



# Proceedings



**Ethiopian Public Health Institute**

January 14 - 16,  
2016

## **2nd National Nutrition Research Dissemination Conference**

**Conference Theme:** Micronutrient Interventions for Child Survival and Sustainable Development:  
Hunger Free Ethiopia in SDG

**Conference featured in this issue:**

**Sub-theme 1** Nutrition intervention and related researches

**Sub-theme 2** Food processing technology and product development related research

**Sub-theme 3** Nutrition sensitive agriculture and related research

**Sub-theme 4** Micronutrient and macronutrient related research

**Sub-theme 5** Food safety and quality related research

**Dessalegn Hotel  
Addis Ababa, Ethiopia**

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## ACRONYMS AND ABBREVIATIONS

A&T	Alive & Thrive
AEWs	Agriculture Extension Workers
ANC	Antenatal Care
AOR	Adjusted Odds Ratio
ART	Antiretroviral Therapy
ASFs	Animal Source Foods
BMI	Body Mass Index
CRD	Completely Randomized Design
DDS	Dietary Diversity Score
ENA	Essential Nutrition Action
EPHI	Ethiopian Public Health Institute
FG	Free glucose
FSNRD	Food Science and Nutrition Research Directorate
HDA's	Health Development Army volunteers
HEW	Health Extension Worker
HIV	Human Immunodeficiency Virus
HVC	Highly Vulnerable Children
ICMR	Indian Council of Medical Research
IDF	International Diabetes Federation
IYCF	Infant and Young Child Feeding
MLP	Moringa Leaves Powder
NNP	National Nutrition Program
OFSP	Orange Fleshed Sweet Potato
OLS	Ordinary Least Square
OTP	Outpatient Treatment Program
PUFAs	polyunsaturated fatty acids
RCBD	Randomized Complete Block Design
SAM	Severe Acute Malnutrition
SD	Starch Digestibility
SDRI	Starch Digestibility Rate Index
SDS	Slowly Digestible Starch
SNNPR	South Nation National People Region
TFC	Total Flavonoid Contents
TIPs	Trials of Improved Practices
TPC	Total Phenolic Contents
TS	Total Starch
WHO	World Health Organization

# BACKGROUND

**T**he Ethiopian Public Health Institute (EPHI) was established to protect and promote the health of the Ethiopian people by addressing priority public Health and Nutrition problems; EPHI is the result of the merger of the three Institutes: National Research Institute of Health, Ethiopian Nutrition Institute, and Departments of Traditional Medicine.

## **The main objectives of the institute are to:**

- Contribute to the development of health science and technology
- Provide referral medical laboratory services relating to the causes, prevention and diagnosis of major diseases of public health importance
- Establish and support National Laboratory Quality Assurance Programs and systems

Ethiopian Public Health Institute expanded operations include its enhanced role in health research based on the priority health and nutrition problems identified in the national public health research agenda. Based on the prevalence of health and nutrition problems and by taking public needs into considerations, the Institute had been setting priority strategies to address the public demands.

EPHI conducts research on Nutrition, traditional medicines, and medical practices as well as on the causes and spread of diseases. The Institute is an autonomous public authority having its own National legal personality. Recently, nutrition and health, research ventures in Ethiopia have stated to be viewed as essential component of better health status and general wellbeing of the population. The institute has contributed a lot for the improvement of the public health and nutrition problems of the country taking the public needs into considerations. Currently the institute is focusing on priority problems such as malnutrition (macro and micronutrient deficiencies), public health emergency management and strengthening the quality of National public health laboratory services. It is also the technical arm of the federal ministry of health. One of the most significant programs that the institute is currently involved is the National Nutrition Program (NNP). The Food Science and Nutrition Research Directorate (FSNRD) is carrying out NNP activities as part of its regular operations. The mandate of the Directorate is to coordinate nutrition research activities in the country and to carry out effective research to develop evidence based and innovative solutions to reduce and eradicate malnutrition. It also offers laboratory services to the public and organizations, supports curriculum development and teaching at universities, and carries out 'on- job' training for various organizations on health and nutrition related topics.

## **Purpose of the conference**

## ***2<sup>nd</sup> National Nutrition Research dissemination Conference***

- To share recently finalized nutrition research output to program implementer, academia's and policy makers
- To availing up-to-date information for policy discussions and measures.
- To strengthen research collaboration among different key actors in Ethiopia.
- To Identify best practices and support dissemination for scale up



## KEY NOTE ADDRESS

By

Dr. Abdulaziz Addish, MI Africa's Deputy Regional Director.  
Micronutrient Survey Dissemination workshop  
January 14-16, 2016, Addis Ababa

Distinguished Participants, Ladies and Gentlemen,

It is a tremendous honor to be here today to deliver, on behalf of Micronutrient Initiative, a keynote speech at this very important forum. It is my sincere pleasure to be here as participant of this workshop.

I would like to first congratulate Ethiopian Public Health Institute for coming on the stage in hosting Micronutrient Survey Dissemination workshop.

As you all know, in order to reduce infant and child mortality and morbidity in the country, the Ethiopian government has endorsed and implemented different policies and programs. But still, these policies and strategies always need to be assessed and improved in a way that they can actually contribute for the reduction of infant and child mortality and morbidity and assurance of a well-nourished and productive society in the country.

Indeed these can be achieved with the cumulative efforts and commitment of Ethiopian Government, Research institutes, academia and other partners that have been engaging in different sectors.

MI as key partners of Ethiopian Government on nutrition has had a footprint in Ethiopia since 1997, supporting child survival programs through provision of vitamin A supplements, and an even broader presence, focus, and mandate since the establishment of an MI country office in 2005.

Over the past three years alone, with support from the Government of Canada and other donors, MI has invested tens of millions of dollars in the health of Ethiopia's children. As part of the continuum of implementation research to improve the reach and equity in access to micronutrient interventions, MI has also funded/supported/ nearly 2 Million Canadian Dollars (**1,189,374 CAD**) for Ethiopian Public Health Institute (EPHI) to conduct:

1. Micronutrient Survey in Ethiopia
2. National Food Consumption Survey

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3. Iron Folic Acid (IFA) Research
4. IFAs End line Evaluation and EMNS
5. Calcium Research in Ethiopia
6. Assessment of Iodine deficiency disorder
7. Assessments of risks providing IRON+MNS to child

**Ladies and Gentlemen, Invited Guests**

I hope this workshop will be an important learning session where all participants will have a lot to take home and the findings will encourage all policy makers, program managers and researchers to use this National Micronutrient survey dissemination workshop as platform to exchange knowledge and experience. Hopefully, the findings will have paramount significances in redesigning nutrition programs, Micronutrient sub analysis and evidence based nutrition intervention.

Finally, I would like to reaffirm that MI will continue working with partners to conduct micronutrient and food consumption surveys to paint a clear picture of the micronutrient status in target populations in the country.

Thank you very much for your kind attention and I hope the workshop will be a great success.

Thank you.

## OPENING REMARK

By

**Dr. Amha Kebede, General Director of EPHI**

**January 14-16, 2016, Addis Ababa**

**Conference on: Micronutrient Interventions for Child Survival and Sustainable Development:  
Hunger Free Ethiopia in SDG**

**Dignitaries,  
Colleagues,  
Invited Guests,  
Ladies and Gentlemen,**

Good Morning.

First of all,

I would like to welcome you all to this important gathering and it is a real pleasure for Ethiopian Public Health Institute (EPHI) to host this conference. This conference is planned to provide evidence based information for this audience that came from different government sector offices, research institutes, academia, development partners, media and others who are all significant for the National Nutrition Program (NNP) implementation in Ethiopia.

It is remembered that there is a decline in stunting, underweight and wasting in children under-five years of age in Ethiopia, however the current under nutrition rate such as, stunting 40%, underweight 25% and wasting 9% remains very high. As you all know child under nutrition is associated with high morbidity and mortality risk, cognitive and physicomotor underdevelopment and lower physical capacity. Hence under nutrition is leading to a significant loss in human and economic potential. The World Bank estimates that undernourished children are at risk of losing more than 10 percent of their lifetime earning potential, affecting national productivity.

Human capital is the foundation of economic development. Improved nutritional status of people has a direct impact on economic performance through increased productivity and enhanced national comparative advantage. In order for Ethiopia to maximize present and future opportunities for economic growth, increased efforts are needed for cost-effective interventions that address the nutritional situation of the most vulnerable members of society.

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Currently, Ethiopia is trying to reach middle class country but to achieve this, unreserved effort need to be in place for children to grow well and mothers to be healthy and well nourished. We need to also recognize that achieving nutrition and food security would generate immediate impact on the achievement of the Millennium Development Goals (MDGs). This is only possible, if we can work on nutrition to enhance the nutritional wellbeing of the nation. In this regard, evidence based NNP implementation among different sectors is crucial. Therefore, EPHI, the technical arm of the FMoH, is striving to coordinate nutrition research and monitoring activities in the country and leading the nutrition research, monitoring and evaluation sub-committee of the NNP.

So far, the institute has conducted various operational and basic research activities, host different workshops, trained professional and provided laboratory services. Among the latest and the most important research done recently by the institute in collaboration with supporting partners, the institute will present the result of the **National Micronutrient Survey**.

**Ladies and gentlemen,**

The objectives of this conference is many fold in that it aimed at bringing different **research topics** from all corners of the country, sector offices, academia, research institutes, development partners and others. The conference is hoped to bring all participants in to similar understanding about federal and regional implementation of NNP, foster collaboration among different stakeholders, share knowledge and experience among key nutrition actors in Ethiopian and strengthen and support collaborative research among different sectors.

**Ladies and Gentlemen,**

**Invited Guests**

This conference, I hope will enrich the research outputs to make sure quality evidences and system based findings goes to policy makers and program developers that will allow them to use our limited resource appropriately and cost effectively. This conference will also help policy makers and program developers to formulate informed, timely and appropriate policies and programs that are evidence based and locally applicable.

I wish you all to have a joyful and successful time where you can contribute to the overall success of the workshop and ultimately to the success of the national nutrition strategy and program in Ethiopia.

Finally, on behalf of EPHI, I would like to thank all for coming here to attend this important workshop and would like to congratulate EPHI and other supporters for making this a reality; EPHI researchers, support staffs,

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and administration, colleagues from the Federal ministry of health, regional health bureaus, partners and others stakeholders for their technical and financial support.

**Ladies and Gentlemen,**

With these few remarks, I wish you very successful discussions and deliberations over the next days and I now officially declare that conference is opened

Thank you!

## THEME 1: NUTRITION INTERVENTION AND RELATED RESEARCHES

### SUMMARY OF THE FINDINGS

Malnutrition is one of the main public health problems among children and women in Ethiopia.

Poor complementary feeding practices are common and complementary foods typically lack diversity and are low in micronutrients. Dietary diversity score was as low as four percent. Many of the dietary habits, beliefs and practices of the mothers are against scientific recommendations. A considerable proportion had misconceptions and taboos that can potentially affect their nutritional status and related health outcomes of the newborn. Anemia during pregnancy is a major public health problem and the effect has been associated with major maternal and fetal complications; it is associated with age, family size, not taking fruit after meal, gestational age, multi-gravidity, history of abortion, history of malarial attack, HIV infection, and have intestinal parasite.

Nationally, the prevalence of stunting, wasting and underweight in children 6 to 59 months were found to be 34.1%, 10.8% and 24.2% respectively. Twenty percent of Ethiopian women of reproductive age were thin or chronic energy deficient and 9.5% were overweight and 3.6 % obese. Total goiter rate was 10.7% in women and 3.7% in school age children. Breastfeeding initiations within one hour were 65.3%; and Colostrum feeding were 80%.

Child malnutrition and food insecurity remain main problems in Ethiopia. Nationally, 47.7% of households were mild food insecure and 29% moderate food insecure; 78.6% child and 98.3% women consumed cereal based foods, Vitamin-A rich plant based foods 2.6% and 3.4%, were the least consumed food group both by children and women. Household food insecurity affects normal physical growth intellectual capacity, Cognitive function, social skills, academic performance and School absenteeism.

Immune impairment as a result of HIV infection leads to malnutrition, and Malnutrition at the time of starting ART was significantly associated with decreased survival. The prevalence of metabolic syndrome was high among non-faster animal source food as compared to fasters.

Child caring practices and infection lead to children under nutrition. Parents' education, family size and wealth index were factors for double burden of malnutrition among in-school adolescents.

Agriculture Extension Workers contributed effectively in improving complementary feeding practice by meal frequency and dietary diversity. There was very limited awareness about the NNP and Multi-sectoral guideline, barriers to effective coordination between health and agriculture sectors including lack of knowledge and commitment about nutrition by the local government structure.

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There should be multi sectorial community based nutrition interventions and initiation of income generating livelihood. and, efforts should be made to improve household income earning capacity, nutrition related education is needed; efforts need to be made to address barriers that hinder AEWs involvement in promoting complementary feeding; Agriculture office and its partners need to strengthen efforts and prioritize training AEWs to increase complementary feeding practices, Attention should be given to nutritional assessment, feeding habit and dietary counseling to the care giver; maternal education level and adequate family support for school adolescents. Strengthen the prevention and control of communicable diseases like malaria, HIV and intestinal parasites, provision of nutritional support in conjunction with an early start of ART and the food by prescription initiative should be further strengthen; Nutrition programs focusing on child feeding in Ethiopian Orthodox communities should explicitly address the topic of how to feed children ASFs during long fasting periods.

## LINKAGES BETWEEN HEALTH AND AGRICULTURE SECTORS IN ETHIOPIA: A FORMATIVE RESEARCH EXPLORING BARRIERS, FACILITATORS AND OPPORTUNITIES TO PROVIDING NUTRITIONAL SERVICES

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**Background:** In Ethiopia, poor complementary feeding practices are common and complementary foods typically lack diversity and are low in micronutrients. Inappropriate traditional food processing technologies and lack of know how in improving nutrient density from the same ingredients is well documented. This study was conducted to understand whether such structures exist and are functional. It also looked at barriers and facilitators for the successful implementation of the NNP as well as the opportunities for future collaboration between the health and agriculture sectors to provide nutrition services.

**Method:** Data was collected at woreda and kebele level using focus group discussions and key informant interviews. Both health and agriculture sectors were more or less equally represented.

**Result:** We found that very few people knew about the National Nutrition Programme and the Multi-sectoral implementation guideline. The level of awareness was even worse at kebele level. However, we found some well performing woredas and Kebeles where there was effective inter-sectoral collaboration between the health and agriculture sectors. The main facilitators of success among such well-performing sites were the existence of strong local government commitment to nutrition, presence of 1 to 5 and 1 to 30 community networks and other partners such as NGOs who provided support to nutritional activities.

Participants of the study felt that the existence of 1 to 5 and 1 to 30 community networks i.e. health development armies (Health sector) and agriculture development armies (agriculture sector), food demonstration sites and resources available by local partners such as NGOs are valuable opportunities to accelerate delivery of nutritional services.

In conclusion, this study identified very limited awareness about the NNP and Multi-sectoral guideline, particularly at kebele level. The study also identified barriers to effective coordination between health and agriculture sectors including lack of knowledge and commitment about nutrition by the local government structure.



## SUSTAINABLE UNDER NUTRITION REDUCTION IN ETHIOPIA (SURE); A FEASIBILITY STUDY EXAMINING SURE IMPLEMENTATION IN BASONA WORANA WOREDA, AMHARA REGION, ETHIOPIA

Desalegn Kuche<sup>1</sup>, Tesfaye Hailu<sup>1</sup>, Girmay Ayana<sup>1</sup>, Alemnesh Petros<sup>1</sup>, Mekonnen Sisay<sup>1</sup>, Masresha Tessema<sup>1</sup>, Bizuayehu Gutema<sup>2</sup>, Gelila Zewude<sup>3</sup>, Mihretab Salasibew<sup>4</sup>, Cami Allen<sup>4</sup>, Alan Dangour<sup>4</sup>

<sup>1</sup> Ethiopian Public Health Institute, <sup>2</sup> Ethiopian Institute of Agriculture Research,

<sup>3</sup> Federal Ministry of Health, <sup>4</sup> London School of Hygiene and tropical medicine

**Background:** Under nutrition is still a public health problem and remains a concern to Ethiopia's rapid economic development. Community Based Nutrition (CBN) is an important component of the national nutrition program to improve nutritional status of infants, young children and children under-five years as well as pregnant and lactating women. Despite implementation of CBN and other nutrition programs, IYCF practices remain very poor in Ethiopia, especially timely introduction of complementary food and dietary diversity.

**Methods:** This feasibility study tested the implementation of SURE programme design components in Basona Worena Woreda, Amhara region before the roll out of the main programme across four regions in Ethiopia. Study participants were households (mothers and fathers of under-2 children), health and agricultural extension workers, health and agricultural development armies, and men's and women's support groups (1-30 community network members). Qualitative study design was employed. Data was collected using pre and posttest, observation, semi-structured interviews and focus group discussion. The analysis was carried out by Nvivo software version 10.

**Result:** Health and agriculture extension workers gained demonstrable knowledge about infant and young child feeding, nutrition-sensitive agriculture and gender after attending the training provided by master trainees using the SURE training manual. HEWs and AEWs largely failed to apply the 3 A's process (assessment, analyze and act) while providing counseling to households on IYCF and dietary diversity. The seasonal food calendar was not used as intended in the SURE programme design, and inconsistent delivery of dietary diversity messages was observed. No household action plan was agreed and documented at the end of each household visits. Similarly, health and agricultural extension workers did not follow the steps outlined in the SURE training manual and apply the skills necessary to conduct men's and women's group dialogues. Pairs of mothers and fathers in each household visited were found to be supportive of the joint HEWs and AEWs visits. HEWs and AEWs regarded their joint household visits as innovative and felt that they can realistically continue to

work together provided that there is a strong commitment to nutrition by the local political and administrative bodies, who routinely oversee performance of HEWs and AEWs.

**Conclusion:** The integrated delivery model is well-accepted by both frontline workers and mothers and fathers. However, the feasibility study results also suggest that additional programme supports and tools are required to support achievement of the intended quality of delivery, namely: individualized assessment, analysis and proposal of correct actions to mothers and fathers, and negotiation of specific, clear and actionable solutions to relevant community problems on complementary feeding and dietary diversity.

**Key words: Under nutrition reduction, Complementary feeding, Dietary diversity, Ethiopia**

## ETHIOPIAN NATIONAL NUTRITION PROGRAM END LINE SURVEY

Girmay Ayana , Masresha Tessma, Tesfaye Hailu, Adamu Belay, Desalegn Kuche, Solomon Eshetu, Andinet Abera, Aweke Kebede, Temesgen Awoke, Girma Mengistu, Yosef Beyen, Alemnesh Petros, Mekonen Sisay, Mesert W/yohanes, Tsehay Assefa, Tibebe Moges, Biniyam Tesfaye, Dilnesaw Zerfu  
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**Background:** Malnutrition is one of the main public health problems among children and women in Ethiopia. However, there has been encouraging progress in reducing the prevalence of stunting and underweight over the last 10 years. This achieved through improvements in food and nutrition security and scaling up of nutrition programs to reach more children and women through multi-sectoral implementation of the National Nutrition Program (NNP) and the strategy.

**Method:** It was a cross sectional study design with a regional and national level representative sample. Information related to household socioeconomic and demographic characteristics, household food security and dietary diversity, child feeding practice, and children nutritional status, child morbidity, women nutritional status, and nutrition knowledge attitude and practice were collected through questionnaires.

**Result:** Nationally, the prevalence of stunting, wasting and underweight in children 6 to 59 months were found to be 34.1%, 10.8% and 24.2% respectively. Stunting and underweight prevalence decreased from 38% to 34.1% and 34% to 24.2%, between the year 2010 and 2015. This shows that stunting has been declining annually by 1.3%. Twenty percent of Ethiopian women of reproductive age were thin or chronic energy deficient (BMI less than 18.5 kg/m<sup>2</sup>) and 9.5% were overweight and 3.6 % obese (BMI 25 kg/m<sup>2</sup>). Thinness for women decreased from 29% to 20% since the implementation of NNP, whereas overweight increased from 5.3% to 9.5%. Nationally total goiter rate was 10.7% in women and 3.7% in school age children. The national prevalence of goiter among women of reproductive age and school age children reduced significantly from 40% to 10.8% and from 36 to 3.7 % over the last 10 years. Though the national total goiter rate was lower in school age children, the highest prevalence of goiter was found in Dire Dawa (14.1%), Benshangul Gumuz (11.4%) and Harari (5.4%). Total goiter rate in women of reproductive age was also high in Benshangul Gumuz (28.1%), Dire Dawa (20%), Tigray (19.9%) and Amhara (10.4%). The national iodized salt coverage that was tested using rapid test kit was 84.5%. The prevalence of night blindness among children under 5 was 0.6 %, contributed by only three regions namely Oromia, Benishangul-Gumuz and Dire Dawa. Prevalence of Bitot spot was 0.2% and solely reported from Oromia region. Pre-lacteal feeding practice was high at national level (17%) and highest Pre-lacteal practice was reported in Afar (32.1%) and Somali (48.8%). The practice decreased almost by half (17%) when compared with baseline (31%). Nationally breastfeeding initiation within one hour improved from

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46% to 65.3% in the last five years. Colostrum feeding has also showed improvement (80%) comparing with the result in the baseline, (60%). In most of the regions, 75% of women didn't know how to prevent vitamin A deficiency and 46.4% did not know how to prevent iron deficiency. Twenty one percent of women know importance of consuming iodized salt. Nationally, 47.7% of households were mild food insecure and 29% moderate food insecure. Among region, the highest prevalence of severe food insecurity was reported in Somali region (39.6%) and the lowest in Addis Ababa (3.3%). National prevalence of minimum dietary diversity (>five food groups) in reproductive age women was improved from 13% to 20 % in the last five years.

## SCHOOL ABSENTEEISM AND ITS ASSOCIATION WITH FOOD INSECURITY AMONG SCHOOL ADOLESCENTS IN JIMMA ZONE, ETHIOPIA

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**Introduction:** Household food insecurity not only affects normal physical growth of young children, but also it adversely affects their intellectual capacity, social skills, and academic performance. Evidences from different studies showed health and nutrition problems are major barriers to educational access and achievement in low-income countries which poses a serious challenge for the effort towards the Millennium Development Goal of Education for all.

**Methods:** A community based cross-sectional study was done in Jimma zone from October-November, 2013. Structured questionnaires were used to collect data on food security, socio-demographic and economic variables using respondent's mother tongue. The data were entered in double, checked for missing values and outliers, and analyzed using SPSS (Version 16.0). Regression analyses were used to see the strength of association between dependent and independent variables using odds ratio and 95% of confidence interval. Variables that have  $p=0.28$  in the bivariate analyses were entered into a multivariable regression analyses to control for associations among the independent variables.

**Results:** The frequency of school absenteeism was significantly high among food insecure adolescents compared to food secure ones ( $<0.001$ ). A large proportion of (56.06%) food secure adolescents were never absent from the school compared to 40.49% of food insecure adolescents. Being a male ( $p<0.05$ ), urban residence ( $p<0.05$ ) and being household food secure ( $p<0.05$ ) were negatively associated with school absenteeism while low grade ( $p<0.01$ ) and food aid dependency ( $p<0.01$ ) were positively associated with school absenteeism. Food insecurity among young adolescents was significantly associated living alone [AOR=3.35(1.89, 5.94)], family support [AOR=0.13(0.01, 0.06)], having livestock [AOR=0.20(0.06, 0.70)], poor family [AOR=1.46 (1.21, 1.98)] and lack of maternal education [AOR=4.16(1.04, 16.67)].

**Conclusions:** School absenteeism is significantly associated with household food insecurity, female-sex, rural residence and poor dietary intake. Food insecurity among young adolescents was positively associated with poor family support, lack of having livestock, poor economic status and lack of maternal education. Therefore, efforts should be made to improve household income earning capacity, maternal education level and adequate family support for school adolescents.

**Keywords:** Absenteeism, Adolescents, Insecurity, Jimma

## FACTORS ASSOCIATED WITH NUTRITIONAL STATUS OF HUMAN IMMUNODEFICIENCY VIRUS INFECTED CHILDREN IN HAWASSA UNIVERSITY REFERRAL HOSPITAL, HAWASSA, SOUTHERN ETHIOPIA

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**Background:** Nutritional problems and HIV infection are closely interlinked disorders. Immune impairment as a result of HIV infection leads to malnutrition, which in turn, can lead to reduce the immunity. This study aimed to assess nutritional status and associated factors among HIV positive children.

**Method:** Institution based cross sectional study was conducted on 455 HIV positive children aged 6week to 14 years. Weight and height/length measurements were taken. Data were collected from caretakers using a structured questionnaire and child medical record. Logistic regression analyses were used to determine the factors affecting nutritional status of the children.

**Result:** In this study, the proportions of stunting, underweight, and wasting were 60.2%, 41.2%, 21.4%, respectively. In 5-10 years children, underweight was associated with advanced HIV clinical stage [AOR=2.33 (1.47, 3.67)], low child meal pattern [AOR=7.49 (2.48, 22.65)], food variety >4 [AOR=0.46 (0.23, 0.95)], low average monthly income of the family [AOR=4.97(2.24, 11.05)] and dietary counseling to the care taker [AOR=0.46 (0.29, 0.75)]. Wasting was significantly associated with presence of acute disease [AOR=1.70 (1.01, 2.86)], dietary counseling to care taker [AOR=0.09 (0.35, 0.23)] and rural residential area [AOR=2.38 (1.01, 5.64)]. Stunting was significantly associated to low average monthly income [AOR=2.56 (1.14, 5.75)].

**Conclusion:** This study has shown the high prevalence of under nutrition among HIV positive children on follow up in Hawassa referral hospital. Hence, attention should be given to nutritional assessment, feeding habit and dietary counseling to the care giver.

**Key words:** Nutritional status, HIV infected children, Hawassa, Ethiopia

## EFFECTIVENESS OF A COMPLEMENTARY FEEDING PROMOTION PROGRAM FOR CAREGIVERS OF INFANTS USING TRAINED AGRICULTURE EXTENSION WORKERS IN A RURAL AREA OF ETHIOPIA: A RCT

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**Background:** Complementary feeding practice is inadequate in Ethiopia. Dietary diversity score was as low as four percent (CSA 2011, p.171). There is no study on interventions targeting agriculture extension workers (AEWs) to promote complementary feeding for infants. Hence, this study was conducted to assess the effectiveness of complementary feeding promotion using Agriculture Extension Workers in addition to existing Health Extension Workers (HEWs), compared with HEWs alone, in Wonchi Woreda Oromia region, southwestern Ethiopia.

**Methodology:** This study was a community based cluster randomized control trial. The intervention and control groups each had 192 infants aged six to twelve months. Qualitative and quantitative data was collected at baseline, follow up (every three monthly) and effectiveness study (at 12 months) was conducted. The intervention comprised of messages on complementary feeding recommended practices promoted by trained AEWs on bi-weekly basis. Care givers complementary feeding knowledge, attitudes and practices and infants weight gain and nutrition status was measured. One focus group discussion and interview to all AEWs was conducted in each groups at baseline and final study. Data was analyzed using SPSS, STATA and ENA for SMART nutrition survey methodology. Analysis was conducted using descriptive statistics, chi-square, Fischer exact test and regression.

**Result:** baseline characteristics of children enrolled in the intervention and control groups were generally similar. The proportion of care givers who received complementary feeding message from AEWs (45.5%) was significantly higher among care givers in the intervention group than the control (3.6%) (p=0.000). The mean frequency of infant feeding was 3.2+0.57 and 2.8+0.61 respectively (p=0.000). Infants in the intervention group consumed from 3.5 (SD 0.69) food groups while 3.1 (SD 0.63) in the control group (p=0.0001). Pooled analysis showed variation in diversified food consumption resulted from consumption of dairy products, eggs and vitamin A rich fruits and vegetables among higher proportion of infants in intervention group. There was a positive acceptance of AEWs in complementary feeding messaging among care givers in in the intervention group after received training on complementary feeding messaging. Various factors predicted infant feeding

and growth. However, message from AEWs was a strong predictor of diversified food consumption and height-for-age.

**Conclusion:** messages from AEWs resulted in significantly higher mean meal frequency and diet diversity but no change in infant growth.

**Key words:** Complementary feeding, dietary diversity, meal frequency, weight gain, length gain, length for age, weight for age, caregivers practices, agriculture extension workers and health extension workers



## Maternal Food Taboos, Dietary Habits and Cultural Beliefs of Weight Gain during Pregnancy in Rural Central Ethiopia

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**Introduction:** Maternal nutrition affects pregnancy and prenatal outcomes. In Ethiopia, there is paucity of evidence on dietary habits and cultural believes of pregnant mothers.

**Objective:** To explore maternal dietary habits, food taboos and cultural believes towards amount of weight gain during pregnancy among pregnant women in rural Arsi, Central Ethiopia.

**Methods:** A qualitative cross-sectional study was conducted using key informant in-depth interviews, focus group discussion and passive observation of participants. Pregnant mothers, husbands, elderly, community leaders, health workers and agriculture office experts were involved in the study. Participants were recruited purposefully from four districts, each representing the major agro-ecologic areas of the Zone. Data was analyzed manually using the thematic framework analyses method

**Results:** Almost all pregnant women reported that they eat similar (sometimes less) amount and quality of food during pregnancy as before. Food items locally produced and consumed are also the same, except in some cases, lowlanders produce 'teff' but sell most of it than using for household consumption. The consumption of meat, fish, fruits and some vegetables is almost luxury than usual diet. Several forms of food taboos existed with their own explanations. The depth of practicing mainly depends on the age and literacy level of the mother; whereby illiterate and aged mothers more likely to practice them. Food items tabooed (restricted) include: green leafy vegetables, milk and milk products, sugar cane, pepper and others. Almost all of the key informants and discussants disfavored gaining much weight during pregnancy for fear of a link with obstructed labor.

**Conclusions:** Many of the dietary habits, believes and practices of the mothers are against scientific recommendations. A considerable proportion them had misconceptions and taboos that can potentially affect their nutritional status and related health outcomes of the newborn.

**Key words:** Food taboo, pregnancy, rural, weight gain

## Prevalence and Factors Associated with Anemia among Pregnant Women Attending ANC in Governmental Health Institutions, Hawassa City, Southern Ethiopia

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**Background:** Anemia during pregnancy is a major public health problem throughout the world, particularly the developing countries. The effect of anemia during pregnancy has been associated with major maternal and fetal complications. Even if the prevalence of anemia during pregnancy is reducing in Ethiopia, it is still of public health importance and also the associated factors are not well studied and addressed. Data on the prevalence and factors associated with anemia in Ethiopian pregnant women is remain scarce. The objective of the study is to assess the prevalence and factors associated with anemia among pregnant women attending ANC in governmental health Institutions, Hawassa city, Southern Ethiopia.

**Methods:** Institution based cross sectional study was conducted from February 16 to April 30/ 2015. A total of 630 pregnant women who attended ANC at Hawassa city governmental health institutions were included in the study. The data was collected using interviewer administered structured questionnaire, and laboratory investigations. Bivariate and multivariable logistic regression analysis was done using SPSS software Version 16.0.

**Result:** The overall prevalence of anemia using a cut off level of hemoglobin <11 g/dl was 24.4% and the majority of them (85.06%) were of the mild type (hemoglobin: 10-10.9 g/dl). Variables such as age >35 years, family size >5, not taking fruit after meal, gestational age (3rd TM), multi-gravidity, history of abortion, history of malarial attack, HIV infection and have intestinal parasite have shown a statistically significant association with anemia.

**Conclusion & recommendations:** The overall prevalence of anemia in this study is high, it still remains public health important. Anemia during pregnancy is associated with age, family size, not taking fruit after meal, gestational age, multi-gravidity, history of abortion, history of malarial attack, HIV infection, and have intestinal parasite. Hawassa city administration health department should strengthen family planning promotion and service provision both in the health facilities and urban health extension program and should strengthen the prevention and control of communicable diseases like malaria, HIV and intestinal parasites.

## Association of Fasting Animal Source Foods with Metabolic Syndrome and Body Composition among Employees of Jimma University

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**Background:** Metabolic syndrome is a multifaceted clinical entity resulting from the interaction of genetic, hormonal, and lifestyle factors. Over the past two decades, the number of people diagnosed with the syndrome has steadily increased and is associated with the global epidemic of obesity and diabetes. It is defined by a combination of raised blood pressure; dyslipidemia, raised fasting glucose, and central obesity are the main features of the syndromes, as defined by the International Diabetes Federation (IDF). The majors' cause of this syndrome is incriminated to be consumption of saturated fat from animal source foods. Many studies all over the world have shown that avoiding animal source foods and relying on vegetarian diets is associated with lower risk of metabolic syndrome. In Ethiopia Orthodox Christians avoid animal source food strictly during the lent as religious requirement. But, there is no study that evaluated the effect it on metabolic syndrome and body composition.

**Objective:** The main objective of this study is to assess the association of fasting animal source foods with metabolic syndrome and body composition of Jimma university workers.

**Methods:** A comparative cross-sectional study was carried out among 609 employees of Jimma University (JU) from March to April 2015 using the Stepwise approach of the World Health Organization (WHO). The data were entered into EPI data version 3.1 and analyzed using SPSS for Windows, version 20.0; SPSS (Illinoise, Chicago,). Both descriptive and multivariable logistic and linear regression models was used to compare markers of metabolic syndrome and body fat percent by fasting status after adjusting for various variables.

**Results:** Out of the total of 609 participate in the study 569 underwent all the study components giving a response rate of 93.4%. There was significant difference ( $P < 0.001$ ) in metabolic syndrome between fasters of ASF 46(24.6%) and non-fasters 112 (29.3%). Study participants who consume ASF were nearly 2 times more likely have metabolic syndromes than those individuals who don't consume animal source ( $P = 0.020$ ). On a multivariable logistic regression analyses, after adjusting for other variables, ASF fasting, age, sex and wealth index were significantly associated with metabolic syndrome. On multivariable logistic regression, being male (AOR=2.188[95% CI: 1.333, 3.589]), Age group 31-40 years (AOR=3.991 [95% CI: 2.190, 7.273]), age group >40 years (AOR=8.566 [95% CI: 4.557, 16.105]). Not fasting animal source foods (AOR=1.984 [95% CI:

1.113, 3.537]), Consumption of solidified vegetable oil (AOR=2.121 [95% CI: 1.157, 3.889]) and drinking alcohol during the last 12 months (AOR=2.319 [95% CI: 1.356, 3.964]) were significant independent predictors of metabolic syndrome. On a multivariable linear regression, fasting animal source foods was negatively associated with fat mass percent ( $\beta = -2.226$ ,  $P=0.005$ ). Similarly, being male decreased fat mass percent by 13.320 ( $\beta = -13.320$ ,  $P<0.001$ ). On the contrary, an increase in age ( $\beta = 0.376$ ,  $P<0.0001$ ) and wealth index ( $\beta = 2.044$ ,  $P<0.0001$ ) were positively associated with increase in fat mass percent. For an increase of age by one year fat mass percent increased by 0.376. Similarly, for an increase in wealth index fat mass percent increased by 2.044

**Conclusion and Recommendations:** The prevalence of metabolic syndrome was high among non-faster ASF as compared to fasters. Behavior change communications on life style modifications including reduction of ASF consumption and alcohol consumption is very critical to curb the consequences of metabolic syndrome and consequent chronic degenerative diseases.

**Keywords:** Fasting, lipid profile, metabolic syndrome, Lipoproteins, body composition

## A Systematic Process and Tools for applying Formative Findings to Strategic Design for Radio that Bolsters Behavior Change in Ethiopia

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**Background:** Alive & Thrive (A&T) is a comprehensive behavior change program to improve infant and young child feeding. Our program uses radio to extend the program's reach, to amplify the community-based interpersonal activities, and to shift social norms. A radio serial drama, spots, and magazine-format shows reach mothers, fathers, grandmothers, community leaders, and frontline workers in health and agriculture sectors.

**Objective:** share the methodical process and tools used to translate formative research findings into strategic design of radio programming for behavior change.

**Translating Findings to Strategic Design:** A&T conducted several formative research efforts to answer questions such as: What are the priority feeding practices for mothers? Which people influence mothers' feeding practices and what actions can those influential take to support the mothers' behaviors? And, what are the "drivers" of those behaviors and actions? To ensure that the findings from the formative research informed design for the radio strategy, we used a simple tool that allowed us to apply the data to identify the priority behaviors to promote at scale and to identify small doable actions that influential could take to motivate mothers. Finally, we applied another tool to show how we moved from the identified "drivers of behavior" to design strategic approaches and messages. The subsequent design document developed from these tools ensures consistency of the radio episodes and outlines the objectives, key messages, and a call to action for various target audiences in each episode of the radio program.

A serial drama, delivered in 48 six-minute episodes, incorporates the messages identified through the systematic process described above. The drama promotes the priority feeding practices for mothers and models the actions that influential can take in support of those behaviors. The drama's characters overcome the kinds of barriers identified through formative research. Messages are reinforced by radio spots, broadcast intensively on the same stations that play the drama. Two magazine format programs report on "local news" to address special issues, such as how to feed children during fasting periods. The radio component delivers an overarching message that Ethiopian parents are actively taking charge of their family's nutrition.

**Result:** Data are collected on the content of the radio programs and to measure the frequency and reach of the program, and will be reported at the dissemination conference.

## Pre-ART Nutritional Status and its Association with Mortality in Adult Patients Enrolled on ART at Fiche Hospital in North Shoa, Oromia Region, Ethiopia: A Retrospective Cohort Study.

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**Background:** Human Immunodeficiency Virus (HIV) compromises the nutritional status of infected individuals and in turn, malnutrition worsens the effects of the infection itself by weakening the immune system consequently accelerating disease progression and death. However, few studies have examined the association between nutritional status at antiretroviral therapy (ART) initiation and early mortality. Therefore, the aim of this study was to assess pre-ART nutritional status and its association with mortality in adult patients enrolled in ART at Fiche Hospital in North Shoa, Ethiopia.

**Methods:** A retrospective cohort study was conducted among 489 ART enrolled adult patients between August 01, 2006 and September 30, 2013 in Fiche Hospital. Study participants were selected by using systematic random sampling method. Actuarial table was used to estimate survival of patients after ART initiation and log rank test was used to compare the survival curves. Cox proportional-hazard regression was used to determine independent predictors of time to death.

**Results:** Most of the study subjects were females 254 (51.9%). The overall mean (+SD) age at ART initiation was 34.36 + 9.24 years. A total of 489 patients were included in the analysis, of whom 87 died during a median study follow-up of 22 months. The estimated mortality among malnourished was 21%, 28%, 33%, and 38% at 5, 10, 15, and 25 months respectively with mortality incidence density of 5.63 deaths per 100 person years. The independent predictors of mortality were: BMI <18 kg/m<sup>2</sup> (AHR=5.4 95% CI: 3.03–9.58), baseline ambulatory functional status (AHR=3.84; 95% CI: 2.19–6.74), bedridden functional status (AHR=4.78; 95% CI: 2.14–10.65), WHO clinical stage III (AHR 2.21; 95% CI: 1.16–4.21), WHO clinical stage IV (AHR 4.05; 95% CI: 1.50–10.97) and CD4 count less than 200 cells/ $\mu$ l (AHR=2.95, 95% CI: 1.48–5.88), two and more opportunistic infections (AHR: 2.30; 95% CI: 1.11–4.75).

**Conclusions:** Malnutrition at the time of starting ART was significantly associated with decreased survival. Provision of nutritional support in conjunction with an early start of ART and the food by prescription initiative should be further strengthened.

**Keywords:** antiretroviral therapy, malnutrition, survival analysis, mortality.

## Improving Infant and Young Child Feeding Through Social and Behavior Change Approach. Impact Evaluation by Food Policy Research Institute Team

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**Background:** Optimal infant and young child feeding practices are among known interventions to promote child health. Alive and Thrive with its partners promoted age-appropriate child-feeding massages and counseling to mothers under two children at the community level through the Health Extension Program. Community health workers and volunteers reached mothers through the health posts, home visits, community conversation, etc. Women's associations and faith based organizations were involved besides its main partner, the IFHP. The paper presents the results of the impact evaluation, particularly on age-specific practices between baseline and end line periods in program areas of Tigray and SNNPR.

**Methods:** The impact evaluation applied "adequacy design," which involves pre-and post-intervention assessments without a non-intervention comparison group. A total of 75 enumeration areas were randomly selected from districts that were part of the IFHP platform for in Tigray and SNNPR. Repeated cross sectional surveys were conducted at baseline and end line.

**Results:** Most of the WHO-IYCF indicators increased over time in the survey areas. Minimum diet diversity, minimum acceptable diet, and consumption of iron-rich foods all doubled and exclusive breast feeding also increased over time. There was significant increase among children 6-23.9 months of age consuming five of the seven food groups, increased consumption of eggs, meat & vegetables were especially noted.

There were small but significant declines in the prevalence of stunting in the survey areas between 2010 and 2014. More mothers reported on receiving home visits by HEW in the past six months, but there was very little difference in the mean number of home visits among those visited and no change in home visits by community health volunteers. However, among those visited by a HEW or volunteer, more mothers reported that was talked about in their last visit.

**Conclusion and Recommendations:** Program objectives related to improved IYCF practices were achieved, and there were large significant changes in IYCF practices, several of which were demonstrated to be associated with program exposure. Higher intensities of program exposure should be promoted to achieve greater improvements in specific IYCF practices. In addition to direct nutrition interventions, improving child nutrition outcomes will likely result from multiple simultaneous approaches, requiring investments on multisectoral approaches to address the underlying determinants of malnutrition.

## The Role of Religion-Based Fasting in Child Feeding in Ethiopia: Qualitative Study Enhances SBCC Design

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**Background:** Though Amhara is one of the more agriculturally productive regions in Ethiopia, it has the highest prevalence of stunting (52% in Amhara vs. 44% nationally) and poorer complementary feeding practices. To understand why dietary diversity and consumption of animal source foods (ASFs) were lower in Amhara, A&T reanalyzed 2011 Ethiopia Demographic and Health Survey data, looking at several possible factors, including religion. We learned that 21% of Orthodox children consumed protein- and iron-rich ASFs, compared with 37% of non-Orthodox children. More than 80% of Amharans belong to the Ethiopian Orthodox Church, in which fasting is central. Studies on fasting and child feeding are scant in Ethiopia, prompting A&T to design this research.

**Methods:** During the 56-day Lenten fast, we conducted direct observations in 8 households and in-depth interviews including Trials of Improved Practices (TIPs) with 32 mothers of children 6-24 months. We held 20 key informant interviews with church leaders, priests, Health Extension Workers (HEWs), and Health Development Army volunteers (HDAs). A convenience sampling approach was adopted to recruit participants. Interviews were recorded, transcribed, and analyzed using a thematic approach.

**Results:** Although all participants agreed that children were exempt from fasting, nearly half of the mothers reported that they did not feed their children ASFs during the long Lenten fast. Additionally, none of the 8 children observed for a full day was seen to eat any ASFs. All HEWs and the majority of the HDAs said only a few mothers gave eggs, milk, or butter during fasting periods. Chief reasons mothers reported for not feeding ASFs to their children included fear that preparing the food would interfere with their own fasts; lack of availability of some ASFs; and reasons unrelated to fasting. Most mothers in the study (31 of 32) were willing to try feeding eggs, milk, and some milk products during the long Lenten fast. When we told priests and church leaders that despite their exemption, many children were not eating ASFs during fasts, most of those we talked with were quick to note that the church could—and ought to—play a role in improving child feeding.

**Conclusion and Recommendation:** Nutrition programs focusing on child feeding in Ethiopian Orthodox communities should explicitly address the topic of how to feed children ASFs during long fasting periods.



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Working with church leaders to deliver clear messages about child feeding and fasting will be critical to changing practices in the household.

## ASSESSMENT OF DIETARY DIVERSITY AMONG PREGNANT AND LACTATING WOMEN AND 6 TO 23 MONTHS OLD CHILDREN IN RURAL AMHARA REGION, ETHIOPIA

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**Background:** Malnutrition in children is one of the most serious public health problems in Ethiopia in general and in Amhara in particular. Therefore, the objective of this assessment was to measure the nutrient adequacy of children based on 8 food groups i.e. (1) grain, roots and tubers, (2) vitamin A - rich fruits and vegetables, (3) other fruits and vegetables, (4) meat, poultry and fish, (5) eggs, (6) pulses, legumes and nuts, (7) milk and milk products and (8) foods cooked in oil/fat and pregnant and lactating women based on 9 food groups i.e. (1) starchy staples, (2) dark green leafy vegetables, (3) other vitamin A - rich fruits and vegetables, (4) other fruits and vegetables, (5) organ meat, (6) meat and fish, (7) eggs, (8) legumes, nuts and seeds and (9) milk and milk products, in rural areas of Western Gojjam.

**Method:** The study used a community based cross-sectional survey design. Data were collected for children between the ages of six - 23 months in three rural kebeles of South Achefer district, from August 21 to 28, 2014. Systematic random sampling was used to select the required number of children with mothers. A total sample size of 117 children and women were involved. Dietary diversity score (DDS) was collected and calculated as the sum of the number of different food groups consumed by the mother 24 hours prior to the assessment. The DDS was calculated using a score of "1" for those who consumed the food item and a score of "0" for those who did not consume the food item over the past 24 hours. The DDS was categorized into three subgroups: 5 and more (high), 4 - 5 (medium) and less than 4 (low) food groups consumed the previous day. Data analysis was done using SPSS version 22.0. Descriptive statistics with frequency and percentiles were used to present the results.

**Result:** Large proportion (47%) of the children and 53% women were categorized in the lowest dietary diversity score (DDS), while 10.3% children and 10.2% women were categorized in high DDS. Majority of the child 78.6% and women 98.3% consumed cereal based foods. The least consumed food group both by children and women were Vitamin-A rich plant based foods 2.6% and 3.4%, respectively. The result showed that the feeding habit of nutritious foods for children and women were poor and it needs a great effort to change their attitude.

**Key words:** Dietary diversity, proxy nutrient adequacy, malnutrition, food group, household

## EFFECT OF COMMUNITY BASED MANAGEMENT OF ACUTE MALNUTRITION INTEGRATED NUTRITION EDUCATION ON INFANT AND YOUNG CHILD FEEDING KNOWLEDGE AND PRACTICE OF MOTHERS OR CAREGIVERS

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**Background:** Adequate nutrition during infancy and early childhood is fundamental to the growth, health and development of each child to full human potential. Severe acute malnutrition (SAM) affects approximately 20 million children under five years of age, contributes to more than one million child deaths worldwide each year and being treated with community based management of acute malnutrition (CMAM) program. So that this study aimed of assessing the effect of CMAM integrated nutrition education on infant and young child feeding (IYCF) knowledge and practice of mothers/caregivers in Dilla Zuria Wereda, Southern Ethiopia.

**Method:** A quasi experimental study design was employed on a total of 100 mother/caregiver and acutely malnourished child pairs enrolled in outpatient treatment program (OTP) of CMAM. A nutrition education intervention comprising 8 specific messages held every 15<sup>th</sup> day for six continuous months. Pre-tested semi-structured questionnaire was used to collect three phase (Baseline, Follow-up and End-line) data. Collected data entered to SPSS and descriptive statistics was computed. Paired t-test and independent sample t-test were used to check within and between group change on mean knowledge and practice score of mothers/caregivers.

**Result:** At the end of the intervention period mean knowledge score of mothers/caregivers was statistically significantly (p-value<0.001) improved within intervention group and became different (p-value<0.001) between intervention and control group. At baseline (p-value=0.42) and follow-up (p-value=0.44) between groups mean practice score of mothers/caregivers was not statistically significantly different. Between group mean practice score comparison come up with statistically significant (p-value<0.001) difference. By the end of the study within group comparison for mean practice score showed significant difference both for intervention and control.

**Conclusion:** IYCF focused nutrition education improved knowledge and practice of mothers/caregivers of children on medical and nutrition treatment. Further study can be done with large sample size, longer intervention period and more strong design to check consistency of result. Since mothers'/caregivers' knowledge and practice of IYCF is crucial to sustain positive clinical outcomes of OTP management of acute malnutrition stakeholders better give due emphasis to mothers/care givers IYCF focused nutrition education in line with the clinical management.

**Keywords:** IYCF, CMAM, Nutrition Education, Knowledge and Practice

## NUTRITION EDUCATION IMPROVES NUTRITIONAL STATUS OF ADOLESCENTS IN SCHOOL, IN JIMMA, SOUTH WEST ETHIOPIA: A CLUSTER RANDOMIZED CONTROL TRIAL

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**Background:** Since adolescent's growth and development is closely linked with their diet during childhood and adolescence, nutrition education is essential to improve their nutritional status, dietary knowledge and habit. The purpose of this study was to determine the impact of nutrition education on growth and nutritional status of adolescents.

**Method:** An interventional study was conducted in Kersa woerda, southwest Ethiopia by using simple random sampling method from four schools, two per each group, were assigned as intervention and control groups. Then 187 school adolescents were randomly selected in each group by lottery method considering population proportion to size to obtain a total of 374 students. The intervention group received nutrition education. Structured questionnaire was used to assess socioeconomic status at base line. Nutritional knowledge, habit and anthropometrics were measured at base line, follow up and end line survey for both groups. Chi-square, T-test and fixed effect model were used to compare effect of nutrition education between control and intervention through time.

**Results:** After nutrition education, prevalence of thinness in intervention groups showed a significant difference ( $P < 0.05$ ) initially 18.2% and later dropped to 6.2% at end line survey while the figure in the control decreased only from 15.0% to 14.6%. The student t-test showed a highly significant difference between the mean knowledge between the groups within the follow up period ( $P < 0.001$ ). The linear mixed models predicted that weight of boy increased by 2.79 times in the intervention group during the follow up period ( $\beta = 2.79$ ,  $P = 0.0005$ ). The height of boys and girls increased by 2.88cm ( $\beta = 2.88$ ,  $p < 0.0001$ ) and 1.61 cm ( $\beta = 1.61$ ,  $p < 0.001$ ) for a unit increase in the following year respectively .

**Conclusion:** The findings support the importance of providing adolescents with nutrition education to promote healthy dietary knowledge and habits to improve their growth and nutritional status.

**Key words:** Adolescent, Nutrition education, Nutritional knowledge, Nutritional status

S.N	Presenter	Title	Key findings	Recommendations	Question & Answer
1	Girmay Ayana	National Nutrition Program End line survey	<ul style="list-style-type: none"> <li>Stunting 34.1%, 10.8% wasting, and 24.2% underweight. Tigray and Amhara have highest stunting.</li> <li>Nationally 13.1% &gt; 18.5 BMI (Obese) it increased from 5.3% from base line and over weight is high in AA&amp; DD.</li> <li>Nationally Vit. Coverage is 56.9%, Tigray has the highest coverage 83% and Somail 27% the lowest.</li> <li>Breast feed within first one hour increased from 46%-65%. And colostrum feeding increased 60%-80%</li> <li>Nationally 16.3 HH are highly food insured. And among those food secured only 23% the recommend dietary diversity</li> </ul>	<p>NNP implementer bodies should strengthen implementation of NNP and scale up best achievements and make sustainable</p> <p>Revise implementation of the NNP in achieving minimum dietary diversity</p>	<p><b>Q:</b> I didn't see mother's knowledge on IYCF. Where is it?</p> <p><b>A:</b> for the consumption of this presentation it is not included, however, it's reported in the full document of the end line report.</p>
2	Girmay Ayana	Formative Study on Agriculture and Health Linkage for Improved DD & IYCF	<p>56 % &amp; 31% were aware of NNP at Woreda level.</p> <p><b>Facilitator</b></p> <ol style="list-style-type: none"> <li>Strong leadership role</li> <li>Present of technique (nutrition) committee at Kebele level</li> <li>Presence of 1 to 5 and 1to 30 network</li> <li>Presence of partners</li> </ol> <p><b>Barriers (in active)</b></p> <ol style="list-style-type: none"> <li>Lack of inter-sectorial coordination</li> <li>Lack of knowledge about nutrition</li> <li>Lack of logistics (kebele)</li> <li>Drought</li> </ol> <p><b>Opportunities (at kebele level)</b></p> <ol style="list-style-type: none"> <li>Having community network 1 to 5 and 1 to 30</li> <li>Strong appetites and willingness</li> <li>Strong partners</li> <li>Presence of demonstration site</li> </ol>	<p>Further coordination at Ministerial level</p> <p><b>Regions</b> Should rise awareness</p> <p><b>Woredas</b> Should stablish functional Nutrition technical committee</p> <p><b>Kebeles</b> Should utilized Nutrition technical committee</p>	
3	Desalegn Kuche	A Feasibility Study Examining Implementation SURE Program	<ul style="list-style-type: none"> <li>For AEW it is their first time to give advice on home base</li> <li>All most all AEW have forgotten to use seasonal food calendar in planning with house holds</li> <li>All most all AEW &amp; HEW failed to follow 3A's</li> </ul>	<ul style="list-style-type: none"> <li>Skill building including practical field work session</li> <li>Revise should be done on HEW&amp;AEW's pocket guide</li> <li>Provide a pocket guide for HEW&amp;AEW</li> <li>Provide AEW&amp;HEW writing format</li> </ul>	<p><b>Q:</b> How much does this job aids help?</p> <p><b>Q:</b> How could these materials (BCC, IYCF) will be provided?</p> <p><b>A:</b> about BCC materials we done feasibility and we recommend for MoH to modify the training manual and job aids for the final version of job aids we are confident to modify. And we would like to acknowledge UNCEF and Alive &amp; thrive.</p>

4.	Tesfaye Hailu	Data base + Operational Research Monitoring and Evaluation Committee + EVIDENT			<p><b>Q:</b> I didn't get what information you want from data inventory (distributed )</p> <p><b>A:</b> the data will be survey, surveillance of nutrition related like depositing many in the bank. If you deposit it wouldn't be yours rather it would be for public. It could be technical. BCC, published in the journal, or raw data. For published data we should have agreement. It doesn't mean EPHI is the only owner of the data rather all of us.</p>
5	Aregash Samuel	Updates on the effectiveness of Multiple Micronutrient Powder	Improves local food-based CFRS can meet some of the Nutrient requirement of young children		<p><b>Q:</b> Have you say something about the side effect of MNP like vomiting and even death?</p> <p><b>A:</b> We are using 6mg of Iron with 1 gram of NNP which is especially formulated for Ethiopia unlike 10 mg/1 gram of WHO recommendation. So far we don't have mortality report we have 28 dead. 25 before MNP started and 3 in control group we have proper mortality report format we also have 15 days morbidity. And we instruct mothers not to give MNP when the children have vomiting &amp; fever for any case.</p>
6	Kifle Habte	Physicochemical and nutritional profile of commonly consumed edible oils found in Addis Ababa and their health implications.	Among 16 edible oil samples 7 were from Ethiopia All Ethiopian samples are poor in labeling		<p><b>Q:</b> What do you think the risk of food labeling and what would be your recommendation?</p> <p><b>A:</b> my recommendation will be to have a national standardized.</p>
7	Temesgen Aweke	Ethiopian Food Composition Table Updating			<p><b>Q:</b> What methods would you use to make FCT for friendly?</p> <p><b>A:</b> Our plan is first to identify the interest of customer and then to produce in hard and soft copy (internet) like 'Afro diet 'and Tanzania.</p>

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8	Zemenu Kerie	Development Of Potential Food Products In Achieving Food And Nutrition Security Of Households At Hawassa ZuriaWoreda	There is high loss of solid was found when we add more Barley. Amount of soybean and barley increased solid loss.	Percentage of soybean and barley should be 15% & 5% respectively. Soybean is highest in fat & protein content. So in order to avoid this you should use high temperature > 200°C for short time and for phyate use like melting.	
9	Demeke Teklu	Optimization of time and temperature for smoking of Nile Tilapia for a better preservation of protein and gross energy value.			<p><b>Q:</b> From where anti oxidants come?</p> <p><b>A:</b> they come from their smoke</p> <p><b>Q:</b> Have you checked amino acids when you increase temperature?</p> <p><b>A:</b> our first aim was check amino acids but due to budget constrain we didn't do it.</p> <p><b>Q:</b> What do you think about Iodine content of fish? Since Iodine is easily eroded.</p> <p><b>A:</b> Iodine is there in fresh fish. The problem is when we process with more than 60°C we lost it.</p>
10	Dr. Gudina Egata	Seasonal Changes in the Prevalence of Food Insecurity among Rural Households in East Ethiopia: A Longitudinal Panel Study.	During the wet season HH food insecurity was 44.6% and in dry season it was 21.2% Farmer mothers are protected as compare to laborer mother. Dry season is also protective for food insecurity.	It would be better if you include 4 seasons.	<p><b>Q:</b> Have you checked the saving habits with food insecurity?</p> <p><b>A:</b> eastern Ethiopian have cash crops (chat) unlike other part of Ethiopia; haven't seen saving mothers but we may use this suggestion in the future.</p> <p><b>Q:</b> do you have any selection criteria when you use mother-child pair?</p> <p><b>A:</b> we use readymade question of children 6-59 months to check acute malnutrition</p>
11	Abel Ahmed	Assessment of dietary diversity among pregnant and lactating women and 6 to 23 months old children in rural Amhara Region, Ethiopia			<p><b>Q:</b> what is the cut of point and its justifications to categorized 4 and less as "LESS"?</p> <p><b>A:</b> since the questioner is standard ; I adopted it from FAO 2014</p>
12		Comparative Study of The Nutritional Status of Preschool	Nearly 84% participants without home guarding start complementary feeding at 6 months 41%, 28% & 7.9% stunting wasting and	Food based strategies like home grading should be promoted	<b>Q:</b> why do you focus on home guarding?

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	Legese Petros	Children From Households with and without Home Gardening In Wondogenet Woreda, Southern-Ethiopia	underweight respectively with home guarding whereas without home guarding has 43.7% stunting and 38% under weight		A: in our setup agricultural security is focus mainly in food security and it should be in nutrition security through home grading.
13	Melese Sinaga	Association of Fasting Animal Source Foods With Metabolic Syndrome and Body Composition Among Employees of Jimma University.	<ul style="list-style-type: none"> <li>Fats are mobilized during fasting</li> <li>Metabolic syndromes are increasing with non fasting when income increases metabolic syndrome increases especially for wealthier and none fasting</li> <li>Eating vegetables and fruits are preventive for metabolic syndrome</li> <li>Drinking alcohol has positive association with metabolic syndrome</li> </ul>	<p>Behavioral change communication</p> <ul style="list-style-type: none"> <li>Decrease animal source food consumption</li> <li>Decrease alcohol consumption</li> <li>Fasting at least once a week</li> </ul> <p>Further longitudinal study on metabolic syndrome is recommended</p>	
14	Desta Kebed	A systematic process and tools for applying formative findings to strategic design for radio that bolsters behavior change in Ethiopia.	<p>Messages were developed from formative researches</p> <ul style="list-style-type: none"> <li>✓ Doable action/message</li> <li>✓ Drivers of behaviors</li> </ul> <p>7 doable actions (7 Mela in Amharic) with job aids</p> <p>Lessons Learned</p> <ul style="list-style-type: none"> <li>➤ Added realistic, local and color to drama</li> <li>➤ Applying behavior theory</li> <li>➤ Key messages delivered in Amhara TV, FM Bahir Dar and FM FANA</li> <li>➤ FGD conducted at the end of the program</li> <li>➤ To maximize the coverage the radio program copied to CD and displayed in mass (public) where there is no media coverage</li> </ul>		<p><b>Q:</b> Is there a baseline study for your program?</p> <p><b>A:</b> No baseline for the radio program and impact study was not conducted.</p> <p><b>Q:</b> How many parts of the population addressed in your program (coverage)?</p> <p><b>A:</b> To improve the coverage, we have a CD copied program for those who have no radio and we use it in a group campaign. The cards and posters also distributed.</p> <p><b>Q:</b> What is your plan to expand the program?</p> <p><b>A:</b> Ministry of health will use our message for the first 1000 days campaign at national level in scaling up the program</p>
15		Improving Infant and Young Child Feeding through	<ul style="list-style-type: none"> <li>➤ All IYCF indicators are improved</li> <li>➤ Consumption of Animal source foods increased</li> <li>➤ After the HEWs visit a HH and talk on IYCF, the information and awareness on IYCF are improved</li> </ul>	<ul style="list-style-type: none"> <li>IYCF improved</li> <li>Minimum Dietary Diversity improved</li> </ul>	<p><b>Q:</b> What are introduced to bring this double increment?</p> <p><b>A:</b> Complementary feeding demonstration really makes the difference for our achievement</p>



	Dr. Yewelsew Abebe	Social and Behavior Change Approach		<ul style="list-style-type: none"> <li>• There was higher intensity of contact to get the IYCF improved</li> <li>• Targeted multiple actors</li> <li>• Multiple social behavioral change communication approaches and channels used</li> <li>• Friendly tools and job aids used</li> </ul>	<p><b>Q:</b> Why not quasi-experimental?  <b>A:</b> I admitted that the study should be quasi-experimental. We will use it for our futures similar study</p>
16	Bogale Tessema	The role of religion based fasting in child feeding in Ethiopia: Qualitative Study enhance SBCC design.	<ul style="list-style-type: none"> <li>➤ None of the mothers were feeding their children animal source food during fasting days</li> <li>➤ The fear was that animal source food might contaminate the utensils</li> <li>➤ Priests and church leaders are in support of giving animal source foods for under two years children</li> <li>➤ HEWs and HDA said mothers are reluctant to give animal source foods during fasting seasons</li> </ul>	Involving religious leaders for better animal source food consumption to children under two years.	

**The way forwards**

- The presented results must reach for end line users
- Reviewing research articles is not the directive of EPHI; universities must participate.
- Nutrition man powers have many findings. But now establishing the data base is a great achievement and this should be strengthen.
- EPHI must be upgraded itself to “center of excellence “ and to Achieve this must work with FONSE
- We heard from FMOH Nutrition will scale up from directorate to institution; and we should push it
- The National Micronutrient Survey result should be speed up.
- It would be better for the future EPHI should have its own journal (online and hard copy) and would like to know its plan.
- What would be your plan to have use lab methods service with Universities and to ease its accessibility?

## THEME 2: FOOD PROCESSING TECHNOLOGY AND PRODUCT DEVELOPMENT RELATED RESEARCH

### SUMMARY OF THE FINDINGS

Food insecurity and malnutrition are major public health problems in Ethiopia. Promoting consumption of locally available and underutilized cereals and grains with combination of fruit and root crops can reduce the problem of malnutrition. Production of newly formulated products which are nutritionally rich foods are produced either industrially or homemade. Under this thematic area some of the researches shows that supplementation of orange flash sweet potato and pineapple flours to locally available products like flatbread increased vitamin A content. Addition of barley and soybean flours on durum wheat flour during macaroni preparation increases crude protein, fiber and ash contents while reducing the moisture contents. The macaroni prepared from blends of 15 % barley, 5 % soybean and 80 % durum wheat flour have scored better sensorial acceptability. Amaranth is an underutilized plant with high biodiversity, distribution and productivity. Therefore the research findings recommended that use of fermented and popped amaranth during complementary food formulation owing to infant's limited gastric capacity to accommodate bulky foods. The other research under this theme was Nile Tilapia (*Oreochromis niloticus*) smoked at  $80\pm 3^{\circ}\text{C}$  for 2 and  $80\pm 3^{\circ}\text{C}$  for 3 hour possessed the highest gross energy value (kcal) and fish smoked at  $100\pm 3^{\circ}\text{C}$  for 2 and 3 hours and  $90\pm 3^{\circ}\text{C}$  for 2 and 3 hours possessed highest overall sensory acceptability for non-dried and pre-dried. The other study shows that Moringa leaves powder and wheat flour was blended in the ratio of 0:100, 5:95, 10:90, 15:85 and 20:80 by using mixture simplex lattice design. Cookies was prepared from each of the blend by adding sugar, water, salt, sunflower oil, ginger powder, baking powder and vanilla. The result indicated that 5% Moringa leaves powder blended cookies was found to be the best in iron bioavailability and sensory acceptability.

## FORMULATION OF IMPROVED COMPLEMENTARY FOODS OF INFANT AND YOUNG CHILDREN (6-23 MO) FOR THE PASTORALIST COMMUNITY OF ETHIOPIA.

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**Background:** Inadequate nutrition during the complementary feeding period results infrequent infection during early childhood, deficit in growth, poor psychosocial development, reduced learning capacity and productivity and also substantially increases the risk of mortality. However, little efforts have been made so far in developing complementary foods that suits the pastoralist community.

**Objective:** The objective of the present study is formulation of improved complementary foods that suits the infant and young children (6-23 mo) of pastoralist community.

**Method:** A cross-sectional study investigated the portion size of meals per day of IYC (n = 896), frequency of cereals and legumes consumed by IYC. Using linear programming, three alternative formulations were developed by choosing ingredients based on their nutritional composition, price per Kg, and the consumption pattern of the community. The sensory acceptability of the formulated complementary food was evaluated by semi-trained panelists (n= 26), using a 9-point hedonic scale.

**Result and discussion:** Wheat, maize, sorghum, white and red teff, peas and chickpea were selected. The average portion size (g) of meals was about 35 g and it was low compared to previous estimates. The sensory evaluation of the formulated products was acceptable. The present study indicates that through the application of linear programming it is possible to formulate nutrient-dense complementary foods using locally available cereals and legumes.

**Conclusion:** Although the developed complementary foods provide adequate amount of energy, protein, calcium, and iron (91% to 97%). Strategy to improve their zinc and vitamin A content through the consumption of animals source foods or whenever appropriate, through fortification should be advised.

**Keywords:** Complementary foods, infant and young child (IYC), linear programming, pastoralists, sensory evaluation.

## DEVELOPMENT OF POTENTIAL FOOD PRODUCTS IN ACHIEVING FOOD AND NUTRITION SECURITY OF HOUSEHOLDS AT HAWASSA ZURIA WOREDA

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**Background:** Food insecurity and malnutrition are major public health problems in Ethiopia. Promoting consumption of locally available vitamin -A rich foods that can be prepared from cereals in combination with fruit and root crops can reduce the problem of vitamin- A deficiency. Therefore the major aim of this study was to develop flatbread from maize, orange fleshed sweet potato (OFSP) and pineapple flours and thin porridge from maize flour, OFSP flour and avocado pulp. Composite flours in a blending proportion of maize, OFSP and pineapple flours; 100:0:0, 80:15:5, 70:20:10 and 60:30:10 respectively were used to develop flatbread. Thin porridge was prepared from maize flour, OFSP flour and avocado pulp in the proportion of 100:0:0, 80:15:5, 70:20:10 and 60:30:10 respectively.

**Methods:** Completely Randomized Design (CRD) was used to determine the blending effect on the proximate composition of flatbread, functional properties of thin porridge and beta carotene content. Randomized Complete Block Design (RCBD) was used to investigate the organoleptic characteristics of flatbread and thin porridge.

**Findings:** Supplementation of OFSP and pineapple flours to locally available products like flatbread increased vitamin A content. Flatbread prepared from 80% maize, 15% OFSP and 5% pineapple flours was preferred in overall acceptability. Addition of OFSP flour and avocado pulp for thin porridge development increased retention of beta carotene content. The beta carotene content was increased when the amount of OFSP flour and avocado pulp incorporation increased. It is recommended to use 80% maize flour, 15% OFSP flour and 5% avocado pulp for thin porridge development with better consumer acceptability.

**Key words:** Flatbread; Thin porridge; Beta carotene; Proximate; Functional; Malnutrition; Food insecurity

## DEVELOPMENT OF MAIZE BASED ORANGE – FLESHED SWEET POTATO FLAT BREAD FOR LACTATING MOTHERS AT HAWASSA ZURIA WOREDA, SNNPRS, ETHIOPIA

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**Background:** Vitamin A deficiency continues to be a major public health problem in Ethiopia in spite of the various intervention measures since 1989. Food based strategies are cost effective, easy, long-term and sustainable for the prevention of vitamin A deficiency both in rural and urban settings.

**Method:** To improve the vitamin A content of traditional (staple) flat bread prepared from maize, three formulations of maize-based breads were prepared by incorporating Orange Fleshed Sweet Potato (OFSP) flour at 25%, 30% and 35%. Traditional maize-based flat bread served as control. Sensory evaluation was carried-out using a 9-point hedonic rating scale by panelists at the laboratory level. While, community level sensory evaluation (acceptability trial) was done by lactating mothers using a 5- point hedonic rating scale. The proximate composition values of flours and the four flat bread samples were determined using AOAC (2000) methods and open column chromatography method was used to determine the values of  $\beta$ -carotene. All the formulations were accepted both at laboratory and community levels.

**Findings:** The proximate composition results showed an increase in the values of crude fiber and ash for OFSP incorporated flat breads compared to the control. The vitamin A contents ( $\mu\text{g}$  RAE) of maize and OFSP flours were found to be 0 and 888.01  $\mu\text{g}$  RAE per 100 gm respectively. The vitamin A ( $\mu\text{g}$  RAE) content of the control bread was observed to be 0. Among the flat breads samples in which OFSP flour was incorporated, the vitamin A content was highest (269.63 $\mu\text{g}$  RAE) for the sample supplemented with 35% of orange fleshed sweet potato flour. OFSP flour up till 35% can be successfully incorporated in traditional maize based flat bread which can be used as a potential food source of vitamin A for lactating mothers residing in the study area.

**Keywords:** Orange fleshed sweet potato, Retinol activity equivalent, Flat bread, Vitamin A

## EFFECT OF POPPING AND FERMENTATION ON STARCH FRACTIONS, STARCH DIGESTIBILITY AND RHEOLOGICAL PROPERTY OF AMARANTHUS CAUDATUS GRAIN.

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**Background:** Amaranth is an underutilized plant with high biodiversity, distribution and productivity. It has high tolerance to arid conditions and poor soils, resistance to drought, pests and ability to adapt environments that are not conducive to conventional cereals. It has excellent nutritional qualities compared to commonly utilized cereals. Despite all these interesting agricultural and nutritional attributes, there are limited studies on the available amaranth types in Ethiopia.

**Objective:** This study attempted to evaluate the effect of popping and fermentation on starch fractions, starch digestibility, energy density and rheological property of porridge prepared from *Amaranthus caudatus* grain.

**Methodology:** Three types of *Amaranthus caudatus* grains were collected from Bench Majji Zone, SNNPR. The seeds were properly cleaned and popped. Natural fermentation was carried out following a standard protocol using milled raw amaranth flour. Amaranth porridge was prepared at different concentrations and viscosity was measured. A total starch assay kit was used to determine the starch content. Free sugars, starch fractions and in vitro starch digestibility were determined following the method of Englyst et al. (1999).

**Results:** Free glucose (FG), total starch (TS), rapidly digestible starch (RDS), slowly digestible starch (SDS) and resistant starch (RS) contents of the three raw amaranth were found in the range of 0.64-0.67, 48-60, 27.4-33.2, 10.9-13.9 and 8.5-9.4 g/100 DM, respectively. Popping increased RDS, SDS and TS by 8.6, 8.2 and 5.2%, respectively but demonstrate no significant change on FG and RS. On the other hand, fermentation increased FG, RDS and SDS by 95, 11 and 18%, respectively but decreased TS and RS by 1.6 and 75%. The starch digestibility (SD) and starch digestibility rate index (SDRI) were found in the range from 80 to 84% and 57 to 60%, respectively in raw amaranth.

Both popping and fermentation significantly increased ( $p < 0.05$ ) SD. However, the improvement observed in SDRI during popping was not significant but it is during fermentation at  $p < 0.05$ . The viscosity of raw amaranth

porridge generally decreased after popping and fermentation at the same dry matter content allowing preparation of high energy dense food from popped and fermented amaranth.

**Conclusion:** Amaranth starch was found to be highly digestible when served in the form of porridge. Moreover, both popping and fermentation enhances starch digestibility. Therefore, it is recommended that use of fermented and popped amaranth is by far better than raw amaranth especially during complementary food formulation owing to infant's limited gastric capacity to accommodate bulky foods.

**Key words:** Amaranthus caudatus, popping, fermentation, starch fractions, in vitro starch digestibility, viscosity, energy density, complementary food

## NUTRIENT DENSITY & ADEQUACY OF HOMEMADE COMPLEMENTARY FOODS FOR CHILDREN OF AGE 6–23 MONTHS IN FOOD INSECURE WOREDAS OF WOLAYITA ZONE, ETHIOPIA

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**Background:** Complementary feeding should fill the gap in energy and nutrients between estimated daily needs and amount obtained from breastfeeding from 6 month onwards. Homemade complementary foods, however, are often deficient in key nutrients: Ca, Fe & Zn, despite reports of adequacy for energy and protein.

**Objective:** To assess nutrient composition and evaluate adequacy of homemade complementary foods for children of 6 – 23 months in food insecure woredas of Wolayita zone, Ethiopia.

**Methods:** Weighed Food Record method was used to evaluate adequacy of homemade complementary foods based on food samples collected from 68 households in Kindo Koysa & Dugna Fango woredas, selected using multi-stage cluster sampling method. Nutrient profiles in the diets from laboratory analysis were compared to recommended levels for nutrient density (*per 100kcal*). The amount of energy, protein, Ca, Fe & Zn consumed per day was compared to the estimated daily nutrient needs (*g or mg/day*). Significance was tested at  $p < 0.05$ , using *t* – test.

**Result:** Caregivers had good complementary feeding knowledge. Sixty (88.2%) children started complementary feeding at 6 months & 48 (70.6%) were fed 3 or more times per day. The diets, however, lacked diversity & animal source foods were virtually absent. The complementary foods were found to be energy dense. Energy intake per day was 151.25, 253.77 and 364.76kcal in 6 – 8, 9 – 11 and 12 – 23 months, respectively, which were significantly lower than the estimated daily needs from complementary foods ( $p < 0.05$ ). Nutrient density for Ca & Zn (in mg/100kcal) in the diets was very low. The amounts of Ca & Zn consumed (mg/day) were lower than the estimated daily nutrient needs. In the contrary, Fe content in diets of 12 – 23 months was adequate at low bioavailability and at moderate bioavailability for the 9 – 11 months. The amount of Fe consumed, however, was significantly lower than estimated daily needs (in *mg/day*) from complementary foods.

**Conclusion:** The complementary foods were energy dense. Daily energy, Ca, Zn & Fe (except 12 – 23 months) intake, however, was lower than estimated daily requirements. Poor diet diversity & diets with inappropriate consistency were observed in majority of the servings.

**Keywords:** Complementary Feeding, Nutrient Density, Homemade, Estimated Daily Nutrient Intake



## THE EFFECT OF SIMPLE DEHYDRATION METHODS ON THE QUALITY OF SELECTED BANANA VARIETIES -A COMPREHENSIVE STUDY

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**Background:** Being the top producer of banana India contributes about thirty seven percent of world banana production. Out of the total production only one per cent is being exported, two per cent of units are being processed and post-harvest losses account to 20 - 30 per cent of the stored fruits. To overcome this, it is important to adapt simple and effective processing techniques which are not only going to increase the shelf life, but also improve the quality, preserve nutritional and sensory value of food material produces up to the point of consumption. Processing ensures availability of the produce throughout the year when certain foods are either scarce or expensive. The objective of this study is to process the major cultivated banana varieties by simple methods such as sun drying, microwave drying, cabinet drying and osmotic dehydration and to analyze the nutrient content, acceptability and shelf life of the dried products

**Methods:** There are nearly 24 varieties of banana available in the locality Coimbatore and one fourth that is six varieties were selected and dried by the by sun drying and dehydrated by cabinet drying, microwave drying and osmotic dehydration. The overall acceptability, nutrient content and shelf life study were determined by organoleptic evaluation, Indian Council of Medical Research (ICMR) standard procedure respectively.

**Results:** The mean organoleptic score of the microwave dried banana stored for three months showed slight differences; the mean score for flavor and texture was ranged between 2.5 to 2.9 in 90 days of storage; all the selected varieties of banana processed by osmotic dehydration method stored till 90 days found to possess maximum acceptability scores;. among the drying methods the antioxidant activity in microwave dried fruits was maximum; the increase in microbial count in red banana, poovan rasthali, robusta, neypoovan and nendran were found to be between 03(103 CFU) and 04(103 CFU) on 90th day which was at accepted safe level of 103 CFU; Osmotic dehydration was found to be the best method for the long shelf life of dehydrated fruits since the total plate count was negative till 60th day of storage.

**Conclusion:** The study concluded that sun drying, microwave drying; cabinet drying and osmotic dehydration are best suitable for processing the locally available banana varieties. The study also recommends that a processing method to minimize the carbohydrate content and glycemic index of banana could be studied.

**Key words:** Dehydration .Drying, Banana, Nutrient content, Shelf life

## DEVELOPMENT OF MACARONI FROM BLENDS OF WHEAT (*TRITICUM AESTIVUM*), BARLEY (*HORDEUM VULGARE L.*) AND SOYBEAN (*GLYCINE MAX*) FLOURS

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**Background:** Consumption of macaroni made from durum wheat flour was popular, but the low fiber and protein content of wheat flour which was most vital ingredients used for the production of macaroni was major concern in its utilization. Therefore the aim of this study was to incorporate soybean and barley flours on durum wheat flour for development of macaroni.

**Method:** Randomized complete block design (RCBD) was used to investigate the effect of level of soybean and barley on sensorial properties and complete randomized design (CRD) was carried out to study functional properties of macaroni using SAS version 9.01. Macaroni was prepared in a ratio of durum wheat flour: barley: soybean; 100:0:0, 80:15:5, 70:20:10, 70:10:20, and 60:30:10 respectively. Water absorption and cooking loss were determined by cooking 100 gm of prepared macaroni with 1000 ml of water for 10 min. The sensory characteristics of prepared macaroni was also evaluated on the basis of appearance, color, odor, taste, stickiness and over all acceptability using five point hedonic scale by fifteen panellists.

**Result:** The results indicated that incorporation of barley and soybean increases the water absorption capacity of macaroni due to higher fiber content of barley and protein content of soybean which absorbs more water as compared to macaroni prepared from durum wheat flour only. Addition of barley and soybean flours on durum wheat flour during macaroni preparation increases crude protein, fiber and ash contents while reducing the moisture contents. The macaroni prepared from blends of 15 % barley, 5 % soybean and 80 % durum wheat flour have scored better sensorial acceptability. So it is advisable to the food processors to produce macaroni by adding less than 15% barley and 5% soybean flour to durum wheat flour, but increasing the quantity of barley flour above 15% and soybean flour greater than 5% reduces the organoleptic acceptability and functional properties.

**Keywords:** Blending ratio, Soybean, Barley, Durum wheat, Water absorption, Cooking loss, Sensorial properties.

## OPTIMIZATION OF TIME AND TEMPERATURE FOR SMOKING OF NILE TILAPIA FOR A BETTER PRESERVATION OF PROTEIN AND GROSS ENERGY VALUE

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**Background:** This experiment was conducted to optimize temperature and time for hot smoking of Nile Tilapia in order to get the most nutritive quality. Three levels of smoking temperature ( $80 \pm 30\text{C}$ ,  $90 \pm 30\text{C}$  and  $100 \pm 30\text{C}$ ) and time (2:00, 2:30 and 3:00 hours) were used. Accordingly, Face centered central composite design using Design expert (version 7.0.0., Stat-Ease, Minneapolis, MN) was used to optimize and evaluate main effects, interaction effects and quadratic effects of smoking temperature and time on gross energy value and overall sensory acceptability.

**Method:** A Multiple Linear Regressions Analysis (MLRA) was performed to determine all the coefficients of constant, linear, quadratic and interaction terms using least square minimization to fit the intended model to the collected data. The lack of fit test was used to evaluate the fitness of the generated model using coefficient of determination ( $R^2$ ). The adequacy of the model was justified through Analysis of Variance (ANOVA).

**Result:** The result show that all the built polynomial equations were found to be statistically non-significant as determined by ANOVA, lack of fit is non-significant and the model is less adequate to sufficiently describe the experimental data. The numerical optimization using desirability approach of all combination resulted in smoking temperatures and times were found to be optimum to produce good gross energy value and sensory acceptability of smoked fish. From model summary statistics, a negative predicted  $R^2$  implies the overall/grand mean is a better predictor of gross energy value and overall sensory acceptability than the current model. Accordingly, Nile Tilapia (*Oreochromis niloticus*) smoked at  $80 \pm 3 \text{ } 0\text{c}$  for 2:00 and  $80 \pm 3 \text{ } 0\text{c}$  for 3:00 hour possessed the highest gross energy value (kcal) for non-dried and pre-dried respectively and fish smoked at  $100 \pm 3 \text{ } 0\text{c}$  for 2 and 3 hours and  $90 \pm 30\text{c}$  for 2 and 3 hours possessed highest overall sensory acceptability for non-dried and pre-dried respectively.

**Keywords:** Nile Tilapia, Optimization, Smoking, Temperature and Time

### THEME 3: NUTRITION SENSITIVE AGRICULTURE AND RELATED RESEARCH

#### SUMMARY OF THE FINDINGS

Nutrition interventions are focusing on nutrition sensitive agriculture. Among the high impact nutrition sensitive interventions improved home-garden is one of the sustainable agricultural focused work to improve undernourishment. There were significant mean differences in weight for age ( $p < 0.0001$ ), height for age ( $p < 0.026$ ) and weight for height ( $p < 0.0001$ ) between households with and without home-gardening. Proportion of undernourishment from households with home-garden was lower than households without. Permagardening also had positive and significant effects in vegetable gardening practices, diversity of vegetables consumption, and increased monthly income.

Food insecurity was positively associated with paternal occupation (being non-farmer) [AOR (95% CI) = 2.9 (1.8, 4.6)], It is common in wet season and associated with basic household factors. Urban agriculture can play a crucial role in ensuring food security and improvement of the nutritional status of vulnerable populations.

Spice and condiment plants are to flavor and act as nutraceutical foods that provide health benefits. The consumption of habitual concentrations of black tea or 'berbere'-spiced food does not have a significant role on appetite and energy intake of preschool children. The product of mushroom is not price sensitive rather time, because it is an emerging and perishable product and has no shelf life.

Promoting and intervening for home gardening is with green light to reduce the high prevalence of under nutrition among pre-school, Establishing botanical gardens for conservation, encouraging culture of diversifying diets/meals, the use of home gardens for cultivation of multipurpose plants and finding markets for potential home garden products needs to be followed up, Season - oriented food security interventions should be designed.

## SEASONAL CHANGES IN THE PREVALENCE OF FOOD INSECURITY AMONG RURAL HOUSEHOLDS IN EAST ETHIOPIA: A LONGITUDINAL PANEL STUDY.

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**Background.** Food insecurity has become a major public health problem affecting the general population worldwide. However, little has been known about its seasonal variation and correlates in low-income countries using advanced analysis to design time – oriented interventions.

**Objective.** To determine the seasonal changes in the prevalence of food insecurity in the wet and dry seasons among rural households in east Ethiopia.

**Methods.** A longitudinal study was conducted from August, 2011 to February, 2012 among mothers in rural and semi-urban households in east rural Ethiopia. Data were collected from 2,132 randomly selected households. Odds ratio along with 95% confidence interval was estimated to identify predictors of household food insecurity using a conditional fixed- effects logistic regression analysis.

**Results.** Nearly 45% [44.56 %, 95% CI: (42.45%, 46.67%)] and 21.2 %, [95% CI: (19.4%, 22.9 %)] of the households were food insecure in the wet and dry season, respectively. Food insecurity was positively associated with paternal occupation (being non-farmer) [AOR (95% CI) = 2.9 (1.8, 4.6)]. In contrast, being in the middle [AOR (95% CI) = 0.50 (0.37 , 0.68)] and higher [AOR (95% CI) = 0.32 (0.24 , 0.44) ] household's socio - economic positions and dry season [AOR (95% CI) = 0.38(0.29 , 0.52) ] had protective effect against food insecurity.

**Conclusions.** Food insecurity was more common in wet season and associated with basic household factors. Season - oriented food security interventions should be designed to enable the poor rural households have access to adequate food and achieve desired Millennium Development Goals in low – income countries like Ethiopia.

**Keywords:** Ethiopia, Household Food Insecurity, Kersa, Longitudinal study.

**COMPARATIVE STUDY OF THE NUTRITIONAL STATUS OF PRESCHOOL CHILDREN FROM HOUSEHOLDS WITH AND WITHOUT HOME GARDENING IN WONDOGENET WOREDA, SOUTHERN-ETHIOPIA**

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**Background:** Because nutrition, agriculture and health are spiral in their relation nutrition interventions are focusing on nutrition sensitive agriculture. Poor nutrition perpetuates poverty and malnutrition through variety of routes. Among the high impact nutrition sensitive interventions improved home-garden is one of the sustainable agricultural focused work to improve undernourishment. Evidences assessing home-garden Vs nutritional status side by side are limited in Ethiopia this study was to compare the nutritional status of preschool children among households with and without home-gardening in Wondogenet woreda, South Ethiopia, 2015.

**Methodology:** A community based comparative cross-sectional study was conducted in Wondogenet woreda, Sidama Zone, Southern-Ethiopia. Computer generated random numbers were used to select study participants after census of eligible households. Data was collected quantitatively using structured questionnaire. Then the collected data was entered in to a spreadsheet and exported to SPSS and analyzed using SPSS software. WHO Anthro software was used to generate z-score for nutritional status of the preschool children. The statistical tests used for data analysis were t-test and logistic regression. Statistical significance was set at  $p < 0.05$ .

**Result:** A total of 215 preschool children from the home-gardening and 215 from households without home-gardening were included in the study. In households with home-garden, about 41% of the children were stunted, 28% of them were under weight and 7.9% were wasted. The mean (SD) of height for age, weight for age and weight for height Z- scores were -1.55(1.17), -1.3(0.8) and -0.6(0.9), respectively. In households without home-gardening, nearly 44% of the children were stunted, 30% of them were under weight and 8.8% were wasted. The mean (SD) height for age, weight for age and weight for height Z-scores were -1.6(1.2), -0.98(0.93) and -0.14(1.2), respectively. Our results revealed that there were significant mean differences in weight for age ( $p < 0.0001$ ), height for age ( $p < 0.026$ ) and weight for height ( $p < 0.0001$ ) between households with and without home-gardening.

**Conclusion:** High prevalence of stunting and underweight was reported from both households with and without home-gardening. Proportion of undernourishment from households with home-garden was lower than households without. Promoting and intervening for home gardening is with green light to reduce the high prevalence of undernutrition among pre-school children. Further research better be conducted to evaluate the nutritional significance of home-gardening for pre-school children.

**Key words:** Pre-school children, Home-garden, Nutritional Status and Wondogenet

## THE HECKMAN MODEL OF DIETARY DIVERSITY SCORE: THE CASE OF AKAKI SMALL-SCALE IRRIGATION SCHEME

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**Background:** Different economists highlighted that urban agriculture does appear to be associated with greater dietary diversity score and calorie availability. It is therefore paramount for government, NGOs, interest groups and individuals to give small scale irrigated agriculture the needed attention to ensure adequate food supply all year round as food stability (Ocloo et al, 2012). It can play a crucial role in ensuring food security and improvement of the nutritional status of vulnerable populations such as children and the sick (Emmanuel and Thomas, 2012). The objective of the study to evaluate impact of Akaki small scale irrigation scheme on farm households' dietary diversity score and to identify determinants of farm households' dietary diversity score

**Methodology:** Out of 700 farming households with systematically stratified random sampling technique, this causal type of study analyzed 246 household surveys based primary data (personal interview questionnaire) with inferential statistics (Heckman model).

**Result:** Estimate of irrigation participation variable ( $w$ ) in the households' dietary diversity score is statistically insignificant. This implies that households' dietary diversity score was not as such observed in the study area. This is to mean that small scale irrigation scheme did not have an effect on farm households' dietary diversity. Further the study shows the lambda ( $\lambda$ ) value (HHDDS= 0.0003356) result is statistically insignificant and indicates the absence of selectivity bias in the sample.

At 0.01 probability level; sex, educational level (ed), off farm income (offarmi) and irrigation experience (exep) are highly significant determinates. And distance from home to water source (dhomeland) is another significant determinate of households dietary diversity score at 0.05 level of significance. Even if the study focused on 5% level of significant, land size and onfarm income are also significant at the level of 10% significance.

### **Conclusion and Recommendations**

Households are poor in dietary diversity. Government should open schools (farmers' field school) to increase production or skill around the study area. Magnitude of gender (sex) estimate on dietary diversity is absolutely high. Therefore Government should empower female household heads for irrigation activities.

## HOUSEHOLD FOOD INSECURITY AND ITS ASSOCIATION WITH UNDER FIVE CHILDREN NUTRITION STATUS IN SEKELA DISTRICT, WESTERN ETHIOPIA; A CROSS-SECTIONAL STUDY

Ermiyas Mulu (MPH)<sup>1\*</sup> and Bezatu Mengistie<sup>2</sup> (Ph.D)

**Background:-** Child malnutrition and food insecurity remain main problems in Ethiopia. Studies across different parts of the world revealed mixture of evidences about the relationship between household food insecurity and child nutritional status. Therefore; this study was conducted to assess the association between food insecurity and under five children nutritional status in Sekela District, Western Ethiopia.

**Method:-** five hundred seventy six mothers/caregivers living in four randomly selected kebeles in Sekela District were interviewed using structured questionnaire during February of 2014. Household food access insecurity was measured using household food access insecurity scale. The height and weight of children were taken; anthropometry indices were calculated & interpreted according WHO 2006 cutoff point. After checked for completeness and consistency data was entered onto Epi.Data 3.2. Then, it was exported to SPSS 21.0 for further analysis.

**Result:-** A total of 555 households with children aged 6-59 months participated in the study. Of all children; 275 were males and 280 were females. The children mean age was  $31.39 \pm 13.64$  months. The prevalence of stunting, underweight and wasting was 36.9%, 19.8% and 11.5% respectively. The mean household food access insecurity score was  $8.16 \pm 6.01$  and the prevalence of food access insecurity measured by household food access insecurity scale was 74.1%. Household food insecurity had association with only underweight ((AOR=2.25; 95% CI=1.29, 3.94) . Sex of child, age of child, colostrum feeding, upper respiratory infection, feeding frequency and maternal education were factors associated with chronic under nutrition. Child experience of upper respiratory infection was associated with underweight and child experience of fever was associated with wasting.

**Conclusion:-** In the main, household food insecurity and children under nutrition were critical problems in the study setting. Only underweight associated with household food insecurity. Socio demographic factors, child caring practices and infection lead to children under nutrition in the study setting. Thus, there should be multi sectorial community based nutrition interventions and initiation of income generating livelihood to the community to curtail under nutrition and household food insecurity in the locality.

**Key Words;** Household Food insecurity, under five children, stunting, underweight, wasting, Ethiopia



## Impact of Permagardening Intervention on Household Vegetable Consumption and Income on Highly Vulnerable Children and their Care Givers

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**Background:** Limited studies that show impact of permagarden in improving nutrition and income of households of highly vulnerable children (HVC) conducted in Ethiopia.

**Methods:** To complement the gap quasi-experimental cross-sectional design study with intervention and control groups conducted in 7 randomly selected woredas of Amhara and Tigray regions to determine impact of permagarden intervention in improving household vegetable consumption, income, knowledge, attitudes and practices towards gardening among households of HVC in Yekokeb Berhan program.

**Result :** In this study, 884 (427 interventions and 457 control) households participated, out of which 95% of the intervention group reported consumed vegetables in the week before the survey, compared to 79% in the control group (mean difference 16.4%,  $P<0.01$ ). The positive contribution of the program on households' vegetable consumption becomes more evident in frequency and diversity by households. The result shows significantly higher proportion (83%) of households in the intervention group reported consumed vegetable at least twice in a week than control group (59%) with mean difference of 27%,  $P<0.01$ . The diversity of vegetables consumed by a household measured by reported number of different vegetables consumed in 24 hours period before survey. The result also shows that higher percentage of intervention households consumed varieties of vegetables than control households. More than 46% of the intervention group reported consumed at least two types of vegetables in 24 hours period, compared to 37% of control group (mean difference of 9.3%, ( $P<0.05$ ).

Intervention group had significantly higher reported mean monthly household income (478 Birr) than control group (416 Birr) with mean difference of 62 Birr ( $P<0.01$ ). The reported incidence of diarrhea among children under age 5 years in the past one month was higher in control groups than intervention groups, a difference of 19% ( $P<0.01$ ). In general, 75% and 57% of caregivers in the intervention and control groups respectively rated their under age 5 children's general health condition to be 'excellent or very good'.

**Conclusion:** Results of this study confirmed permagardening had positive and significant effects in vegetable gardening practices, diversity of vegetables consumption, and increased monthly income of the intervention group than control. In the long run, vegetable gardening and consumption of households with HVC might increase food nutrient supplies which improve overall wellbeing of HVC. Further research need to explore

whether these observed positive effects are sustainable over time, effects of the program on livelihoods and its policy implications.

**Key words:** Permagarden, HVC, Care Givers /Guardians, control and intervention group

## THEME 4: MICRONUTRIENT AND MACRONUTRIENT RELATED RESEARCH

### SUMMARY OF THE FINDINGS

Micronutrient and macronutrients deficiencies lead to serious health, social & economic consequences. Ethiopia working on micronutrient deficiencies Enhanced Outreach Strategy (EOS); universal salt iodization and iron foliate supplementation for pregnant women, Children and adolescents. Under this thematic Iodine deficiency, zinc deficiency, under nutrition, and overweight and obesity among adolescent, pregnant women, children and adolescent pregnant women

Urinary iodine concentration in pregnant women was below 150 µg/ L in 78% of pregnant women. The median UIC was 85.7 indicating insufficient iodine intakes. The goiter rate was 20 %. The median iodine concentration of the household salt samples was 12.2 ppm. Only 39% of households were consuming adequately iodized salt (≥15 ppm). Iodine deficiency is a serious problem among pregnant women. Strengthening the salt iodization programme with a mass education to increase access to adequately iodized salt and iodine supplementation are urgently required.

The overall prevalence of zinc deficiency was 9.6%. Malarial history in the last two, increased physically activity, having low dietary diversity scores, poor wealth status and being stunted were significantly associated with zinc deficiency. Farther improvement in zinc sufficiency can be maintained through improving dietary diversity, giving special attention for adolescents with malaria and providing nutrition education.

The prevalence of overweight and obesity was found to be 15.5% and 4.5% respectively. Children who learned at private schools, children who often ate sweets were more likely to be over nourished. Frequent television / video games watching, and sedentary activity were significantly associated with over nutrition. Awareness creation on the overweight/obesity for school teachers, parents, and other relevant stakeholders needs to be emphasized.

The level of under nutrition was among adolescent pregnant women 34.0%. Adolescents who married before 15 years; those who had more than three pregnancy and those having daily heavy work load were more likely to be under nourished. Moreover, Adolescent pregnant women having partner and family support; who are literate and those who attended ANC greater or equal to four times were protected from being under nourished. Thus, pregnant teenager's targeted efforts should be made by all concerned bodies to reduce the problem in the study area.

Children Treated for Severe Acute Malnutrition recovering and discharged using current criteria still need particular attention during the first three to four months after discharge and that research is urgently needed to determine the appropriate package of intervention that may accelerate catch up growth and complete recovery. There is evidence for catch-up at discharge from CMAM that was also sustained; this could increase the risk of metabolic abnormalities in the long-term.

## ETHIOPIAN NATIONAL MICRONUTRIENT SURVEY

Dilnesaw Zerful, Adamu Belay<sup>1</sup>, Mesert W/yohanes<sup>1</sup>, Girmay Ayana<sup>1</sup>, Andinet Abera<sup>1</sup>, Biniyam Tesfaye<sup>1</sup>, Desalegn Kuche<sup>1</sup>, Solomon Eshetu<sup>1</sup>, Aweke Kebede<sup>1</sup>, Temesgen Awoke<sup>1</sup>, Girma Mengistu<sup>1</sup>, Yosef Beyen<sup>1</sup>, Alemnesh Petros<sup>1</sup>, Mekonen Sisay<sup>1</sup>, Tsehay Assefa<sup>1</sup>, Tibebu Moges<sup>1</sup>, Tesfaye Hailu<sup>1</sup>, Yibeltal Assefa<sup>1</sup>, Amha Kebede<sup>1</sup>, Masresha Tessema<sup>1</sup>

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**Background:** Health and vitality of human beings depends on diets with adequate amounts of vitamins and minerals. The adverse effects of micronutrient deficiencies are most severe for children, pregnant women and the developing fetus. Approximately 30% of the world's population is unable to use their full mental and physical potential as a result of micronutrient malnutrition. In Ethiopia this micronutrient deficiencies include vitamin A, iodine, iron, and zinc.

**Objectives:** to estimate the prevalence of anemia, iron deficiency, vitamin A deficiency, zinc deficiency, iodine deficiency and adequately iodized salt in Ethiopia. Cross sectional study with a representative sample of nine regions and two city administrations of the country.

**Results:** Information related to household (HH) characteristics, demographics and socio-economic were collected. 95% (n=3805) of the HHs were participated on this study. In Ethiopia the prevalence of inflammation as measured by CRP and AGP among under five children, school children and non-pregnant women of reproductive age were 44 %, 31.6 % and 27.3% respectively. The prevalence of anemia adjusted for altitude among preschool children, school age and non-pregnant women of reproductive age were 34.6, 25.6 and 17.7 %, respectively, and the deficiency was higher among rural residents. The prevalence of Iron deficiency among preschool children, school age children and women of reproductive age as measured by ferritin and adjusted for inflammation was 17.8, 9.1 and 10.0% respectively. Whereas National prevalence of Iron deficiency among preschool age children, school age children and women of reproductive age as measured by STFR was estimated 29.6%, 19.5% and 16.4% respectively. Therefore, the deficiency of tissue iron and depleted body iron store are more prevalent among preschool children than the other target groups. The prevalence of subclinical vitamin A deficiency was 14%, 10.9% and 3.4% in the preschool age children, school age children and women of reproductive age respectively. The national vitamin A supplementation coverage in the preschool age children was 63%. The national prevalence of zinc deficiency was 35% in the preschool age children, 36% in school age children and 34% in women of reproductive age. The prevalence of iodine deficiency among school age children whose mean urinary iodine concentration was below the cut-off was 48%. While in the women of reproductive

age, the prevalence of iodine deficiency was 52%. National salt coverage was 85% but only about 26% of the households were getting adequately iodized salt.

**Conclusion:** Based on the current survey finding Zinc, Vitamin A and Iodine are public health problem according to WHO classification. Since the magnitude of the deficiencies of these micro-nutrients are widely varied among different target groups targeted intervention required to address the deficiency of in needs.

## IODINE STATUS OF PREGNANT WOMEN AND HOUSEHOLD SALT IODINE CONCENTRATION IN RURAL ADA WOREDA, OROMIA REGION, ETHIOPIA

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**Background:** Adequate maternal iodine intake is essential for the development of the fetus. Iodine deficiency (ID) during pregnancy has been recognized as a major cause of abortion, stillbirth, congenital anomalies and perinatal mortality.

**Objective:** To assess the iodine status of pregnant women and determine the iodine content of household salt in the rural areas of Ada Woreda, Oromia region, Ethiopia.

**Method:** A community based, cross-sectional study was conducted in six rural kebeles of Ada in October and November, 2014. Data were collected from 356 pregnant women selected by two stage cluster sampling technique. Salt samples were collected from participants' homes and iodine concentration was determined using a portable digital electronic iodine checker. Presence of goiter was examined by palpation. Urinary iodine concentration was measured using inductively-coupled-plasma mass spectrometry.

**Results:** Urinary iodine concentration (UIC) was below 150 µg/L in 78% (95% CI: 73-82%) of the women. The median UIC was 85.7 (IQR: 45.7-136) µg/L, indicating insufficient iodine intake. Individual values ranged from 1.3 to 1147.2µg/L. The goiter rate was 20.2% (95% CI: 16-24). The median iodine concentration of the household salt samples was 12.2 (IQR: 6.9-23.8) ppm. Only 39% (95% CI: 34-44%) of households were consuming adequately iodized salt (≥15 ppm). The women from households which used adequately iodized salt had 0.28 (95% CI: 0.17-0.48) times lower risk of iodine deficiency compared to those which used inadequately iodized salt.

**Conclusion and recommendation:** Iodine deficiency is a serious problem among pregnant women in the study area. Strengthening the salt iodization programme with a mass education to increase access to adequately iodized salt and iodine supplementation are urgently required.

**Keywords:** Pregnant women, Urinary iodine, Goiter, Iodine deficiency, salt iodine.

## PREVALENCE AND ASSOCIATED FACTORS OF ZINC DEFICIENCY AMONG HIGH SCHOOL ADOLESCENTS: A CROSS-SECTIONAL STUDY IN GAMBELLA TOWN, SOUTHWEST ETHIOPIA

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**Background:** Zinc is one of the essential trace elements and vital micronutrients with diverse physiologic and metabolic functions. Zinc deficiency is a major public health problem in many developing countries and associated with poor growth and development, which increased susceptibility to infections, male hypogonadism, cell-mediated immune dysfunction, and abnormal neurosensory changes but its deficiency has not received due attention especially in Ethiopia. Therefore, this study aimed to assess prevalence and associated factors of zinc deficiency among high school adolescents in Gambella town, Southwest Ethiopia.

**Methods:** An institutional based cross-sectional study was employed in Gambella town in April 2015. Randomly selected 346 High School adolescents were included in the study. Data were gathered using a structured questionnaire after securing written consent and assent. Serum zinc concentration was measured using Atomic Absorption Spectrometry. Statistical analysis was done using logistic regression. The results were presented using odds ratios with 95% confidence intervals. Variables with p-value less than 0.05 were considered as significant.

**Results:** A total of 302 high school adolescents were included in the study resulting in the response rate of 87.3%. The mean ( $\pm$ SD) age of the participants was 17.17 ( $\pm$ 1.15). The overall prevalence of zinc deficiency was 9.6% [95% CI: 6.3-12.9]. Malarial history in the last two weeks [AOR= 4.12: 95% CI: 1.58-10.66], increased physically activity [AOR= 1.97: 95% CI: 1.43-6.39], having low dietary diversity scores [AOR= 4.23: 95% CI: 1.52-12.29], poor wealth status [AOR= 4.68: 95% CI: 1.41-9.49] and being stunted [AOR= 2.84: 95% CI: 1.29-7.46] were significantly associated with zinc deficiency.

**Conclusion and Recommendation:** - Prevalence of zinc deficiency among high school adolescents was lower than other studies done in Ethiopia. Developing strategies to improve zinc utilization among adolescents is recommended. Farther improvement in zinc sufficiency can be maintained through improving dietary diversity, giving special attention for adolescents with malaria and providing nutrition education.

**Keywords:** Adolescents, Zinc deficiency, Serum zinc concentration, Ethiopia



## PREVALENCE OF OVERWEIGHT AND OBESITY AND ASSOCIATED FACTORS AMONG FIRST CYCLE PRIMARY SCHOOL CHILDREN IN DIRE DAWA TOWN, EASTERN ETHIOPIA.

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**Introduction:** Childhood over nutrition (overweight and obesity) has become a major public health concern in many industrialized countries and is emerging as a threat to the public health in low- income – countries. However, there is limited evidence on the extent of over nutrition among first cycle primary school children in developing countries like Ethiopia.

**Objective:** The main objective of this study was to assess the prevalence of over nutrition and associated factors among first cycle primary school children in Dire Dawa Town, East Ethiopia from February 25 to March 14/2014.

**Methods:** A cross-sectional study was conducted on a total of 484 randomly selected first cycle primary school children. A structured questionnaire, portable electronic weight scale and commercial standiometer were used to collect the data. Over nutrition was determined using Body Mass Index (BMI) - for-age Z-scores (BAZ) based on World Health Organization (WHO) cut offs for children aged 5-19 years , in which BAZ > +1 Standard Deviation (SD) to  $\leq +2SD$  was considered as overweight and  $> +2SD$  as obese. Descriptive, bivariate, and multivariable analyses were used to analyze the data. Odds ratio along with 95%CI was estimated to identify factors associated with over nutrition using multivariable logistic regression.

**Results:** The prevalence of overweight and obesity was found to be 15.5% and 4.5% respectively. Children who learned at private schools were 2 times more likely to be over nourished compared with those who learned at public schools [ (AOR=2.5, 95%CI= (1.21-5.09)]. Children who often ate sweets were 3 times more likely to be over nourished compared with those who seldom ate sweets [(AOR=3.56, 95% CI= (1.78 - 7.10)]. Moreover, children who did not participate in sport or physical activity were 3 times more likely to be over nourished compared with their counterparts [(AOR=3.47, 95%CI= (1.6-7.53)]. children who used to watch Television / play video games > 2 hours per day were 2 times more likely be overnourished compared with their counterparts who used to watch Television / play video games <2 hours per day [(AOR= 2.28, 95%CI= (1.22-4.27)].

**Conclusions:** The prevalence of overweight/obesity is increasing among the study population .Learning at private schools, consumption of sweet food items, frequent television / video games watching, and sedentary

activity were significantly associated with over nutrition. Awareness creation on the rising prevalence of overweight/obesity and associated factors among the study participants, school teachers, parents, and other relevant stakeholders needs to be emphasized.

**Key words:** overweight, obesity, school children, first cycle primary school, Dire Dawa, Ethiopia

## UNDER NUTRITION AND ASSOCIATED FACTORS AMONG ADOLESCENT PREGNANT WOMEN IN SHASHEMENNE DISTRICT, OROMIA REGIONAL STATE, ETHIOPIA

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**Background:** Adolescent pregnancy is a major problem world-wide, but is especially prevalent in developing countries. Pregnancy places adolescent females at risk for nutritional problems at even greater risk. In Ethiopia where marriage is universal and occurs at young ages; early teenage pregnancy is of prime public health importance. Addressing the nutritional needs of adolescent pregnant women could be an important step towards breaking the vicious cycle of intergenerational malnutrition. Thus, assessing of nutritional status of adolescent pregnant women at any level, including rural parts of our country, is very important where access to health information is limited.

**Objective:** The aim this study was to assess level of under nutrition and associated factors among adolescent pregnant women in Shashemenne district, Oromia Regional State, Ethiopia from March 10 - April 10/2015.

**Method:** Quantitative community based cross sectional study was carried out among 424 adolescent pregnant women in Shashemenne district. Data was collected using a pre-tested, structured questionnaire and Mid Upper Arm circumference (MUAC) measurement was taken in their own respective home. Data was entered and cleaned in EPI data software. Then, it was exported and analysed with SPSS version 21. Multivariate Logistic regression with odds ratio along with the 95% CI was used to identify factors associated with undernutrition. Statistical significance was declared at p-value  $\leq 0.05$ .

**Results:** In this study, the level of under nutrition was 34.0%. Adolescents who married before 15 years were about seven times (AOR=7.3, 95%CI; 9.5-23.7) more likely to be under nourished. On the other hand, literate women were protected from under nutrition (AOR=0.3, 95%CI; 0.2-0.8). The risk of undernutrition was 70% lower for the literate adolescent pregnant women than the literate women. Adolescent pregnant women who didn't visit ANC were six times (AOR=6.0, 95%CI; 1.2-30.1) more likely to be under nourished when compared to respondents who attended ANC greater or equal to four times. Adolescent pregnant women who get pregnant less than three times (AOR= 0.1, 95% CI; 0.03-0.3) were less likely to be under nourished than those who had more pregnancy. Moreover, adolescent pregnant women having partner and family support were protected from being under nourished (AOR=0.4, 95%CI; 0.2-0.8).

Adolescent pregnant women having daily heavy work load were thirteen times (AOR=13.6, 95%CI; 6.3-28.8) more likely to be under nourished as compared to their counterparts.

**Conclusion:** The level of under nutrition was high which affects both the growing mother and her foetus negatively. Thus, pregnant teenager's targeted efforts should be made by all concerned bodies to reduce the problem in the study area.

## NUTRITIONAL AND HEALTH RELATED OUTCOMES OF CHILDREN TREATED FOR SEVERE ACUTE MALNUTRITION, JIMMA ZONE: PROSPECTIVE COHORT STUDY

Tsinuel Girma

*A partnership study for the USAID ENGINE programme in Ethiopia, implemented by Jimma University, Valid International and Save the Children*

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**Background** :Globally, more than 9 million under five children die each year due to acute malnutrition and millions more are permanently disabled by the physical and mental effects of a poor dietary intake in the earliest months of life. Despite the tremendous progress of recent years, Ethiopia remains one of the countries with high burden of severe acute malnutrition (SAM). The community based management of acute malnutrition (CMAM) approach that has allowed a dramatic reduction in SAM case fatality while enabling rapid scale up and significant increase in programme coverage. Anthropometric parameters are commonly used to declare complete recovery. However, there is still very little research confirming this and highlighting the long term outcome after recovery. Do they remain recovered for long, or do they relapse back into SAM? Do they have higher rates of mortality and illness compared with the general population? Do their immune systems and hemoglobin levels genuinely recover? How much of the weight gain is the desirable lean tissue mass? This study helped address these important research gaps by comparing children who have experienced an episode of SAM (post-SAM) and been discharged as cured from a CMAM site to children from the same community who have not had SAM.

**Study design:** This was a prospective cohort study following in parallel post-SAM cases and their matched controls with no particular intervention. A one-year follow up was done monthly and data on nutrition status, morbidity and vital status were collected at each visit. Data for comparing body composition, hemoglobin level and Tuberculin Skin Test reactivity were collected at enrolment and six months later.

**Key findings:** The findings of this study indicate that post-SAM children of our cohort had better morbidity and mortality profile than those of cohort followed in other countries. However, when compared to non-wasted controls children from the same community they remained more vulnerable and had more incident episodes of acute malnutrition and infectious diseases, and at the time of discharge they have not yet catch up the controls in term of anthropometric indices, lean mass and “cellular health” parameters. However, they had comparable fat mass with the controls. Despite continuous improvement in soft tissues mass increment during post-discharge months there was no complete catch up by the sixth month follow up for BIA parameters and by the end of the 12 months follow up for the anthropometric data. Higher morbidity among post-SAM cases during follow up suggests incomplete recovery of the body defense mechanisms. Interestingly, at discharge and 6

months later, post-SAM cases were comparable to non-wasted controls for hemoglobin level and prevalence of anemia suggesting correction of minerals and micronutrients deficiencies.

**Conclusion:** Overall our results indicate that children recovering from SAM and discharged using current criteria still need particular attention during the first three to four months after discharge and that research is urgently needed to determine the appropriate package of intervention that may accelerate catch up growth and complete recovery. There is evidence for fat catch-up at discharge from CMAM that was also sustained; this could increase the risk of metabolic abnormalities in the long-term.

## **THEME 5: FOOD SAFETY AND QUALITY RELATED RESEARCH**

### **SUMMARY OF THE FINDINGS**

Keeping food safety and quality are major components for food, and nutrition security. Aflatoxins contamination in cereals, legumes, and nuts was susceptible across all the value chain especially when the storage condition was not suitable. Consumption of these commodities exceeding the maximum limits (10 ppb) may cause a potential health risk especially for the young children. Despite this, every year millions of people worldwide suffer from foodborne diseases and illness resulting from the consumption of contaminated foods. Studies revealed that milk samples from different milk producers around Addis Ababa contained higher microbial load, in Hawassa town street vended foods were likely causing food borne illness, and in Awetu river in Jimma town constituted a health risk through vegetable contamination. In addition to this, a study on physico-chemical properties on locally consumed edible oils in Addis Ababa indicated that they were poor in labeling and quality than the imported edible oils. Therefore, studies concluded that regular training and inspection on food safety and quality are recommended to assure safety and quality of food products.

## PHYSICOCHEMICAL AND NUTRITIONAL PROFILE OF COMMONLY CONSUMED EDIBLE OILS IN ADDIS ABABA AND THEIR HEALTH IMPLICATIONS

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**Introduction:** Keeping food safety and quality are some of the major components for food and nutrition security and protecting human welfare. Directly or indirectly edible oils are involved in every day dish and due to this, long time preference to the type of edible oil quality and safety should bring either positive or negative impact on overall health. The objective of this research is to make physicochemical and nutritional profile analysis on the edible oils and based on the finding to write a recommendation for policy makers, inspection and controlling bodies and oil processing industries.

**Material and methods:** Sixteen different types of edible oils are collected from shops and supermarkets found in Addis Ababa in 2015. And in this study almost all types of edible oils found in Addis Ababa were included. Following the sample collection, the physicochemical and nutritional profiles were analyzed according to AOAC standard method of fat and oil analysis.

**Results and discussion:** Among total of sixteen oil brands analyzed, seven were produced in Ethiopia. And all these were poor in labeling. However those imported (9 brands) oils from different countries had the necessary labeling requirements. From the seven local oils analyzed, six were contain acid value higher than the standard. Again from these seven local oils, five were not refined; look deep yellow or brown-yellow and three of them had settable matter. Being solid or hydrogenated has brought significant difference in iodine value, saturated, monounsaturated, omega 3, omega 6, cis and trans fatty acids of the edible oil at  $p < 0.05$ . Generally, imported oils have good labeling in terms of expire date, nutrition facts and fortification as compared to local ones.

**Conclusion and recommendation:** Even though locally produced edible oils have their own quality in terms of having good PUFAs content and low saturated FAs, but they need to pass through all the necessary oil processing steps in the factory; including decreasing the acidity, protect from oxidation, bleaching, refining and deodorizing in order to remove impurities and hazardous substances so that to make safe for consumption and to improve nutritional quality. The inspection and control mechanism should also be strong to conform to standard in labeling the product and decreasing acidity. Compared to liquid vegetable oils, palm oils have high Trans, saturated, mono unsaturated and omega 9 fatty acids with low omega 3, omega 6 and cis fatty acids. Due to this, substituting high conjugated fatty acids (PUFAs) in the place of low conjugated is recommended for their many health benefits.



## MICROBIAL SUCCESSION AND DISTRIBUTION OF LAB IN ETHIOPIAN TRADITIONAL FERMENTED MILK PRODUCTS AS WELL AS THEIR SAFETY IMPLICATION

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**ABSTRACT:** Study was made on the microbiological and physico-chemical changes during the spontaneous fermentation of the two most popular traditional fermented milk products of Ethiopia, *Ergo* and *Ititu*. This activity was designed mainly to study microbial succession and dynamicity of the microbiota across all the fermentation stages of these products under the laboratory situation, using brown bottles (sample A) to initiate fermentation as well as using the actual smoked traditional vessels and following traditional preparation methods (samples B1, B2, C1 and C2). Finally, investigation on the distribution and biodiversity of its microbial populations with special focus on the succession and distributions of the lactic acid bacteria (LAB) in terms of their species type as well as their number in these products was carried out. The effect of the traditional processing methods and the microbial biodiversity on the safety and quality aspects of both products is also investigated in depth. Similar study was also made on the field fermented *Ergo* and *Ititu* samples (sample D1 and D2) collected from farmers home to compare the differences. This approach was preferred since it might help full to select better LAB strains to be used as starters for these products at the later stage. Considering the overall microbial composition of these products, microorganisms belong to LAB, Enterobactereace, Yeast and Mould groups were found to succeeded throughout the fermentation process at various proportions in all samples of both *Ergo* and *Ititu* studied.

A total of about 1278 LAB, 425 non-LAB, 350 yeast and 265 mould isolates were isolated from all the 6 subgroups of samples mentioned above. Out of these 300 LAB, 83 yeasts and 57 mould isolates were selected after preliminary phenotypic identification to genus and species level. Among the selected LAB, 181, 67, 34, 6 and 12 isolates were belonged to genus *Lactobacillus*, *Lactococcus*, *Enterococcus* *Lecunostoc* and *Pediococcus* respectively. Among yeast 9, 13, 15, 17, 29, isolates were belonged *Rhodotorula mucilaginosa*, *Geotrichum penicillatum*, *Candida krusei*, *Picha. anomela* and *Saccharomyces cerevisiae* respectively. Among the moulds 9, 11, 13, 24 isolates were belonged to genera *Rhizopus*, *Fusarium*, *Botrytis* and *Penicillium* respectively. The organoleptic evaluation of these products was also performed and this found vary with the type of equipment used for fermentation as well as weather the smoke is applied or not and with the type of the plant used for

smoking also for the laboratory fermented *Ergo* and *Ititu* samples. Coliforms were detected in most of the raw milk samples which finally disappeared or minimized to the acceptable level throughout the fermentation stages, *Staph. aureus* is the only pathogenic bacteria detected in few raw milk samples and this also finally disappeared in the final fermented samples of both milk products collected from field as well as fermented in the lab. This finding also confirmed that fermentation as is one of the oldest food technologies continues to play an important role in the preservation and safety of fermented milk as well as many other fermented food and feed products in Ethiopian too as in many parts of the world.

**Keywords:** - Microbial succession, Traditional fermented milks, Safety, Smoke, LAB, Indigenous technology,

## DETERMINATION OF HEAVY METALS IN CANNED DRY-MILK AND FISH FROM SUPERMARKETS IN ADDIS ABABA

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**Background:** Human being require metallic elements such as copper and zinc up to certain limits that could cause problems if found in excess. Other metallic elements like cadmium and lead can be harmful to health if foodstuffs containing them are consumed regularly in excess.

**Objective:** To determine the level of Cd, Cu, Pb, and Zn in four brands of canned dry-milk and fish from supermarkets in Addis Ababa.

**Methods:** Laboratory based cross-sectional study design was applied to determine the level of the heavy metals in four imported different brands of canned dry-milk and fish from February to March 2013. Wet oxidation using HNO<sub>3</sub> and H<sub>2</sub>O<sub>2</sub> was used to extract the heavy metals from the foods samples and analyzed by Flame Atomic Absorption Spectroscopy.

**Results:** The level of Cu and Zn in all the milk and fish brands was lower than the maximum level by FAO/WHO. Significantly higher ( $P \leq 0.05$ ) level of Cd ( $1.991 \pm 0.47 \text{ mg/g}$ ) was observed in CM milk brand from Holland and  $3.541 \pm 2.467 \text{ mg/g}$  in CF fish brand from Spain packed in sunflower oil which is above the maximum tolerable limit 0.2 ppm (FAO/WHO, 1984). Significantly higher level ( $15.999 \pm 8.392 \text{ mg/g}$ ) of Pb was observed in NM milk brand from Netherlands, and  $6.574 \pm 2.899 \text{ mg/g}$  in CF fish brand from Spain packed in sunflower oil which is much higher than the maximum tolerable limit 1.5 ppm. But the Cd level was significantly lower ( $0.202 \pm 0.309 \text{ mg/g}$ ) in AM milk brand from Ethiopia, slightly higher than the tolerable maximum limits. The NF fish brand packaged in vegetable oil from Indonesia also contains the lowest ( $0.381 \pm 0.274 \text{ mg/g}$ ) Cd level. Lead was not detected in DF fish brand from Vietnam packed in brine. The levels of lead ( $1.791 \pm 0.275 \text{ mg/g}$ ) in NF fish brand from Indonesia which was lower than the US EPA and MAFF maximum level.

**Conclusions:** The level of Cd and Cu residues in canned dry-milk significantly vary among brands; and the levels of copper residue significantly vary among brands of canned fish at 95 % level. The AM milk brand from Ethiopia was safe in cadmium level. The cadmium and lead level in the NF fish brands from Indonesia packed in vegetables oil, and the lead level in DF brand packed in brine are also safe.

**Key words:** AAS, cand dry-milk, canned fish, Cu, Pb, Cd, and Zn

## EVALUATION OF MICROBIAL QUALITY AND HANDLING PRACTICES OF RAW MILK AT DIFFERENT POINTS OF OROMIA SPECIAL ZONE TO MILK RETAIL CENTERS AT ADDIS ABABA

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**Background:** Milk is a compensatory part of daily diet especially for the mothers with child as well as growing children. It also constitutes a significant proportion of the value of all livestock food products in Ethiopia (about 56%), while livestock food products constitute an important proportion of the value of total food products in the country. Milk is a complex biological fluid and by its nature, a good growth medium for many microorganisms. Microbial contamination of milk can therefore originate from within the udder; the exterior of the teats and udder; and from the milk handling and storage equipment.

**Method:** The study was conducted at different critical points of Oromia special zone surrounding finfine, with the objective of assessing raw milk microbial quality and handling practices.

A total of 102 milk producing farmers at Holeta, Sebeta and Sululta districts were selected by using multi-stage purposive sampling method. A total of 60 raw milk samples were collected hygienically from each presumed critical points and examined for microbial quality.

**Result:** About 98, 97.1 and 94.15% of the participants in the study sites used plastic utensils for milking, storing before transportation and transporting milk. Only 77.2% of the study participants wash their hands before milking in all the study sites. The mean total bacterial counts were:  $6.48 \pm 1.06$ ,  $7.2 \pm 1.15$ ,  $7.02 \pm 0.17$  and  $6.7 \pm 0.64$ ,  $7.88 \pm 0.41$ ,  $7.20 \pm 0.05$  log cfu/ml at farmer and retail shop of Sebeta, Holeta and Sululta, respectively. The overall mean coli form counts ranged from  $5.42 \pm 1.73$  to  $5.78 \pm 0.95$ ;  $5.53 \pm 1.03$  to  $5.63 \pm 0.62$  and  $4.18 \pm 1.22$  to  $6.35 \pm 0.43$  log cfu/ml from farmer and retail shops of Sebeta, Holeta and Sululta respectively. E.coli was detected 26 (43.3%) of the samples at different critical points. Staphylococcus species was isolated from 17(28.3%) of samples collected from different critical points in the study sites. However, no Salmonella was found in all the samples. Mean value of yeast and mold counts were varied from  $3.77 \pm 0.47$   $2.46 \pm 1.15$ ,  $2.16 \pm 1.26$  and  $3.45 \pm 0.26$ , and  $2.30 \pm 0.19$ ,  $2.99 \pm 0.8$  log cfu/ml at farmer level of Sebeta, Holeta and Sululta respectively. Generally, the present was revealed that milk samples contained higher microbial load than

different standards and considered as substandard which will result in public health hazard to the consumer. Therefore, intensive study on microbial status of milk in the study points should be conducted to assure safety and quality policies to be set to assure the supply of quality milk and optimum handling procedures must be applied in the area.

**Key Words:** Microbial quality, food safety, raw milk, Handling practice and Critical points

## IN VITRO ANTIOXIDANT AND $\alpha$ -AMYLASE INHIBITION ACTIVITIES OF SPICED RED CHILI PASTE (DATTA) FROM SOUTH ETHIOPIA

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**Background:** Spiced chili paste (green or red), locally known as Datta, is a traditional popular spicy paste consumed in Ethiopia. This study investigated the total phenolic contents (TPC), total flavonoid contents (TFC), *in vitro* antioxidant and  $\alpha$ -amylase inhibition activities of various solvent extracts of red Datta paste.

**Method:** The TPC and TFC of the extracts were determined by the Folin–Ciocalteu and aluminum chloride method, respectively. DPPH scavenging, reducing power, and total antioxidant activities were taken as parameters for evaluation of antioxidant activity.

**Result:** It was found that acetone extract contained the highest TPC ( $14.98 \pm 0.44$  mg of gallic acid equivalent/g of dried extract) and TFC ( $22.05 \pm 0.87$  mg of quercetin equivalent/g of dried extract). The acetone extract showed the highest, 2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging activity ( $IC_{50} = 87.30 \pm 7.41$   $\mu$ g/mL), iron reducing power ( $11.06 \pm 3.2$  mg of ascorbic acid equivalent/g dried extract), and total antioxidant activity ( $0.62 \pm 0.13$  mg butylated hydroxytoluene equivalent/g of dried extract) than other four extracts used. The acetone extract also exhibited the highest percentage of  $\alpha$ -amylase inhibition activity ( $54.31 \pm 4.7\%$ ). TPC and TFC were strongly correlated with DPPH ( $r = 0.93, 0.94, p < 0.01$ ), ferric reducing power ( $r = 0.89, 0.83, p < 0.05$ ), and total antioxidant activity ( $r = 0.88, 0.85, p < 0.05$ ), respectively. The  $\alpha$ -amylase inhibition activity was well correlated with TPC ( $r = 0.81, p < 0.05$ ) and TFC ( $r = 0.78, p < 0.05$ ).

**Conclusion:** The study revealed that antioxidant and  $\alpha$ -amylase inhibition activities of the crude extract of red Datta paste were variable when extracted by different solvents indicating a high potential to be used as natural antioxidants as well as for preventing oxidative stress mediated human disorders such as suppressing hyperglycemia.

**Keywords:** Antioxidant; chili pepper; Datta paste; phenolic content;  $\alpha$ -amylase, spice

## STUDY ON ASPERGILUS SPECIES AND AFLATOXIN LEVELS IN SORGHUM (SORGHUM BICOLOR L.) STORED FOR DIFFERENT PERIOD AND STORAGE SYSTEM IN KEWET DISTRICTS, NORTHERN SHEWA, ETHIOPIA

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**Background:** Sorghum serves as staple food for over 100 million people in Sub-Saharan African countries. It is the most important nutritional security crop and ranks third among major cereal crops in terms of area and production next to teff and maize in Ethiopia. However, sorghum is susceptible to contamination by molds that produces Aflatoxins that causes hepatotoxic and carcinogenic effects on humans and animal.

**Method:** This study was conducted to assess *Aspergillus* species and Aflatoxins level in sorghum (*sorghum bicolor* L.) stored under different storage system for different storage period. Thirty samples were analyzed for Aflatoxins contamination using HPLC equipped with fluorescent detector and *Aspergillus* species were isolated and identified using phenotypic features in a culture media.

**Result:** The study result showed that about 56.7%, 16.7%, and 23.3% of the sorghum samples were found to be contaminated with *Aspergillus flavus*, *Aspergillus niger* and *Aspergillus parasiticus*, respectively. The level of total Aflatoxin, AFB1, AFB2, AFG1, and AFG2 were in the range of 11.44 to 344.26µg/kg, 3.95 to 153.72µg/kg, 1.17 to 91.82µg/kg, 9.87 to 139.64µg/kg, and 3.22 to 52.02µg/kg, respectively. The concentration of Aflatoxins in all sorghum samples surpassed the maximum level set by the European commission and therefore, deserves attention to control them across the sorghum value-chain.

**Keywords:** Sorghum, Aflatoxins, *Aspergillus* spp., Storage Period, Storage System

## MICROBIOLOGICAL QUALITY OF STREET VENDED FOODS IN HAWASSA CITY, SOUTH ETHIOPIA.

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**Background:** Each year, millions of people worldwide suffer from food-borne diseases and illness resulting from the consumption of contaminated. Globally, 1.8 million people died from diarrheal diseases in 2005 alone due to food-borne disease. Outbreaks of food-borne illness can damage trade and tourism, and lead to loss of earnings, unemployment and litigation. Food borne illness associated with the consumption of street foods has been reported in several places in Africa, India and elsewhere. In Ethiopia, health risks associated with street foods are common. *Salmonella*, *Shigella* and other food-borne pathogens were isolated from different street foods.

**Objective:** The main objective of this study was to determine the microbiological quality of street foods at Hawassa city, South Ethiopia.

**Methods:** A cross-sectional study was conducted on 72 food samples of ready to eat foods vended on streets in Hawassa city from May to September 2014. The food items were selected by simple random sampling technique from five purposively selected areas of the city. A Food samples were analyzed for microbial load and potential pathogenic organisms.

**Results:** The age of more than 70% of participant vendors were below 30 years and 82% of them was females. The personal hygiene assessment of the vendors showed that 82% of them did not use proper hair covering and worn gown. Eighty nine percent of the vendors did handle food with their bare hands. The overall mean total aerobic colony count of 72 locally prepared food items was  $5 \times 10^5$  CFU/g. Moreover, the mean Enterobacteriaceae counts was  $2 \times 10^4$  CFU/g. various species of bacteria were detected of which *E. coli* was 29.6% followed by *Salmonella* and *Citrobacter species* (12.7% each). *S. aureus* and *Klebsiella spp.* did also account for 9.9% each. The highest degree of contamination was observed in raw fish (24%) followed by Potato (18%). Samples from ‘Amora Gedel’ vending areas were more contaminated with *Salmonella Spp.* with 7/9 (78%) and *E. coli* 8/21 (38%).

**Conclusion and recommendations:** This study identified that the street vended foods were moderately contaminated. Isolation of pathogens such as *S. aureus*, *Salmonella spp* and *E. coli* were indicating that street vended foods are likely risk for causing food borne illness.

**Key Words:** Street vended foods, Microbiological quality, Total aerobic count, Hawassa, Ethiopia.



POSTER PRESENTATION

**EFFECT OF OUTPATIENT TREATMENT PROGRAM INTEGRATED NUTRITION EDUCATION ON NUTRITIONAL STATUS OF OTP ENROLLED YOUNG (6-24 MONTHS) CHILDREN**

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**Background:** Adequate nutrition during infancy and early childhood is fundamental to the development of each child's full human potential. Severe acute malnutrition affects approximately 20 million children under five years of age and contributes to more than 1 million child deaths in the world each year. The aim of this infant and young child feeding educational intervention was to determine the effect of its integration into the community management of acute malnutrition(CMAM) on the nutritional status of young children who are enrolled in outpatient treatment program(OTP) of CMAM.

**Method:** A quasi experimental study design was employed. A quantitative baseline survey was conducted in 100 mother-child pairs on socio-demographics, food security status, food group intakes of children, diet diversity score and anthropometric data of children. An in depth interview with the help of health extension workers concerning complementary feeding practices and a barrier to prepare complementary foods was conducted. This helped in the development of intervention strategies and understanding the local context of young child feeding. An education intervention comprising 8 specific messages for the intervention group, held twice a month for 6 months, was conducted. Within and between groups nutritional status (WHZ, WAZ and HAZ) difference was tested using t-test.

**Result:** Dietary diversity was improved in the intervention group as compared to the control group even though it was not statistically significant. Proportion of wasting and underweight decreased from 12.5 % to 4.76 % and from 31.25 % to 14.28%, respectively in the intervention group, while in control group wasting and underweight decreased from 13.46% to 8.69% and from 34.6% to 10.86%, respectively. Within group nutritional status (WHZ, WAZ and HAZ) was significantly (p-value<0.001) different both for intervention and control group. The between group comparison showed significant difference for WHZ (p-value=0.002) and WAZ (p-value<0.001) but not for HAZ (p-value=0.57).

**Conclusion:** IYCF focused nutrition education positively affected nutritional status of acutely malnourished children. Checking for sustained change waiting for similar effect on HAZ is in need of further study with better sample size and longer duration. Community based nutrition program is one of the packages of health extension program, if the intervention is implemented using it, it could make sure greater sustainability of the intervention over the long term.

**Key words:** Nutrition education, community management of acute malnutrition and nutritional status of children

## LACK OF MATERNAL FORMAL EDUCATION AND ANCYLOSTOMIASIS ARE ASSOCIATED WITH ANEMIA DURING PREGNANCY IN WEST ETHIOPIA: A CROSS- SECTIONAL STUDY.

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**Background:** Anemia is a global public health problem associated with increased morbidity and mortality during pregnancy. However, despite the wider scope of the problem, there is paucity of information in Ethiopia on its magnitude and correlates across the regions. The main objective of this study was to assess the prevalence of anemia and associated factors among pregnant women attending antenatal care clinic at Aira Hospital in West Ethiopia.

**Materials and Methods:** A facility based cross-sectional study was conducted on 712 pregnant women from January 01 to February 28, 2014. All eligible pregnant women who came for Antenatal care services during the study period were interviewed using structured pretested questionnaire. The stool samples were checked for intestinal parasitic infection and hemoglobin concentration was determined using cyanmethemoglobin method. Odds ratio along with 95 % Confidence interval was estimated to identify factors associated with anemia using multivariable logistic regression with backward stepwise elimination method. The level of statistical significance was declared at p – value of  $\leq 0.05$ .

**Results:** The prevalence of anemia was 15.6%, 95 % CI (13.1%, 18.5%). Anemia was more common among mothers who have no formal education [(AOR =2.77; 95 % CI (1.49, 5.16)] compared with their counterparts and among those who were infected with hook worm (ancylostomiasis) during the study period [(AOR = 2.44; 95 % CI (1.41, 4.22)].

**Conclusions:** Anemia was found to be a mild public health problem among the study participants in the study area. Absence of maternal education and intestinal parasitic infection were significantly associated with anemia during pregnancy. Hence, appropriate nutritional oriented and non-nutritional interventions should be designed to curb the burden of anemia during pregnancy in Ethiopia.

**Key words:** Anemia, Aira, Ethiopia, pregnant women

## EFFECT OF KHAT AND ASSOCIATED FACTORS ON NUTRITIONAL STATUS AMONG KHAT CHEWERS IN KHAT CHEWING SHOPS AT GULALLE SUB CITY, ADDIS ABABA, ETHIOPIA

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**Introduction:**-Though community is chewing khat for multiple reasons, it has huge public health impact on mental, physical and social well-being. Also there are khat use effect study reports that show indirectly as khat affect the nutritional status of the khat chewers from different khat related studies; but there is studies limitation regarding effect of khat chewing on nutritional status.

**Method:**-Community based comparative cross-sectional study had been conducted from March to June, 2015. Cluster sampling had been used for khat chewers and systematic random sampling techniques for none khat chewers. The study was conducted among 504 study participants. Whereas the data was collected by using interview administered questionnaire and in-depth interview based questionnaire, observation and weight scale measurement.

**Result:**-A total of 504(99.60%) individuals were participated with 253(50.79%) khat chewer and 251(48.81%) non khat chewers. Among the participants, 239(48.02%) of them are male khat chewers and 14(2.78%) of them are female khat chewers. Whereas 25(4.96%) of the total were female non khat chewers. The current study revealed that 86(17.06%) of total participants were underweight; whereas 55(21.48%) of underweight participants were khat chewers and 31(12.5%) of them were non-khat chewers. Those khat chewers were 1.994 times more likely to be underweight compared to those non-khat chewers (AOR=1.994[1.145-3.475]).

khat chewers who had meal twice per day were 4.456 time more likely to be under weight (AOR=4.456,95% CI [1.035-19.190]; and those khat chewers how use animal and animal products as their main meal component daily were 0.218 times less likely to be under weight (AOR=0.218, 95% CI [.022 -.127], whereas the odds of underweight were 18% among those khat users who in take two litters of fluid per khat chewing session to chew the khat (AOR=0.180,95% CI [.051-.640]. Khat chewers those who not use chabsy (alcohol) were 2.530 time more likely to be underweight compared to those alcohol users as chabsy AOR=2.530, 95% CI [1.021-6.267]. In other case those who chewed khat for 2-3 hours per session were 0.154 time less likely to be underweight (AOR=.154, 95% CI [.028-.849]).

**Conclusion and Recommendation:** - the study identified that as being underweight was public nutritional status problem in which those khat chewers were more affected. Amount of khat used per session, length of khat chewing session, length of khat chewing duration, meal frequency & type of meal, amount of fluid intake and chabsy had effect on nutritional status of khat chewers. Decreasing amount of khat per session, decreasing khat chewing session length and frequency of khat chewing and increasing amount of fluid intake used to chew khat to more than three liters per khat chewing session were recommended to decrease the risk of being underweight of those khat users.

**Key words:** - Khat, nutritional status, khat chewers, non- khat chewers, Gulelle sub-city

## PHYSICOCHEMICAL, FUNCTIONAL AND SENSORY EVALUATION OF FUNCTIONAL COOKIES DEVELOPED FROM BLEND OF *MORINGA STENOPETALLA* LEAF POWDER AND WHEAT FLOUR FOR PREGNANT WOMEN AND LACTATING MOTHERS

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**Background:** Iron deficiency is a major health risk to pregnant women and lactating mothers in developing countries like Ethiopia. Consumption of locally available Iron rich foods like Moringa stenopetalla can be one of the strategies to combat iron deficiency anaemia.

**Method:** Moringa leaves powder (MLP) and wheat flour was blended in the ratio of 0:100, 5:95, 10:90, 15:85 and 20:80 by using mixture simplex lattice design. Cookies was prepared from each of the blend by adding sugar, water, salt, sunflower oil, ginger powder, baking powder and vanilla. The proximate composition, gross energy, Fe, Zn, Ca, P, phytate, tannin, water activity ( $a_w$ ), molar ratio, physical properties and sensory qualities of cookies and functional properties of composite flours were evaluated.

**Result:** The crude fibre, ash, crude protein, Fe, Zn, Ca, P, Phytate (PA) and tannin contents were significantly increased ( $P<0.05$ ) while crude fat, moisture, carbohydrate and gross energy of the cookies were decreased ( $P<0.05$ ) as the ratio of MLP increased in the blend ratio. The  $a_w$  was not significantly different ( $P>0.05$ ) among MLP blended cookies (0.42) but difference ( $P<0.05$ ) was observed on control cookies (0.51). The functional properties of the composite flours like water absorption and swelling power were significantly ( $P<0.05$ ) increased while oil absorption capacity is significantly decreased as blending ratio of MLP was increased. Related to physical properties of cookies, breaking strength was slightly increased while diameter and thickness of the cookies were slightly decreased as blending ratio of MLP was increased. The molar ratios of PA: Ca and PA: Zn was below the critical values 0.24 and 15.0 respectively while molar ratio of PA: Fe was above the critical value 1.0 in all cookies except for T<sub>2</sub> (5% MLP) (0.99). Hence, Zn and Ca were bioavailable in all cookies while so Fe was more bioavailable in T<sub>2</sub> cookies. The sensory acceptability of cookies decreased significantly with increasing in MLP ratio. Hence, the overall acceptability results confirmed that the 5% MLP blended (T<sub>2</sub>) cookies was more accepted than the others. In general, the study indicated that T<sub>2</sub> (5% MLP) was found to be the best in iron bioavailability and sensory acceptability.

**Keywords:** Moringa Leaf Powder, Cookies, pregnant women, bioavailability, nutritional value, Iron deficiency, sensory acceptability.

## EFFECT OF PROCESSING ON NUTRITIONAL AND ANTI NUTRITIONAL COMPOSITION, AND FUNCTIONAL PROPERTIES OF SELECTED SORGHUM VARIETIES

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**Background:** The study was conducted to remove the seed coat by hardening the fragile endosperm using hydrothermal processing method and to evaluate changes during dehulling on proximate composition, anti-nutritional content, functional properties and mineral elements composition of four sorghum varieties namely; Seredo and Abba melko (bird resistant sorghum) and teshale and wegere (sorghum eaten by birds). The obtained yield of decortications for sampled sorghum in terms of head grain was 75.7-77.9%, broken 0.9-4.32% and seed coat 19.8-21.2%.

**Method:** Standard methods were used for the analysis. The decorticated samples using hydrothermal processes had low level of protein, fat, fiber and ash content respectively as compared to the undecorticated samples.

**Result:** A significant increase ( $P < 0.05$ ) in carbohydrate content was recorded in processing samples with respect to the unprocessed samples. Although, the proximate composition, and mineral elements level were slightly reduced in relation to unprocessed samples in decortications processing techniques, the result obtained showed the increment of carbohydrate and functional properties and the variety which have high content of anti-nutrition factors indicated 82% , 84.8% , 85.7% and 62.9% reduce in the level of phtate, tannin, total alkaloids and total polyphenols respectively.

Even if decortications reduces titrable acidity fermentation increase the titrable acidity by 33.3% and also fermentation was found to cause a gradual reduction in a pH with time which had significant role in flavor/taste and critical importance with regard to the shelf-life and safety of food. Through fermentation at 0hrs to 48hrs on average the pH was drop from 6.61 to 5.53. However, Tannin content of the sorghum would have no significant effect on fermentation processes. High popping capacity of the selected sorghum varieties was obtained for unprocessed and in dry mater compared to process and tempering in the water. Sensory acceptability was respond like moderately and like slightly by 18 untrained panelists for both processes and unprocessed end product (unleavened bread).

**Conclusion:** decortications using hydrothermal processing would loss less important chemical composition of the whole grain even if the removal of seed coat effective to avoid anti-nutritional factors which chelate minerals.

**Key words:** Sorghum, hydrothermal process, Decortications, Chemical composition, Functional properties

## OLS ESTIMATORS OF MUSHROOM MARKET SUPPLY IN THE CITY OF ADDIS ABABA

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**Background:** Chang (2008) as cited by Birhanu Gizaw (2010) mushrooms are eukaryotic heterotrophy organisms; nutritionally classified as saprophytes. Having this in mind, increasing mushroom market supply is every mushroom cultivator's goal. World production of cultivated edible mushrooms is estimated to be almost 5 million tones, valued at about \$9.8 billion per year, to which Africa contributes a very small proportion (United Nations). Therefore understanding of those factors which can reliably and significantly predict mushroom market supply is a growing interest of every economist.

**Objectives:** To regress mushroom market supply on various estimators; to identify estimators of mushroom market supply and to estimate the direction and magnitude of impact of various estimators on mushroom market supply.

**Methodology:** In Ethiopia, particularly in the city of Addis Ababa both explorative and descriptive researches have done ever before. If this is so since this study is a positive economics it is compulsory to design causal type of research. Sixty sample sizes have been drawn purposively from mushroom market centers for the necessary data collection. Primary data and secondary data (cross-sectional data from 60 observations at mushroom market) were collected from. By testing the normality, multi-collinearity and auto correlation; the collected data was analyzed with linear regression and estimated by ordinary least square (OLS).

**Result:** The p value associated with is less than alpha value (0.05) and very small, both price and numbers of labors employed are jointly reliably can predict mushroom market supply. The product is not price sensitive rather time, because it is an emerging and perishable product and has no shelf life.

**Conclusion:** Based on the results acquired from the study, jointly price and number of labor employed in the business have predictive power to estimate mushroom market supply. Labor was the only relevant estimator of mushroom market supply and jointly with price it has direct relationship with mushroom market supply.



## EVALUATING THE ROLE OF BLACK TEA AND 'BERBERE' SPICED FOOD CONSUMPTION ON APPETITE AND ENERGY INTAKE OF PRE-SCHOOL CHILDREN IN ORPHANAGE; ADDIS ABABA

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**Background:** The effect of drinking habitual concentration of black tea or habitual consumption of red pepper on appetite and food intake of children remains unknown. The objective of this study was to determine the role of habitually consumed black tea or 'berbere'-spiced food on the appetite and energy intake of children less than five years of age in an orphanage in Ethiopia.

**Method:** With-in subject crossover design was used to which 21 preschool children (24- 54 months) participated. The effect of black tea or 'berbere'-spiced food on energy intake and appetite was investigated by evaluating intake of the test meals. Anthropometric measurements, caffeine and catechin analysis in tea, and proximate composition of the test meals were also determined.

**Result:** Although fewer children (n= 5) had anthropometric values of <-2 SD, more than half of the children were at the border of Z score for stunting, underweight, and wasting. The consumption of habitual concentrations of black tea had no significant effect on satiation ( $P=0.07$ ) and satiety ( $P=0.22$ ). Similarly, the consumption of 'berbere'-spiced foods had no significant effect on satiation ( $P=0.55$ ). This suggests that both the consumption of 'berbere'-spiced foods and black tea had no effect on food/energy intake ( $P> 0.05$ ). In contrast, increasing portion size had a significant effect on appetite and energy intake ( $P< 0.001$ ).

**Conclusion:** The consumption of habitual concentrations of black tea or 'berbere'-spiced food does not have a significant role on appetite and energy intake of preschool children. Given that portion size had a significant effect on food/energy intake, age-dependent increase in portion size may be required to improve the nutritional status of the children.

**ETHNOBOTANY OF SPICE AND CONDIMENT PLANTS AND THE ASSOCIATED INDIGENOUS KNOWLEDGE ON MANAGEMENT, UTILIZATION AND CONSERVATION OF THEM IN AND AROUND HOME GARDENS IN LOMA AND GENA BOSA DISTRICTS OF DAWURO ZONE, SOUTHERN ETHIOPIA.**

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**Background:** This paper documents the traditional management, conservation and use of plant diversity focusing on spices and condiment plants found in and around home gardens along with the indigenous biological knowledge in the study area.

**Method:** Data was collected from September 2006-March 2007 to get relevant information and plant specimen of different seasons. The ethnobotanical information was gathered from 32 spices and medicinal plants vendors. Home garden owners and traditional healers were also asked for assurance of information. Samples of 100 home gardens (HGs) were considered and data on 214 plant species were collected from 300 plots each 5mx10m. The data were analyzed using SPSS computer software. The procedure for preference ranking and Shannon diversity index were also applied.

**Result:** About 43 species of spice and condiment plants were recorded both in the market and home gardens of the study area that were distributed in 16 families. Family *Lamiaceae* contains 13 species (30.23%), and *Asteraceae* with six species (13.95%), took the top places. *Capsicum annuum* recorded in 62 HGs, *Ocimum americanum* in 53, *Ruta chalepensis* in 51 and *Capsicum frutescens* in 47 HGs. There are about 13 uses of spice and condiment plants recorded in the study area. *Ocimum basilicum var. thyrsoiflorum* with the maximum uses (10) takes the first rank followed by *Thymus schimperi*, *Lippia adoensis* and *Ocimum basilicum var. basilicum* take the second rank having each eight uses. The preparation of spices, condiments, injera and bread by milling, pounding and cooking and provision of food for the whole family is the women's work. The fresh or dried, powdered or the needed parts of spices (*Sawuuwaa*) are added in to the main dishes before or/and during cooking while condiments (*Dok'k'uwaa/Tushuwaa*) are prepared from fresh leaves and fruits and add or used to other food's after cooking in order to make them more tasty and enjoyable. The main condiments are *Dataa*, *Awaaziyaa* and *Kuubuuwa*. About 40 spices were with medicinal value and prepared in the form of sause (*Kuubuwa*), soups (*Eretsa*) and drinks (*haytsa bunaa*). Spice and condiment plants are to flavour and act as nutraceutical foods that provide health benefits.

**Conclusion:** There is culture of diversifying the home garden with different plants for food security and for ease of eating the staple foods, and sometimes income generation. Establishing botanical gardens for conservation, encouraging culture of diversifying diets/meals, the use of home gardens for cultivation of multipurpose plants and finding markets for potential home garden products needs to be followed up.

**Key Words:** Biodiversity, Condiments, Dawuro, Home Garden, Indigenous knowledge

## PREVALENCE OF ANEMIA AND NUTRITIONAL STATUS AMONG HIV-POSITIVE CHILDREN RECEIVING ANTIRETROVIRAL THERAPY IN HARAR, EASTERN ETHIOPIA.

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**Back ground:** Anemia and growth retardation are common manifestations of HIV-positive children, which threaten their lives. Therefore, this study tried to assess the burden of anemia and the nutritional status of HIV-positive children receiving antiretroviral therapy (ART) in eastern Ethiopia.

**Methods:** A total of 108 records of children on ART followed up in Hiwot Fana Specialized University Hospital from 2007 to 2010 were retrospectively reviewed from November 1 to November 30, 2011.

**Results:** Approximately 54.4% of the children had been anemic before the initiation of their ART (at baseline): 7.8% were severely anemic and 44.7% were moderately anemic. These percentages were higher in preschool children than in school children (adjusted odds ratio [AOR]: 4.80 [95% confidence interval {CI}: 1.96, 11.75]), and were higher in males than in females (AOR: 2.61 [95% CI: 1.06, 6.45]). The prevalence of anemia was reduced to 39.2% 1 year after initiation of ART. The increasing of hemoglobin values was highly significant for both zidovudine (AZT) - and stavudine (d4T)-based ART ( $P, 0.05$ ). At baseline, 51.6% of the study subjects were underweight (weight-for-age Z score less than -2 standard deviation [SD]); 49.1% were stunted (height-for-age Z score less than -2 SD); and 31.5% were wasted (body mass index less than -2 SD), which, after a year on ART, declined to 8.9%, 15.9%, and 9.8%, respectively.

**Conclusion and recommendation:** There was high prevalence of anemia and growth failure among HIV-infected children in the study area. However, there was a decline after initiation of ART. Therefore, adherence counseling to strengthen the uptake of ART is recommended. Moreover, large-scale, prospective studies should be done to understand the magnitude and etiology of the problems with HIV-negative control groups.

**Keywords:** hemoglobin, underweight, stunting, wasting

**ASSESSMENT OF THE MAGNITUDE OF DOUBLE BURDEN OF MALNUTRITION AND ITS ASSOCIATED FACTORS AMONG SELECTED IN-SCHOOL ADOLESCENTS IN ARBA MINCH TOWN, SOUTHERN ETHIOPIA: SCHOOL BASED CROSS SECTIONAL STUDY.**

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**Background:** The Double Burden of Malnutrition is a recent emerging nutritional problem of the coexistence of both under nutrition and over nutrition. Although several studies have been conducted on under 5 children malnutrition in Ethiopia, there is a research gap on double burden of malnutrition among adolescents.

**Objective:** To assess the magnitude of double burden of malnutrition and its associated factors among in-school adolescents in Arba Minch town, Southern Ethiopia.

**Methods:** School based, Cross-sectional study design was conducted among 634 high school students aged 10 to 19 years old in Arba Minch town from March, 2015 to April, 2015. Stratified multi-stage sampling method was used. To select the study participant, the schools were first stratified by ownership as governmental and private. Two schools from each category was randomly selected and the number of sample size required for each school was allocated proportional to the number of students in each school and grade level, Finally 406 students from government and 228 from private were included. A self-administered questionnaire was used to collect socio-demographic, food insecurity and physical activity data. Anthropometric measurements [weight, height, waist circumference and hip circumference] were performed by using calibrated equipment's and standardized techniques. Finally bivariate and multivariate analysis was done using multinomial regression model using SPSS, version 21 and WHO Anthro-Plus software, version 1.0.4 for classifying nutritional status of adolescents.

**Results:** The magnitude of underweight, normal and overweight and/or obesity were 19.7% (95%CI: 16.5%, 23.2%), 69.2% (95%CI: 66.2%, 72.2%) and 11.2% (95%CI: 8.7%, 13.7%), respectively. Respondents whose family size of five or less were 80% times less likely to be underweight [AOR=0.2; 95% CI= 0.12 to 0.4] compared to those whose family size of more than 5, whereas, the odds of being overweight and/or obesity was 79% times lower in participants who spent 9 hours and less in sitting than those who spent in sitting above 9 hours per day [AOR=0.21; 95% CI=0.1 to 0.4].

**Conclusion and recommendation:** This study revealed the coexistence of double burden of malnutrition among in-school adolescents. Parents' education, family size and wealth index were some significantly

associated factors. Intersectoral collaboration among health sectors and education sectors to intervene nutrition problem and nutrition related education is recommended.

**Key words:** Double burden, Malnutrition, Factors, Adolescents

## PREVALENCE OF ZINC DEFICIENCY AND ITS ASSOCIATION WITH DIETARY, SERUM ALBUMIN AND INTESTINAL PARASITIC INFECTION AMONG PREGNANT WOMEN ATTENDING ANTENATAL CARE AT THE UNIVERSITY OF GONDAR HOSPITAL, GONDAR, NORTHWEST ETHIOPIA

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**Background:** zinc deficiency during pregnancy has far-reaching consequences on both mother and fetus and subsequent child survival. However, data on the prevalence and determinants of zinc deficiency among pregnant women are scanty and inconclusive.

**Objective:** The aim of this study was to assess the prevalence of zinc deficiency and associated factors among pregnant women attending antenatal care at the University of Gondar Hospital, Northwest Ethiopia.

**Methods:** Institution based cross-sectional study was conducted at the University of Gondar Hospital from March to May, 2014. A total of 377 pregnant women were selected by systematic sampling technique. Data on socio-demographic factors, reproductive history and nutrition related factors were collected using a structured questionnaire. Blood sample were collected to analyze biochemical indicators. Statistical analysis was done using logistic regression analysis method. P-value < 0.05 at 95% confidence interval was considered as statistically significance.

**Results:** The prevalence of zinc deficiency among pregnant women was 57.4% (95% CI: 52.2%– 62.9%). Living in rural area [AOR = 1.92; 95% CI (1.04, 3.56)], too close birth [AOR=3.97; 95% (1.30, 12.13)], low intakes of diet of animal origin [AOR = 2.29; 95% CI (1.35, 3.89)], inadequate dietary diversity [AOR = 2.09; 95% CI (1.24,3.51)], lack of nutrition education [AOR =1.78; 95% CI (1.10,2.86)], low serum albumin [AOR = 2.55; 95% CI (1.40,4.63)] and intestinal parasitic infection [AOR = 2.60; 95% CI (1.49,4.54)] were significantly associated with zinc deficiency.

**Conclusion and Recommendation:** Zinc deficiency is of public health concern in the study area. To combat the problems, nutrition education to increase knowledge as well as practices concerning the consumption of zinc rich foods and optimal dietary diversity, use of home based phytate reduction techniques and agricultural based approaches should be considered.

**Key words:** Zinc deficiency, pregnant women, Gondar



## IRON FRACTIONATION OF CEREALS CONTAMINATED WITH DIFFERENT TYPES OF ETHIOPIAN SOILS AND ITS CONSEQUENCE ON BIO-ACCESSIBILITY

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**Background:** Iron is an essential micronutrient and widely found in soils. However, iron deficiency is one of the major health problems widespread worldwide. Diet in developing countries mainly comes from non-haem food sources often from soil contamination at the time of threshing. The potential bio-accessibility of different types of contaminant soil is unknown. This study was conducted to investigate the impact of different soil types on the total iron content of cereals as a result of contamination and its bio-accessibility potential.

**Method:** Two separate analysis were conducted, one for cereals (red teff, white teff, white wheat and white sorghum) and the other for the soil types (andisol, cambisol, nitisol and vertisol) to determine the total iron content and iron fractions (exchangeable, carbonate bound, oxide bound, organic bound and residual) fractions by using sequential extraction procedures.

**Result and Conclusion:** The study result showed that the total iron content of the four soil types were significantly different ( $p < 0.05$ ) and clay rich nitisol had high amount of iron content ( $6972.63 \pm 25.56$  mg/100g DM). Alkaline soil andisol had low amount of iron content ( $3163.36 \pm 22.33$  mg/100g DM). Vertisol had total iron content of  $4483.4 \pm 52.93$  mg/100g DM and cambisol had total iron content of  $6390.49 \pm 47.84$  mg/100g DM. The iron content of non-contaminated cereals were significantly different ( $p < 0.05$ ) except red teff ( $6.48 \pm 0.19$  mg/100g DM) with white teff ( $6.52 \pm 0.2$  mg/100g DM). The iron content of white sorghum was lower ( $4.04 \pm 0.13$  mg/100g DM) followed by white wheat ( $4.49 \pm 0.13$  mg/100g DM). Very small amount of iron from cambisol (0.001%) and vertisol (0.004%) had potential bio-accessibility but not in nitisol and andisol when analyzed alone. Intentional contamination of white teff (50%) with equal amounts of the four soil types had highest exchangeable fraction than the non-contaminated one (increased by 2.6%) from the total iron in case of cambisol contamination and (increased by 0.3%) in case of nitisol contamination which. A significant difference was observed on the fractionation profile of soils and cereals ( $p < 0.05$ ).: Soil type variation had an impact on the potential bio-accessibility of cereals and soil with cereal combination had better bio-accessibility potential than cereal alone.

**Recommendation:** Further investigation should be conducted on contamination of teff with different soil types and contamination of cereals by soil at different dose of contaminant soil.

**Key words:** White teff, red teff, iron, sequential extraction scheme.

**DIETARY DIVERSITY, VITAMIN-A INTAKE AND NUTRITIONAL STATUS OF CHILDREN AGED 6-23 MONTHS AMONG HOUSEHOLDS WITH AND WITHOUT HOME GARDENING, IN MELGA WEREDA, SIDAMA ZONE, SOUTHERN ETHIOPIA: A COMPARATIVE CROSS SECTIONAL STUDY**

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**Background:** Malnutrition continues to be a major public health problem affecting children and women throughout the developing world. Dietary diversification is considered as the most sustainable and affordable strategy to combat malnutrition through implementation of home gardens. The role of home garden has not been well addressed in Ethiopia. Hence, this study compare dietary diversity, vitamin-A intake and nutritional status of children aged 6–23 months among households with and without home gardening in Melga Wereda, Sidama Zone, Southern Ethiopia.

**Method:** Community-based comparative cross-sectional study was conducted in a total sample of 190 children aged 6–23 months during September 20 to October 10, 2014. A purposive sample of 95 households with home gardening and a random sample of 95 households without gardening were selected from four rural kebekeles of Melga Wereda. Structured questionnaire was used to gather the data. The collected data were entered in to Epi Info version 3.5.1 and exported to SPSS version 20.0 software packages for further statistical analysis. Children from gardening and non-gardening households were compared using independent sample t–test and chi-square test. Linear regression was done to control potential confounders. P-value  $\leq 0.05$  were considered significant.

**Result:** The finding showed that children of gardening households had a significantly higher dietary diversity score (3.25) and vitamin-A intake (2.91) than the non-gardening counterparts which was 2.45 and 2.09, respectively. The difference was significant at  $p < 0.001$  when controlling for potential confounders. No significant difference was observed in nutrition status of children among household with and without home gardening.

**Conclusion and Recommendation:** Home gardening has a significant impact on dietary diversity and frequency of plant source of vitamin-A rich foods consumption of children, although no significant difference was observed on nutritional status. Providing sustained nutrition education for the community to put up a home garden and integrating home garden with household animal production interventions may have a potential to contribute to improved child nutritional status.

**Keyword:** Home garden, dietary diversity, vitamin-A intake, nutritional status

## **IODIZED SALT CONSUMPTION AND GOITER STATUS OF SCHOOL AGE CHILDREN IN SCHOOLS OF AKAKI-KALITY SUBCITY OF ADDIS ABABA, ETHIOPIA.**

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### **Abstract**

Iodine is an essential micronutrient required for synthesis of thyroid hormones. The deficiency of Iodine leads to a number of Iodine Deficiency Disorders. The aim of this study was to assess prevalence of goiter, urinary iodine status and to determine iodine content of salt consumed by school age children 7-12 years. A school based cross-sectional study of 270 children from five randomly selected schools in Akaki-kality subcity of Addis Ababa on June 2015. Questionnaire was used to collect information of socio-demographic, knowledge on iodine deficiency and practices of iodized salt consumption. Clinical examination of thyroid was assessed by standard palpation method, causal urine samples were analyzed by Sandell-Kolthoff reaction and iodine content of salt samples were determined by iodometric titration. Descriptive statistics and multivariate logistic regression analysis were carried out. The overall prevalence of goiter was 23.3% with (Grade 1=22.2% and Grade 2=1.1%). Prevalence of goiter in females was 27.4% and in males was 19.3%, but there is no statistically significant association. As the age increased the goiter prevalence also increased, in age group 10-12 years (AOR=2.6; 95%CI=1.4, 4.8) and school where children learned (AOR=3.8; 95%CI=1.4, 10.1) were factors highly associated with goiter. The median urinary iodine level of school aged children was 85.7 µg/L. Iodine status of children <100 µg/L was high associated with age group 7-9 years (AOR=2.2; 95%CI=1.1, 4.3), educational status of family (AOR=4.1; 95%CI=1.4, 11.8) and children consuming coarse salt (AOR=308.4; 95%CI=39.2, 2429.2). Only 20% of the total salt samples had adequate iodized salt, which was by far lower than the recommendation. The result of this study revealed that iodine deficiency cause moderate public health problem in the study area. Therefore, further strengthen the existing monitoring system for the quality of iodized salt and awareness creation activities on the community have to be intensified.

**Keywords:** Iodine deficiency, School age children, Urinary iodine excretion, Goiter, Iodized salt

## ESSENTIAL AND TOXIC METALS CONTENT FROM TUBER AND LEAF OF ANCHOTE (COCCINIA ABYSSINICA) ACCESSIONS COLLECTED FROM ETHIOPIA.

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**Background:** Anchote [*Coccinia abyssinica* (Lam.) Cogn.] is among the root and tuber crops which are grown in Western and South Western parts of Ethiopia. Its newly growing leaves along with the tendrils are also served as vegetable after being cooked.

**Methods:** Forty-four Anchote accessions were analysed for 10 essential and 3 toxic elements from the tuber and leaf parts using inductively coupled plasma-mass spectrometry (ICP-MS) and inductively coupled plasma-optical emission spectrometry (ICP-OES) following standard procedures.

**Results:** The concentration (range) for major minerals in mg per 100 g of dry weight were: Na (42.78–98.78), P (14.09–48.64), K (13.63–95.28), Ca (80.64–372.16), Mg (9.33–59.36), Fe (0.39–2.92), Cu (0.10–0.21), Zn (0.22–0.53), Mn (0.14–0.35) and B (2.14 – 7.04) for tuber samples; whereas Na (30.45 – 92.24), P (42.46 – 79.15), K (107.72-178.91), Ca (64.10 –226.95), Mg (29.72 –70.65), Fe (1.58 – 18.65), Cu (0.47–1.60), Zn (0.32 – 3.41), Mn (0.97 – 1.85), and B (2.14 – 7.04) for leaf samples. Three toxic metals Cd, As and Pb were present in mean concentrations 0.86, 0.83 and 7.05 ng/g, respectively in the tuber samples, while the same was 1.29, 2.62 and 13.53 ng/g in the leaves, respectively. This level of essential elements for Anchote is by far above the concentration of several plants in Ethiopia. On the other hand, the level of toxic elements is almost negligible. The result also shows that the mean concentrations of P, K and Mg in the leaf samples were higher than that of the tuber samples. However, the mean concentrations of Na and Ca were higher in the tuber samples than leaf samples and the mean concentrations of Fe, Cu, Zn, and B were greater in leaf samples than tuber samples.

**Conclusion and Recommendation:** The study clearly shows that Anchote is a rich source of essential minerals with negligible amount of toxic metals. Hence, it is recommend to advocate the plant for wider consumption in Ethiopia and beyond as it can play a significant role in alleviating unacceptably high level of malnutrition.

**Keywords:** Anchote, essential minerals, toxic metals, tuber,

## IN-VITRO ANTIBACTERIAL ACTIVITY OF ACACIA ETBAICA AGAINST BACTERIA ISOLATED FROM FOOD OF ANIMAL ORIGIN

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**Background:** *Acacia etbaica*, native plant to east African region, is used traditionally to treat diseases of humans and domestic animals by local communities in Tigray Region, Ethiopia. In addition, the local communities use *Acacia etbaica* to fumigate their milk containers. However, there is no scientific evidence on its antibacterial efficacy.

**Method:** Methanol extract of leaf of *Acacia etbaica* was tested for its *in-vitro* antibacterial activity against *Staphylococcus aureus*, *Escherichia coli* and *Salmonella* isolated from cow milk using agar disc diffusion method.

**Results:** The Minimum Inhibitory Concentration (MIC) of the plant crude extract was also determined using micro-dilution method in 96-well plates. *Acacia etbaica* showed significant antibacterial activity with mean zone of inhibition of 16.9(±0.80) mm, 14.91(±0.44) mm and 14.39(±0.17) mm in diameter at a concentration of 2000µg of plant extract per disc against *Staphylococcus aureus*, *Escherichia coli* and *Salmonella* respectively. The MIC of the crude extracts of *Acacia etbaica* was determined to be 0.03mg/ml, 0.01mg/ml and 0.05mg/ml against *Staphylococcus aureus*, *Escherichia coli* and *Salmonella* respectively.

**Conclusion and Recommendation:** The results suggest that the methanol extracts of *Acacia etbaica* could be a rich source of antibacterial compounds against food born pathogen. It is recommended that further studies on the identification of the active component of the plant should be done.

**Keywords:** *Acacia etbaica*; Disc diffusion; *Escherichia coli*; Minimum Inhibitory Concentration; *Salmonella*; *Staphylococcus aureus*

## HYGIENIC AND SANITARY PRACTICES OF STREET FOOD VENDORS IN THE CITY OF ADDIS ABABA, ETHIOPIA

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In Ethiopia, like other developing countries, street food vending is one of means of income generation and women play a dominant role for this sector. The quality of raw materials, food handling and storing activities are major factor that affect the safety of street food. The aim of this study is to investigate the hygiene of street vendors and sanitary conditions of vending sites on the streets of Addis Ababa. A total of 140 street food vendors in two sub-cities (Gulele and Arada Sub-cities) were investigated from September 2014 to March 2015. A structured questionnaire, interviews and extensive observation were used in the study. Most of street vendors (78.6%) were women. The majority of the vendors (68.5%) had either primary or no education. Among the vendors 88.6% didn't have apron and 95% were not covered their hair during cooking process. In the two sub-cities jerry cans were commonly used for water storage. 35% of street food vendors were changed the cleaned utensil water when only it is dirty. Largest number of street vendors (90.7%) was used recycled paper to serve the consumers. All the vendors (100%) handled money with bare hands while serving food. Regarding to use of cooking oil 38% of the vendors were changed cooking oil monthly and 43.6% of street food vendors were changed weakly. There is no significant difference ( $p = 0.679$ ) between the sub-cities on using cooking oil. All of the vendors had no health certificate from authorized dignitary. 78.6% of the vendors prepared their food along the road side. In most of the vending site vehicles were passed which released dust and gaseous pollutants. Moreover in some areas wastewater drainage tunnels were found in the vicinity of vending site. Although street vended food is a means of income generation at the household level but the way food prepared and sold is in unsanitary environment. Awareness creation plays a key role for food safety and handling so that the concerned bodies should commit for providing food safety training to street vendors.

**Keyword:** Street food vendors, health certificate, unsanitary environment, food safety



**CLOSE REMARKS AND POINTS RAISED DURING THE CLOSE UP OF THE 2<sup>ND</sup> NATIONAL NUTRITION RESEARCH DISSEMINATION CONFERENCE AT DESALEGN HOTEL ON JANUARY 16, 2016**

**Rapporteurs: Aregash Samuel and Mekonnen Sisay**

**Mr. Tesfaye Hailu summarized the 3 days' workshop as follows:**

He first thanked all the presenters and participants for their active participation in the conference and also praised the teams of FSNRD for their coordinated effort and commitment to make the workshop successful. He also summarized the main thematic areas of the presentations held in these 3 days and emphasized that all the papers presented are encouraging and useful for the nutrition professionals. He also mentioned that EPHI used to hold a conference with the research findings of the Institute alone; before but starting last year (October 2014) the directorate started inviting other researchers also to present their findings thus accordingly last year we had accepted 70 abstracts and this year 90 abstracts were submitted to the organizing committee and 34 were selected for oral presentation and 24 for poster presentation. He also added that the proceeding of this workshop will be available for the public and policy makers in particular; within 3 months of time.

Having said this he invited **Dr. Amha Kebede, the Director General of EPHI**, to officially close the conference. **Dr. Amha:** suggested to have a short discussion before closing up and invited the participants to raise their comments or questions regarding the 3 days conference. He also recommended that such type of conference should be organized every year or at least once in two years. Following this he invited the audience to raise their comments or suggestion. The comments and concerns raised are described as follows:

- 1) **Prof. Tefera Belachew:** started by appreciating the effort of EPHI to organize such a very nice conference. He also said that a great work has been done and the presented papers were also very good. There are also some papers which need to reach to the end users for example the paper presented by Alive and Thrive on how to prepare suitable message to reach the community. He also emphasized that such papers are very useful to guide the implementing organization in order to deliver the right message to the community. He also suggested that these papers need to be prepared in the form of policy briefs (in about 2 pages) and submitted to policy makers. He also requested that for the future conference EPHI could also consider involving university professionals in the poster and paper review process.
- 2) **Dr. Cherinet Abuye:** also started acknowledging the good progress/trend of EPHI in organizing such conference. He said one of the indication of this is participation of audiences from various organizations and different parts of the country. This shows that the invitation had a wider coverage. He also said that this conference has a lot of developments than the previous ones. For example the paper presented on

the 2<sup>nd</sup> day shows that a lot of professionals are coming up in the field of nutrition and a lot of results are available from the studies conducted in the country. In the previous time many research findings were placed on the shelf but now it looks that a better time has come to present research findings. He also appreciated the initiatives on the nutrition data base and said that it would have been much better if the nutrition data bases were compiled and presented to the audience. He also added that previously contents of the study was given more priority but now more focus could be made on the quality of the study. Moreover, he also commented that EPHI should work towards being a *center of excellence*. He also reminded Dr Amha that “he said EPHI and FoNSE will work together to strengthen the food and nutrition issues”. In behalf of FoNSE, Dr Cherinet expressed the willingness to work together and he ended his comments by thanking EPHI to organize such very important conference.

- 3) **Dr. Tsegaye Demisse:** He said in addition to having a large number of papers and a quality ones such efforts and the increasing number of nutrition offering universities as well as professionals could contribute a lot to get something which can even change the nutrition landscape of Ethiopia. Hence this is the time that nutrition directorate should grow to the Institute level to deliver its responsibility to the community. He also added the need for the revision of the Food Composition Table (FCT) of Ethiopia. He stressed that EPHI should work hard to revise FCT at the earliest time. He also stressed that it is very pertinent to deliver the National Micronutrients Survey results as soon as possible and disseminate to the nutrition community. He also said it is very interesting to hear the preliminary results and very encouraging to see the decrease on the national prevalence of few micronutrients like Iodine and Vitamin A deficiency. He also confirmed that it was a successful conference.
- 4) **Mrs. Aregash Samuel:** also appreciated the progress of EPHI in organizing such a very important events and requested if EPHI has a plan to share the study to the professionals through scientific journals in addition to the policy briefs.
- 5) **Mr. Amare Tariku from Gondar University:** He requested the following points,
  - What is the role of EPHI to improve the quality of studies conducted in these areas?
  - He also said that there is a big constraint in identifying a strong research method to conduct the study. We would like to send our students, but we want to make sure the accessibility of services to students for research purpose. We want to reduce the number hours spent for the process to use EPHI facility. From experience our students could submit their report after 6 months delay due to the lengthy process in EPHI. We would like to request the management of EPHI to speed up the process so that it is possible for our students to finish the analysis within 1-2 weeks.

**Dr. Amha** gave detailed responses to the points raised which is summarized as follows:

## **2<sup>nd</sup> National Nutrition Research dissemination Conference**

- He started saying such conference is organized to contribute in the efforts made to reduce malnutrition and to participate in the prevention strategy of the ministry of health. This conference is a consultative meeting and a showcase of collaboration of different parties in nutrition. That is why we accepted a good number of abstracts to be presented orally. The conference was organized on 5 sub thematic areas which includes research works on :
  - Nutrition intervention and related researches
  - Food safety and quality related research
  - Nutrition sensitive agriculture and related research
  - Micronutrient and macronutrient related research
  - Food processing technology and product development related research

As a nutrition professionals focus has to be made not only in traditional areas but also new developments need to be searched and presented. For example the next conference should focus on **food safety and quality** aspects. For instance the issue which was a concern in current time, a study on aflatoxin level in milk, is important to consider. If we revisit and discuss our program for FoNSE meeting we could also invite policy makers and convince them on the importance of food safety and quality.

We assure you that all the presentations will be published very soon in proceedings and some of them will be synthesized into a policy briefs.

The main points which came out of this 3 day conference is:

- Establishing the multi-sectoral nutrition data base:-this requires the effort of all of us and we will work hard to make this a reality.
- Revising the Ethiopian Food Composition Table:- this is a 20 years old document. We, as EPHI, will work hard to revise this as soon as possible.
- National Micronutrient Survey:- We will release the result in the coming 1-2 months. We know the importance of the result for many intervention planning. We also know that it will be outdated if it is very late. The longer we keep it the more out dated it will be.
- Regarding to NNP end line result, we saw that stunting is reduced to 34%, we will also finalize the report and disseminate very soon.

For the question raised from Gondar University: EPHI is now in a very good condition. Since many laboratories in Universities are also functioning we hope that the analytical part has significantly reduced

now. We believe that the analytic part of nutrition should be strengthened we take this comments as our assignment. Supporting students form higher learning institutes is our routine work. In early times we used to take about 10 students per year but now we are in the age of about 15 universities undertaking the undergraduate and graduate courses so we expect that we will have quite a number of students coming to EPHI for laboratory support. EPHI is willing to support students but if discuss on the system nothing should be free. We have to work on the condition in which a strong and functional system is established.

The objective of this dissemination conference is to strengthen the collaboration between various organizations working on nutrition. In this conference various organization like program implementers, partners, and government offices have participated. We have to make sure that research findings are utilized by the concerned body. For this the findings need to be presented in a strong and systematic way. The good thing now is that we work together with policy implementers so this help us to increase our potential to transfer the message.

We know that government commitment for nutrition activities is good and the Seqota declaration is one of the exemplary activity for this. This also shows the initiative of the government to reduce stunting from the country. If we properly design our programs the probability of utilizing it; will be very high. It is very encouraging to see these many participants on the third/last day of the conference.

On behalf of EPHI and in particular FSNRD, I thank you all for your active participation. In addition to this my sincere thanks goes to our partners who supported us by providing financial support to conduct this very important workshop.

I now declare that the 3 days conference is officially closed!!