designed from international design spill overs from other nations. International donor agencies faced little opposition with the policy because of the funds they had to support the policies. The data suggests that, any nutrition policy needs the help of foreign advocates both in terms of empirical evidence and funding to back up implementation in order for it to appear on Ghana's policy agenda.

**Keywords:** Micronutrients, vitamin A, Iron, iodine, Kaleidoscope mode

#### **FEEDING PRACTICES AND HEALTH OUTCOMES AMONGST HUMAN IMMUNO-DEFICIENCY VIRUS EXPOSED AND UNEXPOSED CHILDREN (0-59 MONTHS) BEITBRIDGE DISTRICT, ZIMBABWE 2015: AN ANALYTIC CROSS SECTIONAL STUDY.**

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**Background and objective:** Breastfeeding by HIV positive women is a major means of HIV transmission, yet not breastfeeding carries significant health risks to young children. In 2014, a survey using Lot Quality Assurance Sampling in Beitbridge district, Matabeleland South province, reported that 67.4% (n=285) of children <24 months were not receiving the recommended dietary diversity and 63% (n=190) of infants <2 months were not exclusively breastfed. The province had the highest adult HIV prevalence (21%) in Zimbabwe and the prevalence of

stunting was 29%. We assessed feeding practices and health outcomes of HIV exposed and unexposed under-fives in Beitbridge.

**Methods:** We conducted an analytic cross-sectional study in Beitbridge district. The district was stratified into three catchment areas. From each stratum, one high HIV burden health facility was purposively selected. One hundred and seventy mother-child pairs were recruited from health facility registers using systematic random sampling. Data were collected using pretested interviewer-administered questionnaires, records reviews and anthropometry. Forward stepwise logistic regression using Epi-info® was conducted to determine independent predictors of health outcomes among under-fives.

**Results:** HIV exposed children were eight times more likely to be exclusively breastfed than unexposed-children (POR 8.30, 95% CI: 3.68-18.71). Stunting was significantly higher among HIV exposed children (POR 2.94, 95% CI: 1.12-7.69). Morbidity was lower in HIV exposed children (POR 0.24, 95% CI 0.10-0.55). Bottle-feeding (aPOR 4.13; 95% CI: 1.16-14.29) was an independent predictor of diarrhoea among HIV exposed children. Age appropriate introduction of water (aPOR 0.25; 95% CI: 0.09-0.70) and minimum meal frequency (aPOR 0.15; 95% CI 0.03-0.74) were protective. HIV exposure (aPOR 0.34, 95% CI: 0.12-0.94) and giving colostrum (aPOR 0.22, 95% CI: 0.07-0.70) were protective against acute respiratory infections (ARI)/Cough.

**Conclusions:** Practising recommended infant feeding practices was protective against morbidity and malnutrition among under-fives. These practices were more common among HIV exposed children. HIV exposure was associated with lower risk of morbidity and high vulnerability to malnutrition. Health workers should reinforce education on infant

feeding.

**Key words:** HIV, Exposed, Feeding, Health Outcomes

#### **INTERNATIONAL TRADE AND THE GLOBALIZATION OF FOOD SAFETY: IMPLICATIONS FOR AFRICA**

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**Introduction/Background:** Food safety, food security and ecological safety are among the pressing sustainability crisis facing the world today. While these problems are transnational, they are more acute in developing and least-developed countries where millions of people face severe food shortages. Goal #2 of the Sustainable Development Goals (SDGs) is to “end hunger, achieve food security and improved nutrition and promote sustainable agriculture”. Although “food security” was traditionally understood to mean the availability of adequate food stocks in times of need, it has now long been realized that there are other important dimensions to food security. A holistic approach that incorporates food safety as an integral part of food security, ongoing policy initiatives across the world focus on the inexorable linkages between food safety, food security and ecological safety.

**Methods:** These linkages, as evidence for available literature show, pose serious challenges for most African countries in the context of economic globalization driven by trade and corporate interests. As nearly all African countries have opened their economies to the progressive (multilateral) trade liberalization agenda of the World Trade Organization (WTO), and other bilateral, regional trade and investment regimes, implementation of national policy to address emerging and acute food security, food safety, and public health concerns would raise difficult regulatory challenges. The globalization of food production and distribution processes is exacerbating the challenge of universal food safety standards, regulation and enforcement.

**Results & Conclusions:** Food safety and food security policies of most African countries are shaped in complex ways by trade and investment-driven corporate interests outside of Africa. It is imperative to strengthen local capacity for a comprehensive food sector reform. As a necessity, and

to be effective, African policy makers and civil society must device the best policy approaches to respond to the trade and investment-driven international agreements and frameworks in their countries.

**Key Words:** Food safety; Food security; Sustainability; World Trade Organization; SDGs.

## **STRENGTHENING THE MONITORING AND EVALUATION OF THE GHANA SCHOOL FEEDING PROGRAM: IMPROVED METHODS, METRICS, AND TOOLS**

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**Background and objectives:** The lack of simple and effective evaluation tools hinder process and impact assessments of the Ghana School Feeding Programme (GSFP) that are needed to inform and improve program effectiveness. Monitoring and evaluation (M&E) efforts of the GSFP to date have emphasized the assessment of educational and qualitative agricultural outputs while outcomes and outputs that assess nutritional quality of the meals have been ignored. The aim of this study was to determine the feasibility of using the GSFP's newly-developed M&E tools to measure the nutritional quality of school meals.

**Methods:** A total sample of 18 schools from 6 districts with contrasting demographic and socio-economic characteristics was selected to represent the northern, middle and coastal belts of Ghana. Two separate tools were used by caterers (cooks) and school head teachers

(principal) to report daily information on the amount of food cooked and the amount of food served, respectively. Data were collected for a school term and the reported amounts were compared. Interviews were conducted with caterers and head teachers to understand their experiences with using the new tools.

**Results:** The caterers reported consistently higher amounts of food cooked than the served amounts reported by head teachers. All of the observed meals did not meet the target of one-third of the recommended nutrient intakes for protein and iron. Both caterers (80%) and head teachers (50%) expressed their unwillingness to complete the new M&E forms as part of daily duties because it increased their workload. Head teachers often delegated the M&E responsibility to other teachers.

**Conclusions:** Involving caterers and head teachers in M&E of the GSFP may not be a sustainable way of measuring meal quality. We recommend the use of standardised menu planning and household measures, in addition to external M&E personnel who can regularly measure adherence to planned meals and portion sizes.

**Keywords:** school feeding, monitoring and evaluation, nutritional quality

#### **FOOD HABITS AND FOOD PYRAMID IN CAMEROON: CASE OF BANGANG RURAL COMMUNITY**

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**Background and objectives:** Malnutrition is a serious public health problem among children and adults in Cameroon, despite the diversity and availability of food resources. The aim of this work was to evaluate dietary

habits, food frequency and food availability in Bangang community (Western Region of Cameroon).

**Methods:** A cross-sectional descriptive study was carried using six health centres in the community as data collection side. Assessment of feeding practices of 300 households, the 24-hour recall was used to evaluate the power and frequency of foods consumed. Subsequently, food history was conducted in selected families where parents have agreed to extend their participation in the study during two harvest seasons and two sowing in order to evaluate their eating habits. The market surveys in four main seasons helped to establish food availability and the main food stuffs of the community. Food diary, which was held for 7 days, was used to determine the amount of food consumed in the household. Food diversity score on 8 group base was used.

**Results:** All the foods groups were represented, but the availability depended very much on the seasons. Recipes were monotonous as demonstrated by poor average food diversity scores, low in meat, fish, fruits, milk and dairy products. The protein, lipid and carbohydrate energy intakes in families were unbalanced by excess of carbohydrates and lipids and more often by deficit of proteins. A food pyramid was proposed and will serve as a tool of further of food and nutrition education.

**Conclusions:** Diets were characterized by unbalanced recipes, monotonous, poor products of animal origin and fruit. Food and nutrition education base on food resources will help to reduce malnutrition rate in the community

**Keywords:** feeding practice, food frequency, food pyramid, Bangang, Cameroon

#### **NUTRITION POLICY REVIEW AND GAP ANALYSIS: FROM DEVELOPMENT TO IMPLEMENTATION**

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Improving nutrition is central to achieving human capital development. To date, nearly 90 % of countries have policies and programs that address one form of malnutrition or another. These nutrition-relevant policy frameworks, action plans and strategies exist at continental, regional and national levels across the 55 countries in Africa. Across all these countries, there are regular policy revisions once the set timeframe expires.

At continental, regional and national levels, food and nutrition security policies continue to reaffirm commitments to prioritizing nutrition in their policy agenda. Some notable commitments include; reductions in stunting prevalence, elimination of all forms of malnutrition etc. In all these policy statements, alignments to WHA targets (2025); SDG 2 (2030), and Malabo Declaration are evident. So if, all these nutrition policies are in place, why it is that progress in addressing malnutrition has remained uneven. Indicators such as stunting is stagnated across many African countries with only 9 countries on progress, while nearly 34 have made very little progress with the rest having no progress.

Evidence shows that gaps exist in policy implementation and over time the policy environment is increasingly becoming complex. Such complexity is driven by multidimensional nature of malnutrition thus posing difficulties in responding to the triple burden of malnutrition. A new paradigm shift is thus required on how nutrition policies will be framed and implemented.

It's in this context that understanding the policy environment is imperative. This discussion paper will underscore how the existing policy landscape can influence effective nutrition programming. The discussion will be informed by; nutrition policy review, manifestations of models and best practice examples of countries that have succeeded in ensuring dramatic nutrition outcomes through well-designed and implemented policies; and key recommendations on way forward.

**Keywords:** nutrition policy, multi-sectoral, Africa

## **SOCIO-ECOLOGICAL DETERMINANTS OF ILLEGAL DRUG USE INITIATION AND CONTINUATION IN AN URBAN COHORT.**

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**Background and objective:** Illegal drug use factors differ among population settings and so are the factors that are associated with the habit.. This study aimed at determining the factors that are associated with illegal drug use initiation and continuation in an urban cohort.

**Methods:** Illegal drug users (123 males and 18 females) were recruited in the Greater Accra Region through snowball sampling. A structured questionnaire was used to solicit information on personal, interpersonal, societal and institutional factors that were considered as influences in illegal drug use initiation and sustenance based on the socio-ecological framework. Body mass index (BMI) was determined from body weight and height measurement. Percentages were presented for the factors listed. Differences between the factors at initiation and sustenance were tested using Chi square.

**Results:** Respondents were aged between 15 and 48 years with a mean BMI of 23.1kg/m<sup>2</sup>. Mean hemoglobin level was 10.0g/dl and was not associated with BMI. Initiation was mainly as a result of interpersonal factors. Eighty-three per

cent of males and 73.0% of females started using illegal drugs due to interpersonal reasons. Eighty-six per cent and 72.0% of males and females respectively continue to use illegal drugs mainly due to personal reasons. There was no statistical significant difference between drug use initiation factors between males and females ( $p=0.43$ ) and drug continuation factors between males and females ( $p=0.23$ ).

**Conclusions:** Illegal drug use is initiated by interpersonal factors while its continuation is due to personal factors among this cohort. Hemoglobin level was low among users. These elements should be considered during mitigation efforts by enforcement authorities.

**Key words:** Illegal drug use, initiation, urban cohort, Greater Accra

#### **NUTRITIONAL ATTRIBUTES OF BAKED PRODUCTS FROM COMPOSITE FLOURS OF WHEAT AND PIGEON PEA**

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Wheat-based products such as bread and biscuit have low nutrient density. Supplementation of wheat flour (WF) with pigeon pea flour (PF) in the production of baked products is an excellent vehicle for improving the nutritional content of bread and biscuits. This work determined the nutritional traits of bread (PWB<sub>0</sub>) and biscuit (PWB<sub>0</sub>) produced from wheat-pigeon pea composite flour. Red variety of pigeon-pea was purchased from a local market. It was sorted, cooked for 20 minutes, drained, de-hulled, oven dried at 60°C for 48hours and processed into flour by milling/sieving. Supplementation of WF with PF was done in the ratios 10, 20 and 30% to produce bread (PWB<sub>1</sub>, PWB<sub>2</sub>, and PWB<sub>3</sub>) and

biscuits (PWB<sub>1</sub>, PWB<sub>2</sub> and PWB<sub>3</sub>). Control groups for bread (PWB<sub>0</sub>) and biscuit (PWB<sub>0</sub>) were produced. Nutrient and anti-nutrient content of the baked products were determined by AOAC methods. Data were analysed using ANOVA at  $p<0.05$ . PWB<sub>0</sub> and PWB<sub>0</sub> nutrients composition ranged from (g/100g) 10.19-12.50 protein, 2.26-6.36 fat, 1.26-1.91 ash, 68.67-68.84 carbohydrate. In mg/100g, contained 54.95-76.95 calcium, 3.13-3.61 iron, 0.30-0.60 zinc, 261.70-317.55 potassium, 74.95-83.45 folate, 5.53-5.72 niacin, 4.66-5.94 vitamin C and 0.07-0.10 (IU)  $\beta$ -carotene. PWB<sub>1</sub>, PWB<sub>2</sub>, PWB<sub>3</sub> and PWB<sub>1</sub>, PWB<sub>2</sub>, PWB<sub>3</sub> contained in g/100g 11.69-16.19 protein, 2.82-8.15 fat, 1.53-2.62 ash & 64.11-65.20 carbohydrate in mg/100g, 75.50-98.20 calcium, 2.64-3.11 iron, 0.37-0.65 zinc, 276.05-395.25 potassium, 85.20-96.75 folate, 6.10-6.74 niacin, 5.27-7.09 vitamin C and 0.10-0.13 (IU)  $\beta$ -carotene. PWB<sub>0</sub> and PWB<sub>0</sub> in mg/100g, contained 0.10-0.13 tannin, 0.51-0.70 phytate, 1.31-1.89 oxalate & 2.70-2.95(TIU) trypsin. PWB<sub>1</sub>, PWB<sub>2</sub>, PWB<sub>3</sub> and PWB<sub>1</sub>, PWB<sub>2</sub>, PWB<sub>3</sub> (mg/100g), contained 0.11-0.20 tannin, 0.78-1.07 phytate, 2.10-3.79 oxalate & 2.81-4.03(TIU) trypsin. Overall acceptability of PWB<sub>0</sub> and PWB<sub>0</sub> ranged from 6.73-7.20 while PWB<sub>1</sub>, PWB<sub>2</sub>, PWB<sub>3</sub>, PWB<sub>1</sub>, PWB<sub>2</sub>, PWB<sub>3</sub> ranged from 4.87-7.40 with PWB<sub>1</sub> having the highest mean score. Biscuit and bread made from composite flours of wheat and pigeon pea had better nutrient composition, well accepted and low in anti-nutritional factors which were within the tolerable limits.

**Key words:** pigeon pea, wheat, composite flour, bread, biscuit.

#### **NUTRIENT COMPOSITION OF TRADITIONAL COMPLEMENTARY FOODS CONSUMED BY INFANTS AND YOUNG CHILDREN IN EASTERN AND NORTHERN REGIONS OF SIERRA LEONE**

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Adequate nutrition is essential for infants' cognitive and physical development. Malnutrition among children under five in Sierra Leone is among the highest in the world. This study aimed at evaluating nutrient contents in traditional complementary foods consumed by infants and young children in two regions of Sierra Leone. The study identified sixteen traditional complementary foods commonly consumed in the Eastern and Northern regions of Sierra Leone and their recipes by administering semi-structured questionnaire to 800 mothers and caregivers using simple random sampling. Ten of the collected recipes were standardized and analysed for protein, fat and fibre, functional (Dispersibility, Water Absorption Capacity and Swelling Power), minerals (Iron, zinc and calcium) and anti-nutritional (tannin, phytate and trypsin-inhibitors) using standard laboratory methods. Data were analysed using means, percentages, analysis of variance and means separated using Duncan's multiple range test. **Results** showed that Bennie-mix, *pamahun*, rice and millet pap protein ranged from 9.92% – 16.87%, fat 4.8.8%-17.26%, fibre 3.09%-7.21% which agrees with WHO standard for complementary foods. Functional properties also varied significantly ( $p>0.05$ ) among these samples. Tannin ranged from (1.19mg – 3.83mg), phytate (0.61mg – 3.76mg) and trypsin inhibitors (0.26mg – 5.79mg) which were low in all the selected samples as recommended by WHO. Iron ranged from 0.45mg – 3.58mg and zinc 1.24mg – 4.38mg. It can be concluded that four out of the ten standardized traditional complementary foods are rich in macronutrient but required enhancement of the micronutrient.

**Keywords:** nutritional, infant, young-children, complementary foods

## **DIETARY DIVERSITY INTERVENTION AND ITS IMPACT ON IRON STATUS OF PRE-SCHOOL CHILDREN (36 -59 MONTHS) IN EMALI, KENYA**

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**Background and objective:** Nutrition Intervention study was carried out in Emali, Makueni County, one of the ASAL regions in Kenya. The ethnic communities of Kamba who are vegetable, crop and small livestock farmers and Maasai who keep goats and cattle live either side of the trans-Africa Highway dissecting the township of Emali. One third of Emali's households are reliant on rain-water to secure water for their family and livestock, causing a severe impact of drought on their livelihoods. The purpose is to assess the impact of a two year intervention.

**Methods:** A randomized cluster control study was carried out on 495 caregivers and children pairs to assess the socio-demographic status, nutritional status, dietary practices and morbidity patterns. Haemoglobin levels of 20% of the children were determined. The intervention involved feeding the ECD children with a diversified diet that included animal protein and vegetables. These foods were served with the porridge and a mixture of maize and beans that were prepared at the ECD centres.

**Results:** Findings showed that nutritional status based on all the indices (Weight, Height and Age) generally improved. Children from Kamba had slightly improved haemoglobin (Hb) values. However, haemoglobin level of their counter parts in Maasai had deteriorated. Notably, intervention group had comparatively better nutritional status. Improvement on the nutritional status of the intervention group was attributed to the dietary interventions.

**Conclusions:** From the findings it's evident that dietary diversification and modification strategy can have a great impact on the nutritional status of ECDE children if well implemented.

**Keywords:** ECDE, Iron status, Dietary diversity Intervention, caregivers and child pairs, Kamba-Maasai.

## **THE PREVALENCE OF HYPERTENSION IN ADOLESCENCE AND RELATED RISK FACTORS IN SOME SELECTED SENIOR HIGH SCHOOLS IN THE ASHANTI REGION**

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**Background and objective:** Hypertension is acquiring significance in low-income countries, accounting for an increasing global morbidity burden. In children, blood pressure tracking patterns confirm that persistent blood pressure elevation may be related to adult hypertension. But the health of adolescents has frequently been overlooked in global public health issues because this age group is assumed to be healthy and so little research is done on them. The objective was to determine prevalence of hypertension in adolescence and related risk factors in some selected Senior High Schools.

**Methods:** A cross-sectional descriptive was conducted on 909 students in some selected Senior High School (SHS) in the Ashanti Region to explore the prevalence of hypertension and related risk factors in adolescents. Anthropometric measurement, blood pressure, physical activity level and 24-hour food recalls were determined appropriately.

**Results:** The prevalence of obesity and hypertension were 3.10% and 9.10% respectively. Additionally, 12.0% of the respondents were underweight, 10.30% were overweight, 16.70% had elevated isolated Systolic pressure (SBP) and 6.10% had elevated isolated diastolic pressure (DBP). Except for waist to hip ratio (WHR) and weight, all other anthropometric indices significantly ( $p < 0.05$ ) differ among

male and female SHS students. The rates of SBP ( $r=0.134$ ) and DBP ( $r=0.106$ ) increased with increasing BMI ( $p<0.05$ ). Except for body fat, all other anthropometric indices were significant ( $p<0.05$ ) for all normotensive, pre-hypertensive and hypertensive SHS students.

**Conclusions:** The weight, waist circumference and hip circumference had significant ( $p<0.05$ ) and strong positive ( $r=0.793, 0.677$  and  $0.742$ ) correlation with BMI in their order. The type of physical activity engaged by participants did not differ ( $p>0.05$ ) based on their blood pressure groups. These findings emphasize the urgent need for public health measures in adolescent, to prevent blood pressure from becoming another public health burden.

**Keywords:** Adolescents, hypertension, obesity, related risk

#### LESSONS FROM REVITALIZING PRENATAL IFA SUPPLEMENTATION PROGRAM IN ETHIOPIA

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**Background:** At 29%, anaemia is still a public health problem in pregnant and lactating women in Ethiopia. The consumption and adherence to iron folic acid (IFA) tablets by pregnant women remains low. Nutrition International in coordination with the Ministry of Health and partners designed a phased approach consisting of developing, testing and scaling up of modalities to improve the coverage and adherence of prenatal IFA supplementation.

**Program Intervention:** In phase-I (January 2012 and March 2014), we conducted formative assessment, developed and tested intervention strategies for promoting adherence to IFAS 8 woredas. In phase-II, scale up strategy adapted and Implemented (2013 to 2015) in more than 840 woredas targeting 2.5million women. The strategy involved training of 31, 358 health care providers and distribution of

17,181 copies of counselling job aids and IFA supplementation protocols. Nearly 900 episodes of radio/TV messages were disseminated.

**Methods:** We reviewed evaluation and annual program monitoring survey data to determine the effect of the program.

**Results:** Between 2012 and 2014 the IFA coverage doubled from 40.1% to 80.4% and the consumption of  $\geq 90$  IFA tablets increased from 3.4% to 28.1%. The IFA tablet availability at health facilities significantly improved at end point compared to baseline with 73.3% facilities reporting no stock outs ( $P<0.001$ ). There was a strong correlation between time of starting ANC visit and time of starting IFA supplementation at end point (Baseline  $r=0.59$ ; End point  $r=0.89$ ). It was only 36.7% of women that consulted health care provider help them overcome adherence challenges they encountered.

**Program implications:** The training, distribution of IFA supplementation protocol and counselling checklist and the media campaign were successful to improve coverage and utilization of prenatal IFA supplementation. Strengthening social mobilization to improve the perception of women on early pregnancy disclosure, improving the quality of client-provider interactions will reduce ANC dropout rate, avail more time that increases frequency of contact to give IFA tablet, to check adherence and provide tailored counselling.

#### KNOWLEDGE, ATTITUDES, AND PRACTICES OF MOTHERS OF UNDER-5 CHILDREN ON INFANT AND YOUNG CHILD FEEDING IN RURAL COMMUNITY IN BURKINA FASO

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**Background and objective:** Maternal and child under nutrition is the underlying cause of 3.1 million deaths and responsible of 35% of disease burden in children under 5 years. Poor infant and young child feeding (IYCF) practices are one of the proximate causes of malnutrition. In Bobo-Dioulasso, in the southwestern area of Burkina Faso, prevalence of wasting and stunting in children under 5 is 6% and 15.3%, respectively. This study aims to assess the knowledge, attitudes, and practices (KAP) of mothers on IYCF in rural community around Bobo-Dioulasso before the initiation of a communication intervention on optimal IYCF.

**Methods:** A cross sectional study was conducted in January 2017 and included 245 randomly selected mothers. Information was collected using the FAO 2014 guidelines for assessing nutrition-related Knowledge, Attitudes and Practices.

**Results:** More than half (55.1%) of participating mothers were younger than 30 years and 59.2% of them were illiterate. Forty seven percent of children were between 12-23 months. Mothers of under-5 children have good knowledge about exclusive breastfeeding up to 6 months (86.9%) and the benefits of colostrum (91.8%). In addition, almost (98%) all mothers reported that they breastfed their children at birth. About three quarters (73.8%) of mothers with infants less than 6 months gave supplemental water to their infants. In multivariate analysis, illiterate mothers were less likely to have appropriate feeding practices as compared to mothers with at least secondary school education.

**Conclusions:** Participating mothers had good knowledge on IYCF in this area of the country; however, most of mothers with infants under 6 months practiced suboptimal feeding with provision of supplemental water. Education level of mother was a determinant of their feeding practices.

**Keywords:** Infant and young child feeding; Knowledge, attitudes, practices; Mothers of under-5 children; Burkina Faso

## **IMPROVING NUTRITION AND FOOD SECURITY IN AFRICA: THE ROLE OF SUSTAINABLE AQUACULTURE PRACTICES**

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**Background and objectives:** As the world faces the huge task of feeding a growing population, Africa will be at the receiving end of a mal-nutrition population. Fish is a critical part of the diet in most parts of Asia and Africa. It is a vital source of high-quality protein and many micronutrients essential to good health. Aquaculture is the fastest growing sector of agriculture in the world. In the last three decades, farmed fish production has increased by 12 times, at an average annual growth of over 8 percent, making it the fastest-growing food production sector, answering to the growth in fish demand. It is believed that aquaculture can improve the nutrition and food security situation in Africa under a sustainable production practices.

**Methods:** The role of sustainable aquaculture practices was examined. The contributions of aquaculture to food security and nutrition were investigated in order to ascertain the importance of aquaculture to food security in Africa. The current level of fish farming and production practices in three countries in sub-Saharan Africa was documented with a view to quantify their role in food security in Africa.

**Results:** The contributions of aquaculture from the three different African countries were very significant while the major constraints to increased production such as climate change, high feed and seed cost, degraded ecosystems etc. are discussed. The paper identified Egypt, Nigeria and Ghana as some of the leading producers. The paper observes that in economic terms, fisheries drive a considerable number of ancillary activities, such as net-making, boat building, engine repair and maintenance. They all provide additional fisheries-related employment and

income opportunities, often located close to ports and landing sites.

**Conclusions:** The paper recommends a national and regional aquaculture plan and strategy that will mainstream aquaculture into key planning and policy instruments in Africa.

**Keywords:** aquaculture, fish farming, food security, nutrition

#### **NUTRIENT COMPOSITION, PHYTOCONSTITUENTS AND ANTIOXIDANT PROPERTIES OF *SOLANUM MACROCARPON* FRUIT STALK**

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**Background and objective:** Vegetables are useful components of the diet due to their contributions in forming a balanced diet. They are found among a vast amount of plant species that can serve as readily available protein sources and herbs. The efficacies of various kinds of herbs have been widely explored, and because of their distribution in different localities have availed the opportunity for traditional herbalists to ensure affordable treatment of ailments. Notwithstanding, the explosion in population have necessitated an extensive research for undiscovered or underexploited herbs/ fruits. *Solanum* is a widely dispersed genus of the Solanaceae family with over a thousand species, a tenth of which are indigenous African species. The dominant species are *S. macrocarpon* and *S. aethiopicum* (Bonsu *et al.*, 2002) and are commonly called garden egg or eggplant. Bello *et al.*, (2005) have reported their usage as medicament for weight loss, catarrh, rheumatism, skin diseases, digestive difficulties, and some allergies. Obviously, both the fruit and leaves of egg plants have been extensively researched on, but no study is yet to be undertaken on the nutrient properties of the stalks attached to the fruit which are usually discarded. This study

was thus carried out to explore the nutrient density of the eggplant stalk.

**Methods:** Proximate composition, vitamins, minerals, amino acids, phytoconstituents and antioxidant properties were determined using standard methods.

**Results:** Results for the proximate composition showed high carbohydrates (27.70 %), fibre contents (22.94 %), and ash (18.83 %) while the phytochemical composition showed higher ribalinidine, catechin, and phenol contents. Vitamin B6, C, A, and B12 were found in higher concentrations, while lysine (9.48 g/100g), phenylalanine (6.86 g/100g), leucine (6.59 g/100g), and arginine (5.66 g/100g) were the predominant essential amino acids. Results for the free radical scavenging potentials showed higher DPPH, nitric oxide, hydrogen peroxide, and ABTS radical scavenging potentials for the garden egg stalk.

**Conclusions:** This study has shown the high nutrient density of the garden egg stalk, thus encouraging its inclusion for dietary uses.

**Keywords:** *Solanum macrocarpon*, Nutrient composition, Phytoconstituents, Antioxidants properties

#### **INFANT FEEDING PRACTICES AMONGST MOTHERS WITH CHILDREN BETWEEN 6 AND 24 MONTHS OF AGE IN THE ADENTAN MUNICIPALITY**

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**Background and objectives:** The World Health Organization (WHO) recommends three strategies for infant feeding. The aim of this study was to determine infant feeding practices amongst mothers with babies 6 to 24 months old within the Adentan Municipality.

**Methods:** A quantitative descriptive cross-sectional survey was adopted with a sample size of 391 mothers. Data were collected through interviews using semi-structured questionnaires and analysed using SPSS (version 13.0). Bivariate analysis was used to evaluate the associations between different selected variables and infant feeding practices.

**Results:** Out of 391 mothers interviewed, 92.3% admitted that they had been informed about the importance of Exclusive Breastfeeding (EBF) at least once during antenatal services. About 84% of mothers initiated breastfeeding (BF) within 30 minutes to 1 hour after delivery, and 59% exclusively breastfed their infants for the first 6 months postpartum. About 46% of respondents initiated complementary feeding at 6 months postpartum. Factors such as health worker's support, family support and employer support encouraged and promoted EBF.

**Conclusions:** EBF was low amongst respondents, compared to WHO standards. Less than half of respondents initiated complementary feeding at 6 months postpartum, indicating poor timely initiation of appropriate complementary feeding.

**Keywords:** Exclusive breastfeeding, complementary, Adentan

**WORKPLACE SUPPORT FOR EXCLUSIVE BREASTFEEDING IN TAMALE, GHANA: PERSPECTIVES OF EMPLOYEES AND MANAGEMENT.**

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**Background and Objective:** It is a global public health recommendation that infants be exclusively breastfed from birth till sixth month of life. However, globally less than 40% of children are exclusively breastfed up to six months. The practice of exclusive breastfeeding (EBF) in Ghana is estimated at 52% and that of professional working mothers is about 10%. This study aimed to document the support that professional working mothers receive in relation to exclusive breastfeeding at workplace in Tamale

**Methods:** A mixed-method study involving professional working mothers, coworkers and employers was conducted between June and July, 2017. A sample of 170 professional working mothers, 15 coworkers and 15 employers were included in the study. Basic descriptive statistics were run and associations between the key outcome variable (EBF) and various covariates was analyzed using bivariate Chi-squared, and logistics regression techniques. A thematic analysis was adopted for the qualitative data.

**Results:** There was high level of awareness of the essence of breastfeeding policies by both employers, and working mothers. The study determined rate of early initiation of breastfeeding within the first hour of birth to be 88.2%. The rate of EBF was low (14.7%). The qualitative data revealed that management and coworkers support for EBF was inadequate. There was an association between level of education and the practice of exclusive breastfeeding (AOR=0.100, 95%CI, 0.014 – 0.689), but not associated with age (AOR=0.972, 95%CI, 0.149- 6.359), and other socio-demographic attributes

**Conclusions:** The proportion of professional working mothers who practiced exclusive breastfeeding was found to be low (14.7%). Support for exclusive breastfeeding was inadequate at the workplace visited

**Keywords:** Exclusive Breastfeeding, Breastfeeding, Workplace, Support



### **SIGN LANGUAGE-BASED NUTRITION EDUCATION IMPROVES KNOWLEDGE AND ATTITUDE OF HEARING-IMPAIRED STUDENTS IN IBADAN, NIGERIA**

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**Background and Objectives:** Good nutrition knowledge is important to promote healthy dietary practices; however, people living with disability (PLWD) have limited access to nutrition information. The link between malnutrition and disability is well-known, yet PLWD-targeted nutrition interventions are scarce. Efforts to alleviate malnutrition and diet-related non-communicable diseases need to prioritize this sub-population. This study was designed to determine the effect of sign language based nutrition education on the knowledge and attitude of hearing-impaired students in Ibadan.

**Methods:** The quasi-experimental study involved 135 in-school adolescents selected from four hearing-impaired schools in Ibadan using proportionate sampling approach. Respondents were classified into control (64) and experimental group (71) of two schools each. A semi-structured, interviewer-administered questionnaire was used to collect information on socio-demographic characteristics, nutrition knowledge and attitude. Baseline and end point knowledge and attitude were assessed using 'Nutrition Knowledge and Attitude Questionnaire in Persons with Disability (KAP-nOKU)'. A three-module nutrition education was implemented for experimental group over three week period using sign languages. Paired t-tests were used to measure the differences ( $p < 0.05$ ) before and after the intervention.

**Results:** Age (years) was similar in experimental ( $16.19 \pm 1.94$ ) and control group ( $16.59 \pm 1.89$ ) and males constituted 51.5% and 54.4% in experimental and group respectively. The two most-preferred modes of nutrition education were video games (30.8%; 33.9%), paper games (27.7%; 32.0%) for experimental and control respectively.

Two key sources of nutrition information for the respondents were schools (31.0%; 51.5%) and health facilities (47.9%; 20.3%) respectively. Knowledge increase from baseline ( $12.15 \pm 4.47$ ) to end point ( $13.31 \pm 3.85$ ) is not statistically significant for control group and significantly increased from  $12.36 \pm 3.68$  to  $16.49 \pm 4.65$  in experimental group. Attitude increase was significantly higher in experimental ( $7.85 \pm 4.47$  to  $9.47 \pm 3.85$ ) than control group ( $8.58 \pm 4.07$  to  $8.61 \pm 3.61$ ).

**Conclusions:** Sign language-based nutrition education improved nutrition knowledge and attitude of in-school adolescents with disability. The use of disability-tailored intervention should be promoted among people living with disability.

**Keywords:** Nutrition knowledge, Nutrition attitude, Hearing-impaired adolescents, PLWD

### **OBESEITY A SERIOUS PUBLIC HEALTH PROBLEM IN DEVELOPING COUNTRIES: IN AFRICA CASE**

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Obesity is a serious double burden public health problem because it significantly increases the risk of chronic diseases such as cardiovascular disease, type-2 diabetes, hypertension, coronary heart diseases as well as certain cancers. It also puts considerable strain on healthcare and social resources. There is a direct link between obesity and the rise in non-communicable diseases. Obesity can also result in gestational diabetes, which is marked by high blood sugar levels during pregnancy. These usually disappear after delivery. Another inherent risk is pre-eclampsia, a condition that affects some pregnant women and usually sets in 20 weeks into pregnancy. Obesity during pregnancy can also affect health later for both mother and child, including increased risk of heart disease, hypertension and diabetes. Children of obese mothers also have a risk of future obesity. And obesity is associated with decreased contraceptive efficacy and also impacts negatively on

normal vaginal delivery. Obesity is caused by increased intake of high caloric fast foods and sugarsweetened beverages. This combination has contributed to the rising burden of obesity on the African continent. Therefore that, saturated fat or the bad fats are a significant risk factor for cardiovascular diseases (CVD) including heart disease and stroke through raising blood total cholesterol and LDL cholesterol levels. The only reasonable treatment of overweight or obesity is the voluntary limitation of energy intake in the form of high-calorie foodstuffs associated with increased energy expenditure by physical exercise. Therefore strict avoidance of super processed foods and sugar-sweetened beverages are crucial. This abstract is presenting the current review and growing public problem associated with obesity as a result of rapid urbanization and life style changes mainly in Africa, like Ethiopia.

**Key words:** Obesity, non-communicable diseases and urbanization

#### **SELECTED NUTRIENT COMPOSITION AND SENSORY QUALITY OF INJERA PREPARED FROM TEFF FORTIFIED WITH MANGO AND CARROT**

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There is an increased global interest in the food industry to develop and market functional foods in which scientific investigations are limited in Ethiopia. Tef injera nutritional character can be further enhanced by substitution with mango and carrot which is known to bear functional ingredients ( $\beta$ -carotene, vitamin C, dietary fibre, proteins and ash). Two mango and carrot forms (flour and juice) and three mango and carrot substitution levels (15%, 20% and 30% mango and carrot) arranged in a factorial experimental design in three replications were co-fermented to find out flour or juice and at what substitution level injera with better nutrient and functional potential can be processed. Tef injera

(100%) was used as a control. Tef injera substituted with mango and carrot (flour and juice) at 15%, 20% and 30% showed a significant ( $P < 0.05$ ) effect on crude protein, crude fibre, ash,  $\beta$ -carotene and vitamin C of injera. With increasing substitution levels of mango and carrot flour, the injera content of crude protein, ash, crude fibre,  $\beta$ -carotene and vitamin content increase from the control. Mango juice with substituted level of 15% indicates relatively highest crude protein, crude fibre and moisture content. Carrot flour substituted injera had high ( $\beta$ -carotene, vitamin C, protein and crude fiber than carrot juice substituted injera. The Injera with high  $\beta$ -carotene and vitamin C contents can be processed by 30% flour substitution. The mango and carrot (flour and juice) were used in injera products to improve the sensory quality, to increase nutritional value and consumer acceptability. These results indicated mango and carrot can be used successfully for the injera making to alleviate nutritional quality.

**Keywords:** Injera, Tef, Carrot, Mango, flour, Juice,  $\beta$ -carotene

#### **EFFECT OF AFLATOXIN EXPOSURE ON HEALTH AND LINEAR GROWTH OF UNDER-FIVE YEARS OF AGE CHILDREN IN SUB-SAHARAN AFRICA (REVIEW ARTICLE)**

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**Background and Objective:** Fungi provide valuable contributions to the diet, medications, food preservation and fermentation, and support complex chemical synthesis of novel compounds. Mycotoxins are structurally diverse fungal metabolites that can contaminate the ingredients of animal feed and human food. The objective of the present review was to examine present evidence and suggest/recommend relevant prevention approach to Ethiopian context.

**Methods:** Systematic search was conducted in major databases including Medline (PubMed) and Google Scholar.

Search words like mycotoxin, aflatoxin, health, growth, stunting, wasting, underweight and malnutrition were used. In addition to this, relevant recent reviews conducted on related topics were identified and their reference lists manually searched.

**Results:** A total of 38 related studies were initially identified. From this 12 studies were incorporated in this review. Study showed that Aflatoxin M1 intake contributed negatively to HAZ of children. Another study reported that aflatoxin, could be among the contributing factors for impaired growth at early childhood and the observed high prevalence of stunting among children. In rural Tanzania, fumonisin exposure through corn (maize) in complementary foods was negatively associated with linear growth in infants. A dose-response relation was seen between aflatoxin exposure and the degree of stunting and underweight in children <5 y old in Benin and Togo. There is also sessional variation in aflatoxin concentration secondary to food intake. Different studies in Ethiopia showed high level of aflatoxin exposure to food and food products. However; there is no published article about the effect of aflatoxin exposure on child growth.

**Conclusions:** Effect of mycotoxin exposure on the development and severity of other undernutrition-related diseases need to be addressed; additionally, effect of mycotoxin exposure on the development and severity of diseases related to physical and cognitive development such as neural tube defects need elucidation. Awareness in health seeking behaviour of the community when the need comes and maintaining the standard of diagnostic and treatment facilities with affordable price need addressed.

**Keywords:** Aflatoxin, growth filtering, complementary food, health hazard

## **ANEMIA AND IRON DEFICIENCY ANEMIA AMONG SCHOOL AGE CHILDREN IN KHARTOUM STATE**

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**Background and Objective:** Few studies are available about prevalence and possible risk factors of anaemia, Iron Deficiency (ID) and Iron Deficiency Anaemia (IDA) among school-age children. This study aimed at identifying the prevalence of anaemia, ID and IDA among school-age children in Khartoum state and to correlate that with the possible risk factors.

**Methods:** A cross sectional study was carried out on 300 children selected randomly during their visit to the emergency or outpatient department of Gafer Ibn Auf Children Hospital (GIACH) in Khartoum, Sudan for check-up, referral or accompanying their relatives. Their age was between aged 6 to 12 years. Interviews were conducted on demographic, socio-economic, eating patterns, dietary food intake data and history of children's infectious status in the last four weeks before the study. Weight and height were measured and the body mass index (BMI) was computed. Five ml venous blood was collected for check of haemoglobin and serum ferritin to detect those who are anaemic, iron deficient, and those with IDA. The findings were cross tabulated with demographic, anthropometric, socioeconomic, and nutritional variables in a trial to find possible risk factors for anaemia, iron deficiency, and iron deficiency anaemia.

**Results:** The prevalence of anaemia was 31.3%, iron, deficiency was 15.3%, and of IDA was 5.2%. The rates of mild, moderate, and severe anaemia were 81.0%, 11% and 8%, respectively. Anaemia was significantly low with consumption of powdered milk, Cheese, Gurasa wheat, and Mango. However, anaemia was significantly higher in children who consumed bread and Asida (Porridge) and among the children who were fed alone compared to fed with children or adults.

**Conclusions:** ID was significantly higher among children who did not consume powdered milk, mutton, biscuit, Madida Dukhon (millet), and onions. Nevertheless, ID was significantly higher in children consumed Roub. The number of IDA cases is so small (less than 30 cases) that no correlation or cross tabulation can be done, to find possible risk factors for iron deficiency anaemia.

**Keywords:** Anaemia, Iron Deficiency, Iron deficiency anaemia, schoolchildren, Sudan

**FUNGAL ASSOCIATION WITH THE SPOILAGE OF SWEET ORANGES (*Citrus sinensis*) BEING SOLD IN GUSAU METROPOLIS-ZAMFARA STATE.**

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Isolation, identification and characterization of fungal association with spoilage of sweet oranges (*Citrus sinensis*) was carried out. Eight samples of both spoiled and unspoiled sweet oranges were collected from Gusau motor park, Tudunwada market, Lebinlebin, Laalaan roundabout, Tsohon Kashuwa (old market) and Sabon-gari in Gusau Local Government Area of Zamfara State. Segments (3-5cm) of tissues from the margins of rotted *Citrus sinensis* were cut with sterile scalpel and were placed on the prepared Sabouraud Dextrose Agar (SDA) in petridishes and incubated at 28± 1°C for 5 days. The pure cultures of the fungal was plated aseptically on SDA and incubated at 28°C for 7 days respectively. The mycelia growth of the fungal isolates that emerged were fixed in lactophenol cotton blue on slide and was viewed under the microscope. The fungal isolates were identified by comparing their morphology and characteristics with standard descriptions.

The Fungal isolated include *Fusarium oxysporium*, *Aspergillus niger*, *Candida tropicalis*, *Rhizopus stolonifer*, *Aspergillus flavus*, *Fusarium solani*, *Penicillium chrysogenum* and *penicillium digitatum*; *Aspergillus niger* was predominant fungal isolated from all the locations of sampling of *Citrus sinensis* while *P. chrysogenum* and *P. digitatum* were the least fungal isolated in this study. *Citrus sinensis* collected from Tsohon Kasuwa had the highest occurrence of fungal isolates 8(32%) this might be due to contaminations from passer-by or even the handlers while sweet orange from Lebinlebin, Gusau motor-park, Laalaan roundabout Tudunwada market sabon-gari had the least occurrence of fungal isolates 4(16%) each and this might be due good personal hygiene of the handlers or good storage

methods. The pathogenicity tests showed that the fungal isolates from the spoiled sweet orange were able to produce the same signs in the healthy oranges when re-inoculated, fungal spoilage of oranges could be reduced by properly handling, correct/good storage for the food type, hygiene of processing environment and the use of predictive methods, Training and Educating handlers.

**Keywords:** Fungal, Spoilage, *Citrus Sinensis*, Segments, Sabouraud Dextrose, Agar, Pathogenicity Tests.

**IRON AND VITAMIN A DEFICIENCY DURING PREGNANCY IN RURAL AND URBAN SETTINGS OF IMO STATE, NIGERIA**

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**Background and Objective:** Pregnant women are vulnerable to nutrient deficiencies because of the increased metabolic demands imposed by pregnancy. The study investigated the prevalence of anaemia and vitamin A deficiency during pregnancy in Owerri urban and Mbaitolu rural areas of Imo State.

**Methods:** A Random sampling of 260 pregnant women (140 urban and 120 rural) was used in this cross sectional survey. Weight, height and arm circumference measurement were done using standard procedures. Haemoglobin, Packet cell volume and serum retinol concentrations were determined using standard procedures.

**Results:** Mean body mass index (BM) of the subjects from the rural was significantly higher ( $p < 0.05$ ) than those in the Urban area. Prevalence of anaemia was 30% amongst the urban subjects and 85% among the rural subjects. There was a significant difference ( $P < 0.05$ ) in the mean serum

(SR) values of pregnant women from both urban and rural areas. About 57.45% and 35% of urban and rural pregnant women had low to deficient levels of serum retinol.

**Conclusions:** Anaemia and low retinol concentration exists in the study population. Anaemia impairs human functions at all stages of life and poor maternal vitamin A status is associated with low breast milk retinol content and is a risk factor for the earlier onset of vitamin A deficiency VAD in infants. Dietary nutritional intervention to improve haemoglobin and vitamin A status of pregnant woman is necessary.

**Keywords:** Pregnancy, Iron, Vitamin A, Deficiency, Urban, Rural

#### **EFFECT OF IRON-FOLIC ACID SUPPLEMENTATION ON CHANGE OF HEMOGLOBIN AMONG VISCERAL LEISHMANIASIS PATIENTS IN NORTHWEST ETHIOPIA: A RETROSPECTIVE FOLLOW UP STUDY**

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**Background and Objectives:** An individual with visceral Leishmaniasis (VL) commonly present with anaemia and one of the VL treatment centre in northwest Ethiopia has been recommended iron-folic acid supplementation to these patients. But there is no documented evidence whether iron-folic acid supplementation improves the haematological profile of patients. Therefore, the study aimed to assess change in haemoglobin (Hb) and its determinant factors among VL patients with and without iron-folic acid supplementation in northwest Ethiopia.

**Methods:** A retrospective cohort study was conducted from January 2015 to December 2016. Data were entered into Epi-Data version 3.1 and transferred to Statistical Package for Social Science (SPSS) version 20 for analysis. Independent sample T-test and linear regression were to

compare the change in Hb and identify factors associated with a change in Hb, respectively. A 95% confidence level and p-values less than 0.05 were used to determine statistically significant.

**Results:** From a total of 602 VL patients, 300 (49.8%) were from University of Gondar hospital. The mean ( $\pm$ SD) change of Hb from baseline to end of treatment was  $0.99(\pm 1.64)$  and  $1.61(\pm 1.88)$  g/dl with and without iron-folate supplementation, respectively, with mean difference 0.62, 95%CI (0.34, 0.90) and a p-value of  $<0.0001$ . In multiple linear regressions, combination therapy of sodium stibogluconate-paramomycin (SSG-PM) was positively associated with a change of Hb ( $\beta$  [SE, p]:  $0.710/0.15$ ,  $<0.0001$ ). Whereas age ( $-0.030/0.009$ ,  $0.001$ ), nasal bleeding ( $-0.261/0.123$ ,  $0.035$ ), baseline white blood cell ( $-0.139/0.044$ ,  $0.002$ ) and haemoglobin ( $-0.513/0.031$ ,  $<0.0001$ ), end of treatment spleen size ( $-0.059/0.015$ ,  $<0.0001$ ) and iron-folic acid supplementation ( $-0.574/0.163$ ,  $<0.0001$ ) were negatively associated with change of Hb.

**Conclusions:** Iron-folic acid supplementation had a negative effect on the change of Hb. A combination therapy of SSG-PM, age, nasal bleeding, baseline white blood cells and Hb, and iron-folic acid supplementation were the determinants of change of Hb. Therefore, avoiding iron-folic acid supplementation and strengthening VL treatment with a combination of SSG-PM and, and early identification of complications is recommended for a better outcome.

**Keywords:** Anaemia, Visceral Leishmaniasis, Iron-folic acid supplementation and change of haemoglobin

#### **FARMER BASED ORGANIZATIONS OFFER OPPORTUNITIES FOR IMPROVING RURAL NUTRITION IN UGANDA**

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Of the 39 million people in Uganda, more than three quarters of them live in rural areas and depend on agriculture as a



source of livelihood. The Uganda Forum for Agricultural Advisory Services (UFAAS) with support from USAID through INGENAES project has been conducting an action-oriented research on the extent to which farmer organizations influence nutrition status of communities while empowering women and men farmers. During this, 30 Farmer Based Organizations (FBOs) were selected from 15 districts in Uganda. These FBOs were trained on value chain development, nutrition and gender sensitive agriculture among other topics. During these trainings, the FBOs developed action plans on gender and nutrition integration within their work plans. They were also assisted in selecting enterprises that would ensure profit maximization while improving nutrition within communities. Comparison was made between FBOs subjected to trainings on gender and nutrition within agricultural extension with FBOs not trained. After eight months of implementation, more than three quarters of the households within FBOs trained had changed the way they handle and prepare food. In the same areas, 60% of the women and men farmers started farming as family business which enhances household income for purchase of nutritious food. There is need to optimize conditions for participation of AEAS in contributing to improved nutrition within communities. FBOs should be empowered in terms of information and materials to enhance their capacity in improving nutrition.

**Keywords:** Nutrition Agriculture Extension Gender

#### **ASSESSMENT OF NUTRITION LITERACY AND NUMERACY OF HEALTHCARE PROVIDERS IN THE LOWER MANYA KROBO MUNICIPALITY, GHANA**

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**Background and Objective:** Unhealthy dietary and lifestyle choices are common risk factors for 80% of chronic diseases. Increasing rates of these diseases suggest how much nutrition education is needed. There are however not enough nutritionists to handle the management of nutrition-

related conditions and education of the public. It is common practice to see other healthcare providers' advice or counsel clients on nutrition. It is important to assess their knowledge, to find out whether they are equipped to dish out nutrition information

**Methods:** This was a descriptive cross-sectional study involving 78 healthcare providers in two facilities in the Lower Manya Krobo Municipality (LMKM). Participants were purposively recruited. Data was collected using interviewer-administered semi-structured questionnaires. Nutrition literacy and numeracy scores were classified into three groups (limited, sufficient and excellent). Data was analysed using STATA version 15.0 and results presented in tables and figures. Ethical approval was obtained from Ghana Health Service Ethical Review Committee

**Results:** Participants' ages ranged from 22 to 56 years. Mean nutrition literacy and numeracy scores were  $24.634 \pm 11.140$  and  $28.998 \pm 5.730$  respectively. 11.54% had excellent numeracy, 8.9% had sufficient numeracy and 79.49% had limited numeracy. Also, 82.05% had limited nutrition literacy, 17.95% had sufficient literacy and none had excellent literacy. Level of education was found to have an association with nutrition numeracy, while study site and marital status were associated with nutrition literacy.

**Conclusions:** Nutrition literacy and numeracy levels were found to be low among the healthcare providers in the study facilities. Apart from level of education, study site and marital status, all other variables were not significantly associated with the outcome variables.

**Keywords:** nutrition literacy, nutrition numeracy, healthcare providers

#### **THE PREVALENCE OF OBESITY AND ITS RELATIONSHIP WITH HYPERTENSION AMONG FEMALE ACADEMICS IN UNIVERSITY OF UYO, NIGERIA**

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**Background and Objective:** Obesity and its attendant health problems are on the increase, affecting people across all regions, ages, socioeconomic strata and gender, with females and the socio-economically advantaged at higher risk. This was a cross sectional study designed to assess the prevalence of obesity (using Body Mass Index and Waist to Hip ratio) and its relationship with hypertension among female academics in University of Uyo, Akwa Ibom State, Nigeria. The level of awareness on the health hazards of obesity was also determined in the study.

**Methods:** A total of 150 female academics between the ages of 25 to 59 years were randomly selected. A structured questionnaire was administered to obtain socio-demographic characteristics of respondents and their level of awareness on the health hazards of obesity. Body weight and height were measured to the nearest 0.1 kilogram (kg) using standardized bathroom weighing scale and 0.1 centimetre (cm) using a heightometer respectively. Weight and height measurements were used to derive Body Mass Index (BMI). Waist and hip ratios were measured using non stretchable measuring tape around the level of the umbilicus and the largest circumference around the buttocks respectively. Waist and hip circumference were used to derive Waist – Hip – Ratio (WHR). Blood pressure measurements were taken using a mercury sphygmomanometer.

**Results:** Most respondents within the age range 30 to 54 years (98.7%), were married, had PhD (61.3%) and family size between 5 to 9 members (72.7%). There was a low level of awareness on the health hazards of obesity (64%) and this was significantly related ( $p < 0.01$ ) to educational qualification of respondents. Prevalence of obesity was 82.6% and 59.1% using BMI and WHR respectively; and increased with age ( $p < 0.01$ ). Prevalence of hypertension was 4.5% and was associated with moderate to severe obesity among respondents.

**Conclusions:** The prevalence of generalized and central obesity in the population is high and indicative of an

epidemic rise; thus the need for public health action to stem the tide and prevent other non-communicable diseases.

**Keywords:** awareness; body-mass index; hypertension; waist-hip ratio; obesity

## **KNOWLEDGE OF PRIMARY HEALTH CARE WORKERS ON NUTRIENT REQUIREMENTS OF PREGNANT WOMEN DURING THE FIRST TRIMESTER IN IBADAN, NIGERIA**

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**Background and Objective:** Adequate and relevant nutrient intake is an essential consideration, especially during first trimester. Information on this need is provided by the primary health workers in many communities. However, knowledge of nutrients intake during early stage of pregnancy among these health care providers has not been adequately explored. This study was conducted to investigate the knowledge of nutrient requirements during first trimester among primary health care workers in Ibadan, Nigeria.

**Methods:** This descriptive cross-sectional study was conducted, using a validated questionnaire containing 21-point knowledge and 18-point attitudinal scales to collect information from consented 300 primary health care workers in the local government area. Four cadres of primary health workers involved in the provision of nutrition information to pregnant women.

**Results:** Age of respondents was  $40.5 \pm 10.1$  years and they included Community Health Extension Workers (41.7%); Nurses (20.7%); Health Assistants (20.0%) and Community Health Officers (13.3%). Respondents (69.1%) had poor knowledge of nutrients intake during first trimester among these workers but 78.1% had good attitude towards provision of nutrition information to pregnant women. Community Health Extension Workers were 80.0% less



likely to have good knowledge of nutrients intake during first trimester (O.R.=0.2; C.I.=0.1-0.4). Primary health care workers with less than 5 years working experience were 60.0% less likely to have good knowledge of nutrient requirements during first trimester (O.R.=0.4; C.I.=0.0-7.1).

**Conclusions:** Poor knowledge was observed among the primary health workers and year of experience was associated with the knowledge of nutrient requirements. In-service nutrition education training programme is suggested to improve the knowledge and experienced health workers should be engaged in the provision of nutrition education talk to pregnant women.

**Keywords:** Nutrient requirements; First trimester; Nutrition education; Primary health care workers

#### **LEVEL AND PREDICATORS OF FOOD INSECURITY AND ITS IMPACT OF NUTRITIONAL STATUS AMONG PEOPLE LIVING WITH HIV/AIDS ATTENDING ANTIRETROVIRAL THERAPY AT PUBLIC HEALTH FACILITIES, SOUTHWEST ETHIOPIA: INSTITUTION BASED CROSS SECTIONAL STUDY, 2018.**

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**Background and Objective:** Food insecurity and HIV/AIDS are common problems in resource limited setting particularly Sub-Saharan countries. Food insecurity and HIV/AIDS are interrelated in with each other. Food insecurity is one of a key contributor of the HIV/AIDS related morbidity and mortality in the world. Both are intertwined and worsening one another in a vicious cycle through a mixture of various

factors. However, the magnitude of food insecurity and its associated factors among People Living with HIV/AIDS are not well studied in Ethiopia. To determine Prevalence and Predicators of Food Insecurity and its impact of Nutritional Status among People Living with HIV/AIDS Attending Antiretroviral Therapy at Public Health Facilities.

**Methods:** An institutional based cross-sectional quantitative study was conducted at Gambella Hospital from January to March 2017. A total of 384 study participants were selected by systematic random sampling technique. Data was coded and entered into Epi-info version 3.5.4 and exported to SPSS version 20 for further cleaning and analysis. Multivariable logistic regression analysis was employed to assess the relative effect of various explanatory variables on the outcome variables. Variables with P-value less than 0.05 at 95 % confidence interval were considered as statistically significance.

**Results:** The overall prevalence of food insecurity among PLWHA receiving HAART at Gambella hospital was 81.1% (95% CI: 77.7%-82.8%). Mild, moderate and severe food insecurity was observed on 4.4%, 34.0% and 45.7% participants respectively. Multivariate Logistic regression analysis revealed that living in rural area (AOR=2.94; 95% CI: 1.11, 3.38), low monthly income (AOR=7.80; 95% CI: 7.80 (3.55-17.1) and inadequate household dietary diversity (AOR=14.4; 95% CI: 4.90, 42.6), Rural residence [AOR=3.59(1.65, 7.836)] were significantly associated with food insecurity.

**Conclusions:** Food insecurity is high among PLWHA receiving HAART at Gambella Hospital, Southern Ethiopia. Living in rural area, low monthly income, and inadequate household dietary diversity were the significant factors for food insecurity. In conclusion about one fifth of participants were food insecure. Factors independently predicting food insecurity were being female, Low monthly income, rural residence, having WHO stage III and IV disease, developing opportunistic infection and none adherence to ART treatment.

**Keywords:** Food insecurity; HIV/AIDS, Gambella

**DETERMINANTS OF MATERNAL NEAR MISS AMONG WOMEN IN PUBLIC HOSPITAL MATERNITY WARDS IN GAMBELLA REGION HEALTH FACILITY, GAMBELLA, SOUTHWEST OF ETHIOPIA: A FACILITY BASED UNMATCHED CASE-CONTROL STUDY, 2017.**

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**Background and Objective:** In Ethiopia, 20,000 women die each year from complications during pregnancy, childbirth and the post-partum period. For every woman who dies of pregnancy complications, about 20 more experience injury, infection, disease, or disability. Maternal “near misses” (MNM), defined by the World Health Organization (WHO) as a woman who nearly died, but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination, is a proxy indicator of maternal mortality and quality of obstetric. In Ethiopia, few studies have been performed on MNM, and little is known regarding determinant factors. This study aims to identify determinants of MNM among women in Gambella Region, Ethiopia.

**Methods:** Unmatched case-control study in hospitals in Gambella Region, southwest of Ethiopia, from January 01 - February 30, 2017. The sample included 103 cases and 205 controls recruited from women seeking obstetric care at six public hospitals. Data was coded and entered into Epiinfo version 3.5.4 and exported to SPSS version 20 for further cleaning and analysis. Multivariable logistic regression analysis was employed to assess the relative effect of various explanatory variables on the outcome variables. Variables with P-value less than 0.05 at 95 % confidence interval were considered as statistically significance.

**Results:** The largest share of cases and controls were between the ages of 20–29 years, accounting for 39(37.9%) of cases and 65(31.7%) of controls. Ninety-two (90.2%) of cases and 185(89.3%) of controls were married. About two-thirds of controls and 47(45.6%) of cases had gestational

age between 37-41 weeks. History of chronic medical conditions was reported in 57(55.3%) of cases and 68(33.2%) of controls. Women with no formal education [AOR=3.2;95%CI:1.24, 8.12], being less than 16 years old at first pregnancy [AOR=2.5; 95%CI:1.12,5.63],induced labour[AOR=3; 95%CI:1.44, 6.17],history of C-section [AOR=4.6; 95%CI: 1.98, 7.61] and chronic medical disorder[AOR=3.5;95%CI:1.78, 6.93], and women who travelled more than 60 minutes before reaching their final place of care[AOR=2.8;95% CI: 1.19,6.35] all had higher odds of experiencing MNM.

**Conclusions:** The Government of Ethiopia should continue efforts to address lack of road and health facility access and education. Work should also be continued to educate women and providers about common predictors of MNM like history of C-section and chronic illness as well as teenage pregnancy at the facility, community, family and individual levels.

**Keywords:** Maternal near miss, MNM, severe obstetric haemorrhage, hypertensive disorder, C-section, Gambella, Ethiopia.

**EARLY INFANT FEEDING MODALITIES AND NUTRITIONAL INDICATORS OF CHILDREN AGED 06-23 MONTHS IN THE MAMPRUGU-MOADURI DISTRICT OF NORTHERN GHANA**

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**Background and Objective:** Good nutrition in the formative years is very important for optimal growth and development of children. As such, the World Health Organization (WHO) recommends that infants aged 0-6months be exclusively breastfed (EBF) and transitioned to appropriate

complementary foods (ACF) afterwards. This study aimed to study early infant feeding modalities (exclusive breastfeeding, mixed feeding and timeliness of complementary feeding) and how they impact nutritional indicators-Stunting, Wasting and Underweight of children ages 6 -23 months in Mamprugu-Moaduri District of Northern Ghana

**Methods:** A cross-sectional study design was used, where quantitative data were collected from 422 mothers and their children 6-23 months using structured questionnaires. Anthropometric indices (weight and height measurements) were done on the children using standardized procedures.

**Results:** More mothers (65.4%)-initiated breastfeeding within one hour of birth and none practiced EBF. Few mothers (2%) gave solid foods to their infants (0-6 months) mixed feeding-(breastfeeding and bottle feeding) was (46%) and 63.8% of mothers reported initiating complementary feeding on the sixth month with continued breastfeeding. High levels of stunting (40.3%), wasting (18.4%) and underweight (35.7%) were established among the children. There was no association between any of early infant feeding modalities and childhood nutritional indicators (stunting, wasting and underweight). Also, none of these practices/behaviors/challenges longer feeding time (operationally defined as feeding spanning 30 minutes to 1 hour) (59%), refusal of food by varied texture (27.7%), fussiness at feeding (28.8%) was associated with childhood nutritional status. The only variable predictive of stunting identified chewing problems among the children during the complementary feeding period (aOR = 0.560, 95% CI, 0.336-0.933).

**Conclusions:** None of the mothers practiced exclusive breastfeeding. Rates of child under nutrition were very high within the district. The data does not support our hypothesis that early infant feeding modality predicts nutritional status in early childhood.

**Keywords:** Exclusive breastfeeding, mixed-feeding, modality

## **OUTCOMES OF CHILDREN AGED 6-59 MONTHS WITH SEVERE ACUTE MALNUTRITION IN A REFUGEE CAMP IN CAMEROON: CASE STUDY, THE GADO REFUGEE CAMP**

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**Background and Objective:** The Gado Outpatient Treatment Centre (OTC) was established at the Gado Refugee Camp in East Cameroon by Medecins Sans Frontiers in 2014 to care for refugees from Central African Republic who were fleeing a politico-religious crisis. This centre managed predominantly children with Severe Acute Malnutrition (SAM). We analysed data from files of children aged 6-59 months treated at the OTC for SAM to see how effective the OTC was.

**Methods:** Ethical approval was obtained from the University of Southampton Institutional Research Board. We carried out a retrospective cohort study, analysing files of children admitted to the OTP from April 2015 to August 2016. We included 254 children aged 6-59 months who met any criteria for SAM. Exposure variables were age, wasting, clinical symptoms on admission and type of malnutrition; outcome variables were treatment duration, Rates of Weight Gain (RWG), Rates of MUAC gain (RMG), type of discharge [recovered, defaulted. Died or referred to Stabilisation Care (SC)]. We also assessed the OTCs Positive Predictive Value (PPV) for diagnosing SAM.

**Results:** PPV was 68.9%; Median age was 14(IQR 6-59); male: female ratio, 48:52. Mean WHZ was  $-3.5 \pm 0.8$  for males,  $-2.8 \pm 0.9$  for females ( $p < 0.001$ , CI 0.5-0.9); Recovery rate was 72.8%, referral rate 26.8%, CFR 0.8% and default rate 0%. Reasons for referral to SC included poor weight gain (44.1%), anorexia (26.5%), infections (26.5%) and persistent oedema (2.9%). Mean overall RWG was 4.4g/kg/day and RMG 0.3mm/cm/day, median duration of treatment 44.5 days (IQR 27.8-68.5). Comparing amongst those with marasmus, kwashiorkor and marasmic

kwashiorkor, median duration of stay was 48, 24.5 and 36.3 days ( $p=0.002$ ); recovery rates were similar 73, 71.4, 71.4% respectively ( $p=0.7$ ); Median RWG, 4.4, 6.7 and 8.1 g/kg/day ( $p=0.05$ ); median RMG, 0.3, 0.3 and 0.5mm/cm/day ( $p=0.06$ ).

**Conclusions:** Treatment of SAM in OTCs is feasible; sphere standards were achieved in terms of CFR and default rate; the OTP had a high rate of referral to SC. RWG was inadequate and was the most common reason for referral to SC. Using combined gender growth charts captured the most wasted males and non-malnourished females; thus, to improve PPV for SAM, only gender-specific growth charts should be used. Quality control should be done regularly to ensure proper collection of data in this OTP. All children with fever on admission should be referred to SC. This study was principally limited by a small sample size.

**Keywords:** acute malnutrition, outpatient treatment centre.

processing industries. There are 393 food industries, 243 processing enterprises and only two qualified industries doing child food fortification according to Ministry of Industry, 2017. In Ethiopia only mass salt fortification is successfully done and the other food fortification of wheat flour, edible oil, sugar is still under development. The reasons for this problem are lack of willingness in the private sectors to start fortification in the existed processing industries and lack of regular enforcement from the government of Ethiopia. Therefore, active engagements from the food industries and the government are the key elements to promote fortification in Ethiopia at large. Some policy related information on why fortification of cereals and grains are neglected rather fortification supplementation given prior by the government strategies will be reviewed. In this review, the policy review on fortification and food industries role will be presented in detail to share the current statuses of fortification and food processing industries contribution in Ethiopia.

**Keywords:** fortification, processors, consumers and policy

## **ROLE OF FOOD INDUSTRIES, TO INTRODUCE AND PROMOTE VALUE ADDED, FORTIFICATION STRATEGIES: THE CASE OF ETHIOPIA**

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It has also been noted that the modern food processing system comprises well established processing and quality control systems that ensure the application of these good practices (GAP, GVP, GMP and GHP), as well as the system that encourages the implementation of HACCP. In ensuring the availability of quality and safe food, there need to exist strong coordination among processors and consumers; in particular, there must be strong coordination among the concerned processing agencies. The problem in Ethiopia in this respect is that the awareness of consumer in reading and using the information provided on the packaged food product is at a very lower stage of development. The second scenario is introduction and promotion of fortification in food

## **ACCEPTABILITY AND PERCEIVED USEFULNESS OF DIABETES SELF-MANAGEMENT SMARTPHONE APP BY REGISTERED DIETITIANS IN NIGERIA**

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**Background and Objective:** Diabetes Mellitus (DM) is one of the four priority non-communicable diseases. The rising burden of DM in Nigeria requires a combination of smart and population-driven interventions and strategies. With the low population of dietitians, the projected exponential increase in the prevalence of people living with diabetes and widespread poor lifestyle habits in Nigeria, the adoption of novel approaches in diabetes control and management is important. This study was aimed at determining the acceptability and perceived usefulness of diabetes

management Smartphone app by Registered Dietitians in Nigeria.

**Methods:** This descriptive cross-sectional study was conducted among 112 registered dietitians across the six geopolitical zones of Nigeria. Data was collected using a validated, semi-structured, electronic-questionnaire. Acceptability of mobile technology for DM self-management was assessed using the Technology Acceptance Model (TAM) was used for data collection. Perceived usefulness was assessed using 10-point Stapel scale. Data analysis was analysed using descriptive statistics, Chi-square and Fischer exact test at  $p=0.05$ .

**Results:** Respondents were majorly female (67.9%), 42.9% were aged 30-39 years, 69.6% and 67.0% were clinical dietitians and full-time employees respectively. Majority (85.7%) had smartphone, 97.2% had never deployed a smartphone app in clinical practice and 73.2% agreed that smartphone app may enhance informed decisions regarding diabetes management. Existing key methods of diabetes management were food record (85.7%), glucometer-based (79.5%), and glycaemic value reading (64.3%). Majority (76.8%) perceived DM smartphone app acceptable in diabetes control and 86.6% were willing to apply it. Perceived usefulness was  $8.32 \pm 1.75$ . Acceptability and perception were strongly associated with age of respondent.

**Conclusions:** Positive perception and acceptability of smartphone apps for diabetes mellitus self-management among Nigerian dietitians was high and found applicable in diabetes control. Inclusion of smartphone-based approaches is hereby recommended for diabetes control in Nigeria.

**Keywords:** Diabetes Mellitus, Technology acceptance, Smartphone application Mobile Health, Dietitians

#### **POSTPARTUM DEPRESSION AND ITS ASSOCIATION WITH FOOD INSECURITY AND SOCIAL SUPPORT AMONG WOMEN IN POST-CONFLICT NORTHERN UGANDA**

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**Background and Objective:** Postpartum depression (PPD) is a major psychiatric disorder affecting women soon after birth and, in some cases, is a continuation of antenatal depression. Food insecurity (FI) and social support (SS) are known to be associated with major depressive disorder, and vice versa. Limited studies exist examining the interrelationships among FI, SS and PPD among women living in post conflict, low-income countries.

**Methods:** Cross-sectional data from 239 postpartum women on depression symptoms, FI and SS in northern Uganda were, respectively, obtained using the Center for Epidemiologic Studies-Depression (CES-D) scale, Individually Focused FI Access scale (IFIAS) and Duke-UNC functional social support scale. Other sociodemographic data were collected using a structured questionnaire. We used standard regression methods to assess associations among FI, SS and PPD.

**Results:** 40% of the women were found to have PPD i.e. with CES-D scores  $\geq 17$ . The mean  $\pm$  standard deviation (SD) for FI score and SS scores were  $6.47 \pm 5.02$  and  $19.11 \pm 4.23$  respectively. In adjusted analyses, severity of depressive symptoms was found to be positively associated with FI (Unstandardized beta and standardized beta of 0.703 and 0.432 respectively, standard errors = 0.093 and  $p$ -value  $< 0.0001$ ) and negatively associated with SS (Unstandardized beta and standardized beta of -0.263 and -0.135 respectively, standard errors = 0.111 and  $p$ -value = 0.019).



**Conclusions:** Many women in this post-conflict region reported experiencing PPD. In addition, our data suggest that food security and psychosocial support interventions may help mitigate women's experience of PPD or its severity.

**Keywords:** Postpartum Depression, Food insecurity, Social support, Uganda, Civil war

## **IMPROVING NUTRITION SECURITY: A PILOT STUDY IN THE COFFEE FARMING COMMUNITIES**

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Lack of access to nutritious and a balanced diet remains a major impediment to the health and well-being of most African communities living in rural areas. Under the circumstances, agriculture and proper food utilization play a crucial role in increasing availability of food and access to diverse and nutritious diets. While ensuring nutrition secure supply-chain through responsible sourcing, Nestlé in Kenya has teamed up with Solidardad, Simlaw Seed Company and Coffee Management Services to increase availability of food throughout the year and improve dietary diversity of farmers by promoting the uptake of kitchen gardens and couples cooking demonstrations. This is after the initial baseline cross-sectional study conducted in February/March 2017; showed Muranga County was food-insecure with most farmers consuming starch-based diets. Additionally, the farmers had inadequate Household Dietary Diversity Scores (HDDS) mean=7.

The results of the intervention show 87% uptake of kitchen garden (N=51 farmers) with an improved adequate HDDS=9. Farmers who attend the cooking demonstration (N=22 couples) (those who purposefully and collaboratively expressed further interest to continue with future project activities), had much improved HDDS=10. In overall terms (N=60 farmers), the most consumed food groups were the cereals, oils and condiments (100% consumption). Vegetables were consumed by 98% of the farmers while the consumption of milk and milk products was noted as 90%. The least consumed were the other animal proteins, with beef, poultry and eggs being consumed by less than 20% of the farmers. No consumption of fish was noted. Future activities seek to increase animal proteins uptake as well as explore the food access arm of the project.

**Keywords:** Cooking demonstration, Kitchen garden, Nutrition Security

## **NUTRITION KNOWLEDGE, EATING HABITS AND NUTRITIONAL STATUS OF NUTRITION AND DIETETICS STUDENTS IN A NIGERIAN POLYTECHNIC**

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**Background and Objective:** Health care practitioners are trained and provided with the opportunity to develop sound knowledge and attitude that will enhance their career delivery. The study therefore examined the nutrition knowledge, dietary habits and nutritional status of nutrition and Dietetic students at the Federal Polytechnic, Ede. Nigeria.

**Methods:** A cross-sectional survey was conducted on 160 (44 males and 116 females) aged 20.4±2.4years. Nutrition knowledge and eating habits were obtained using a well-structured questionnaire. Anthropometric indices and blood pressure variables were determined using standard techniques. Data collected were analysed using the Statistical Package for Social Sciences (SPSS) software (version 20).

**Results:** Majority (75.6%) of the participants had a good knowledge of nutrition but most of them ate two times daily (54.4%) and skipped breakfast (69.5%). Very few of them consume fruits (25%) and vegetables (23.1%) daily. The male participants were taller, heavier and had higher blood pressure than the female participants. Most of the participants had normal weight (78.1%) and were non hypertensive (61.2%). About a fifth (21.9%) of them were underweight, overweight or obese and two-fifths (39.8%) were either pre-hypertensive or hypertensive. There was no significant ( $P>0.05$ ) relationship between dietary pattern, nutrition knowledge and weight status. Participants with BMI  $> 25\text{kg/m}^2$  had significantly higher ( $p<0.05$ ) MUAC, weight, waist circumference and systolic and diastolic blood pressure than those with BMI  $< 25\text{kg/m}^2$ . There was no



significant relationship ( $p>0.05$ ) between the weight status, nutrition knowledge and meal skipping.

**Conclusions:** Although the students had good nutrition knowledge, they had poor meal pattern and poor consumption of fruit and vegetables which may have negative implication on their nutritional and health status.

**Keywords:** Nutrition Knowledge, Eating Habits, Nutritional Status, Nutrition And Dietetics Students, Nigerian Polytechnic

#### **DEVELOPMENT OF A REVISED SOCIAL AND BEHAVIOUR CHANGE COMMUNICATION STRATEGY TO ENHANCE CARE-SEEKING FOR CHILDHOOD DIARRHOEA AND DEMAND FOR ZINC AND LO-ORS IN THREE NORTHERN NIGERIAN STATES**

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**Background and Objective:** Childhood diarrhoea is a public health concern in Nigeria with a national prevalence of 14.3% and a prevalence of 18-21% in the three states (Jigawa, Katsina and Zamfara) where Nutrition International (NI) currently implements a diarrhoea management program. Zinc and Low Osmolarity Oral Rehydration Salts (LO-ORS) is recommended by WHO as a cost-effective treatment for childhood diarrhoea. Results from the Nutrition Intervention Monitoring Surveys (NIMS) conducted in 2017 showed that treatment of diarrhoea with Zinc and LO-ORS is limited by low awareness about its benefits among caregivers (3%), and inadequate care-seeking outside the home (64%) with only 29% of caregivers seeking care in the

public sector. To respond to these gaps, NI revised its existing SBCC strategy to aim to enhance care-seeking behaviour in the public sector and demand for treatment of childhood diarrhoea with Zinc and LO-ORS among caregivers.

**Methods:** The existing SBCC strategy was reviewed through a participatory workshop with key stakeholders drawn from the States' Ministries of Health, States' Primary Health Care Development Agencies, Development Partners, the Media, and Traditional and Religious leaders. A revised communication strategy, which included new messages, was developed and previous BCI materials, including radio jingles, posters and flyers, were modified and pretested in 4 communities within the targeted states. These were further reviewed before dissemination.

**Results:** Radio Jingles in Hausa language, on the proper use and benefits of zinc and LO-ORS for the treatment of diarrhea in children were produced and aired three times daily on 3 popular radio stations. This reached approximately 10 million listeners across the three NI focus states. A total of 8,664 copies of posters and flyers have been distributed to the three program states. This information is now available in 287 public health facilities and was made available to 965 households.

**Conclusions:** Development of a revised SBCC Strategy is intended to address identified gaps in the treatment of childhood diarrhoea with Zinc and LO-ORS in Nigeria: care-seeking for childhood diarrhoea and demand for Zinc and LO-ORS by caregivers.

**Keywords:** Social and Behaviour Change Communication Strategy, Care-Seeking, Childhood Diarrhoea, Zinc and Lo-Ors, Nigeria.

#### **Assessment of stunting in children 6-59months in Kyangwali Refugee Settlement -South Western Uganda**

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**Background:** Stunting is the impaired growth and development experienced by children as a result of poor nutrition and frequent infection. Children are defined as stunted if their height-for-age is less than two standard deviations using WHO Child Growth Standards median. Poor nutrition in first 1000 days cause impaired growth and has adverse functional consequences on children that include poor cognition and educational performance, less productivity and sometimes can be accompanied by weight gain later in childhood which puts the child at high risk of nutrition-related chronic diseases in adult life. While prevalence of stunting decreased from 33% (2011) to 29% (2016) in Uganda, stunting in children 6-59 months in the Refugee population generally remains high. This is majorly due to poor feeding practices and poor maternal and child health care.

**Objective:** The objective was to assess the level of stunting in children aged 6-59 months in Kyangwali Refugee settlement.

**Methodology:** A cross sectional survey was conducted using systematic random sampling in the settlement, An interviewer administered questionnaire was filled by 282 heads of households to elicit information on Infant and Young Child Feeding Practices, while weight and height for children (6-59 months) was measured and WHO Z-score charts were used to categorize stunting.

**Result:** The results showed that 32.6% were stunted, classified as “serious”, the prevalence of moderate stunting and severe stunting was 26.6% and 6.0% respectively. Stunting increased significantly immediately after age 2years as most of children were likely not to receive adequate hygienic feeds.

**Conclusion** Community programs that ensure household access to proper sanitation, clean water, diversified foods, poverty reduction, education on Infant and young child feeding practice can collectively reduce the burden of stunting in population.

**Keys words:** prevalence, cognition, diversified, stunting, chronic

## **WHAT DO UGANDAN WOMEN EAT? A HEALTH AND ENVIRONMENTAL SUSTAINABILITY PERSPECTIVE**

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**Introduction:** Sub-Saharan African (SSA) countries are urbanising and concomitant with this, diets are transitioning, becoming richer in animal protein, sugar, salt and saturated fat. Such diets have likely implications for health and environmental sustainability. Moreover, it has been suggested that in such low-and middle-income contexts, dietary transitions vary between rural and urban areas. The aim of this study was to investigate dietary patterns of Ugandan women of reproductive age and how they differ in urban and rural areas.

**Methods:** This study draws on dietary data collected using a single 24hr recall from a representative sample (n=955) of rural and urban women from the Uganda Food Consumption Survey. Dietary intakes were merged into 35 food categories based on culinary use, environmental impact (greenhouse gas emission) and nutrient content. Intakes were standardised and implausible outliers ( $\pm 6SD$ ) were removed. Principal component analysis was then conducted. The resulting dietary patterns were retained based on statistical output (eigenvalues  $>1.0$ ) and interpretability.

**Results:** Four distinct dietary patterns emerged, collectively explaining 23.6% of the variance in food consumption in this sample of Ugandan women. Bootstrap linear regression results showed that being an urban resident was positively associated with the ‘transitioning, processed, medium

environmental impact' dietary pattern ( $\beta=1.192$ ; 1.057, 1.317 95%CI) and the 'animal-based, high environmental impact' dietary pattern ( $\beta=0.477$ ; -0.276,-0.610 95%CI). The 'plant-based, low environmental impact' dietary pattern, however, was negatively associated with being an urban resident ( $\beta= -0.489$ ; -0.619, -0.397 95%CI).

**Conclusion:** Some aspects of a 'transitioning' diet were identified among urban women, who had a more varied, albeit less environmentally sustainable, diet compared with rural women. This is suggestive of nutrition transition among urban women. Future policy recommendations aimed at addressing dietary transitions among women of reproductive age might require context-specific considerations owing to rural-urban food consumption differences.

**Key words:** dietary patterns; urbanisation; environmental sustainability; Uganda; women