UNDERNUTRITION AND ASSOCIATED FACTORS AMONG PREGNANT WOMEN AT NIGEST ELLIENI MOHAMED GENERAL HOSPITAL ANC CLINIC, HOSSANA, CENTERAL SOUTH ETHIOPIA

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JIMMA UNIVERSITY

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Abstract

Background: Undernutrition is a global health problem affecting more women in developing countries. Woman in sub-Saharan Africa, south east and south central Asia are most affected. Malnutrition causes 300,000 deaths per year and is indirectly responsible for about half of all deaths in young children. Maternal malnutrition in Ethiopia is higher than the level for any African countries. Although there are studies on maternal Undernutrition, they have not included factors like household food security status, meal pattern and dietary diversity.

Objective: To assess the magnitude of Undernutrition and associated factors among pregnant women.

Methods: Institution based cross sectional study was conducted from March to April, 2015 at Nigest Ellieni Mohamed General Hospital. A total of 211 pregnant women who came for ante natal care services were selected using systematic sampling methods. Data were collected using a structured interviewer administered questionnaire.Mid upper arm circumference (MUAC) was measured using adult MUAC tape. The data were edited, coded, entered into EPI data version 3.2.1, and exported to SPS for windows version 20 for analyses. Descriptive statistics and bivariate and multivariable logistic regression analyses were performed to identify factors associated with under nutrition. P values < 0.05 were considered for declaring statistical significance. **Results**: All the 211 were interviewed giving response rate of 100%. On average 24.6% of the pregnant women were undernourished. On multivariable regression model, after adjusting for various variables, indepedendent predictors of under nutrition were frequency of meal consumption less than three times per day(AOR:, 2.601,95%CI: 1.036-6.535 , P=0.044)earning a monthly income of greater than two thousand Birr per month(AOR: 0.319 95%CI: 0.113-0.903 , P= 0.002), having a dietary diversity score of less than 5(AOR:, 12.393, 95%CI 2.607-58.920:, P=0.0001) **Conclusion and recommendations**: The findings large proportions of women are undernourished in the study area. Low monthly income, low dietary diversity and inadequate meal frequency were independent predictors of under nutrition. . Enhancing intervention maternal nutrition during pregnancy focusing of diversification of diet and the importance of having additional meal during pregnancy through the health extension workers and women's development army is essential to curb the problem of maternal malnutrition in the study area.

Key words: Undernutrition, associated factors, pregnant women

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ABBREVIATIONS AND ACRONYMS

ANC	Antenatal Care
BMI	Body Mass Index
CI	Confidence Interval
DHS	Demographic Health Survey
FANTA	Food and Nutrition Technical Assistance
FAO	Food and Agricultural Organization
HFIAS	Household Food Insecurity Access Scale
IUGR	Intra Uterine Growth Restriction
LBW	Low Birth Weight
MUAC	mid Upper Arm Circumference
UNICEF	United Nations Infant Child Education and Food
WHO	World Health Organization

1. INTRODUCTION

1.1. Background

All human beings need a balanced amount of nutrients for proper functioning of the body system. Nutrition is a fundamental pillar of human life and its requirement varies with respect to age, gender and during physiological changes such as pregnancy (1).

Undernutrition: is when the body contains lower than normal amounts of one or more nutrients i.e. deficiencies in macronutrients and/or micronutrients. 'Undernutrition encompasses stunting, wasting and deficiencies of essential vitamins and minerals (collectively referred to as micronutrients) (2-4). Undernutrition is an important determinant of maternal and child health and is the outcome of factors including insufficient food intake, inadequate care and infectious diseases) (5).The incidence of dietary inadequacies as a result of dietary habits and patterns in pregnancy is higher during pregnancy than at any other stage of the life cycle (1).

Maternal nutritional status is considered to be an important factor that affects the successful completion of pregnancy (6). According to Insel and Wardlaw "Good nutrition is critical during child bearing years and the health and nutritional habits of woman in the years before pregnancy and while she is trying to get pregnant or has the potential of becoming pregnant is particularly important."This is supported by (Chatterjee), who highlights that while malnutrition is prevalent among segments of a population, poor nutrition among women begins at infancy and continues throughout their lifetime(7)

Poor nutrition in pregnancy in combination with infections is a common cause of maternal and infant mortality and morbidity, low birth weight and intrauterine Growth Retardation (IUGR) (8). Maternal Undernutrition may predispose a mother to poor health, including infection, preeclampsia/eclampsia, and adverse pregnancy outcomes such a premature birth and intrauterine growth retardation (9). Pregnant women are particularly vulnerable to nutritional deficiencies because of the increased metabolic demands imposed by pregnancy involving a growing placenta, fetus, and maternal tissues, coupled with associated dietary risks (1). Pregnancy is such a critical phase in a woman's life, when the expecting mother needs optimal nutrients of superior qualities to support the developing fetus. Naturally, the urge to eat more is experienced by nearly all pregnant women (10). Although pregnancy is considered a normal

physiological event in the life cycle, for most African women it is a life-threatening situation because of the poor quality of the diet contributes to the widespread energy and micronutrient deficiencies (11). Pregnancy places extra demand on the body systems of pregnant women, necessitating optimal intake of essential nutrients. Maternal diets during pregnancy have gained a lot of attention over the years. This is due to the increased physiologic, metabolic and nutritional demand placed on pregnant women by her gravidity. The dietary intake of pregnant woman needs to provide energy and nutrient for the mother (12).

Pregnancy increases energy needs by 13%, protein by 54% & vitamin and mineral by 0-50%. Research has also proven that, during pregnancy 30,000 kcal (336 MJ) are required to produce a baby, increase the size of the placenta and reproductive organs, provide energy for newly formed tissues and create additional fat stores in the mother (7, 13).

Inappropriate dietary practices characterized by poor dietary intakes, reduced number of meals and inadequate consumption of fruits and vegetables among pregnant women contribute to under nutrition (14). Pregnant women need adequate nourishing food for the fetus to develop well if not, the result will lead to low birth weight (15). For a healthy pregnancy, continues supply of micro nutrients is essential both for the mother and the growing baby.

Majority of the recent research has proven that from the very start, having the right balance of key micronutrient is the best way to insure long term health of mothers and their infants (10, 15).

1.2. Statement of the problem

Undernutrition is more than a medical problem, because its causes are multifaceted . This means that it can result from a combination of hazards. Its effects are even worse on pregnant women, because they have additional nutritional demands and nutritional deficiencies result in the vulnerability of both the mother and the child to be born (7).

Majority of the undernourished pregnant women live in developing countries (for example Bangladesh, China, DRC, Ethiopia, India, Indonesia and Pakistan) and over 40% live in China and India alone. This shows that malnutrition is a global problem and pregnant women are among the most affected (7).

Undernutrition is considered as one of the world's most serious but least addressed health problems (16, 17). More than one-third of all deaths worldwide are due to ten main risk factors, and seven of these are related to nutrition (18).

Worldwide, an estimated 852 million people are undernourished with most (815 million), living in developing countries (8). Maternal Undernutrition contributes to 800,000 neonatal deaths annually (16).

Undernutrition, consisting of fetal growth restriction, stunting, wasting, and deficiencies of vitamin A and zinc, along with sub optimum breastfeeding, underlies nearly 3·1 million deaths of children younger than 5 years annually worldwide, representing about 45% of all deaths in this group (16).

Many of the 200 million women who become pregnant each year, most of them in developing countries, suffer from ongoing nutritional deficiencies, repeated infections and the long term cumulative consequences of under nutrition during their own childhood (1, 6).

A major problem in developing countries is that pregnant women start to attend antenatal clinics in a late stage of pregnancy, so that pre-pregnancy weight and BMI may not be available and antenatal care can then be based on rate of pregnancy weight gain only (6).

It is universally accepted that Undernutrition can have drastic and wide ranging effects on women and children, if not managed optimally, when it does occur in the sever form, usually as a

result of food shortage, very high levels of morbidity and mortality are recorded.(12) .The reason why pregnant women are regarded as more vulnerable to malnutrition than non-pregnant women or men is mainly due to that pregnancy can be viewed as a normal process, there are changes that take place in the mother's body and these lead to nutritional stress for her because her uterus grows, placenta develops, total blood volume increases, heart and kidney works harder and body fat stores increase in preparation of birth and milk production and that nutrients intake need to be increased because there is physiological adaptation such as increased absorption of nutrients during pregnancy and deficiency causes a wide range of disorders and diseases, disability or mortality (7, 11).

Many women suffer from a combination of chronic energy deficiency, poor weight gain in pregnancy, anemia, and other micronutrient deficiencies, as well as infections like HIV and malaria. These along with inadequate obstetric care, contribute to high rates of maternal mortality and poor birth outcomes (1).

About 40 % of women aged 20–24 years in Sub-Saharan Africa marry early (at <18 years of age) With many years of childbearing ahead, pregnancies occur frequently and at short intervals, giving the mother insufficient time to replenish her nutrient stores before the next pregnancy (11). Maternal iron deficiency and consequent anemia comprise a major problem in developing countries, affecting 50% of women during pregnancy. Other micronutrient deficiencies are likely to be widely prevalent, especially those of iodine, zinc, vitamin A, and the vitamin B-complex (9).

Iron deficiency is the most commonly recognized nutritional deficiency in both the developed and the developing world. It is estimated that < 50 percent of women do not have adequate iron stores for pregnancy. Requirements for absorbed iron increase during pregnancy from 0.8 mg/day in the first trimester to 7.5 mg/day in the third trimester. Average requirement during the entire gestation is approximately 4.4 mg/day. An adequate iron balance during pregnancy implies body iron reserves of >500 mg at conception (10).

When there is poor feeding or nutrition on pregnant women, there is general weakness, tiredness during some activities like walking long distance, weight loss, and loss of appetite, anemia and reduced immunity, mental and physical weakness (15).

South Asia in particular, the rates of maternal Undernutrition (in terms of short stature and underweight, reflecting both chronic energy deficiency as well as micronutrient deficiencies) range from 10 to 40% of women of reproductive age and are considered critical to address (19).

Woman in sub-Saharan Africa, south east and south central Asia are most affected. Median underweight in sub-Saharan countries is 10.4%and 6% for rural and urban women, respectively (20). Between 5 to 20 percent of women in various African countries are underweight and Pregnant women in industrialized countries gain on average twice as much as pregnant women in (13, 21).

The consequences of poor maternal nutritional status are reflected in low pregnancy weight gain and high infant and maternal morbidity and mortality. And the poor quality of the diet contributes to the widespread energy and micronutrient deficiencies .(11)

Inadequate pregnancy weight gain is reflected in the high prevalence of low birth weight among 14% of infants in Sub-Saharan Africa. The probability of dying from pregnancy-related causes is one in sixteen for Sub-Saharan Africa compared with one in 4000 for industrialized countries (11).

Malnourished women are more likely to have stillbirths or to deliver LBW babies, suffering from reduced immune competence and suboptimal cognitive development and learning capacity (6). Under nutrition among pregnant women and adolescent pregnancies are the main contributory factors for low birth weight babies. In developing countries indicates that malnourished individuals, that is, women with a Body Mass Index (BMI) below 18.5 kg/m2, show progressive increase in mortality rates as well as increased in1995, about one million adult deaths resulted from health problems exacerbated by over-nutrition, while half of it were associated with under-nutrition (4). In developing countries, it has been estimated that poor nutritional status in pregnancy accounts for 14% of fetuses with IUGR, and maternal stunting may account for a further 18.5% (22).

Many women in developing country maintain pregnancy on dietary intakes lower than those recommended by international agencies. Studies conducted in Kenya found that pregnant women consumed on average 1442 kilocalories per day; lactating women consumed 1749 kilocalories(14)

In The Gambia, studies among pregnant women reported intakes of approximately 1500 kilocalories per day (21).

A major problem in developing countries is that pregnant women start to attend antenatal clinics in a late stage of pregnancy, so that pre-pregnancy weight and BMI may not be available and antenatal care can then be based on rate of pregnancy weight gain only (6).

Undernutrition is a serious problem in Ethiopia, and women and children are the most affected segments of the population. One of every four (26%) women of reproductive age in Ethiopia is undernourished and twice the sub-Saharan average of 13.3%.(23)

Globally, there is limited knowledge of prevalence causes of malnutrition during pregnancy. Such gap could be explained by lack of consensus on type and cut-off points of the anthropometric parameters to be applied among pregnant women. Generally few studies assessed maternal nutritional status during pregnancy. Particularly data on the Ethiopian situation regarding the nutritional status of pregnant women are lacking (20). In Ethiopia 50 % of the population cannot meet their daily minimum energy requirement of 2200 calories 871 and 673 maternal deaths per 100,000 live births in 2000 and 2005, respectively. Filling the gap in knowledge of maternal under nutrition and generating information for intervention is important to maternal nutritional during pregnancy (13).

As maternal malnutrition has intergenerational effects, the nutrition of women must be addressed very early in life. Special emphasis must be placed on improving the nutrition of adolescent girls, who are at the dawn of adulthood (taking on reproductive roles). The nutritional demands of pregnancy place adolescent girls at high risk of maternal mortality, pregnancy-related complications and the delivery of low-birth-weight infants. Addressing the nutritional needs of adolescent girls prepares them to move into adulthood ready to take on reproductive roles. Women must have an adequate nutritional status before and during pregnancy to provide a good intrauterine environment for the developing fetus. Proper maternal nutrition during pregnancy is crucial in reducing maternal and infant mortality which are the target area in achieving millennium development goal. Therefore, this period is an imperative to take rational interventions to break the intergenerational cycle of malnutrition. However most of the studies

that has been conducted previously in the study area didn't explicitly consider factors other than socio-demographic and economic variables

2. LITERATURE REVIEW

2.1. Overview

The WHO collaborative study conducted on maternal anthropometry and pregnancy outcomes in April 24,2009 using data from 111,000 women from across the world reported that mothers with the prevalence of low birth weight (LBW) is higher in Asia than elsewhere, predominantly because of Undernutrition of the mother prior to and during pregnancy (10).

The Lancet Series on Maternal and Child Undernutrition in 2008 reported that Maternal Undernutrition(both micro and macronutrient Undernutrition) contributes to 800,000 neonatal deaths annually; stunting, wasting, and micronutrient deficiencies are estimated to underlie nearly 3·1 million child deaths annually (16). Nutritional vulnerability of vulnerable pregnant women increases their risk to common epidemics like cholera, HIV/AIDS, pneumonia and malaria and other diet related non communicable diseases(7).

2.2. Magnitude and factors

One study conducted in 2007 in Cost-Arica among households using food insecurity assessing question are, the respondents considered that FI has multiple causes, most of them income related, such as unemployment, insufficient income, and bad administration of household income that is generally linked with social problems such as alcoholism and drug abuse. Another cause of FI cited is low level of education of the head of the household.(24)

One study conducted in Islamabad Pakistan to assess the association between dietary diversity and nutritional status among 350 pregnant women in their second and third trimester reported Medium dietary diversity was observed in 89% of pregnant women, while only 5% showed low, and high dietary diversity. Dietary diversity was not associated with socio demographic, or socioeconomic status of pregnant women. Even though weight gain during second ($p=0.2$) and third trimesters ($p=0.049$) had a positive relationship with dietary diversity,

more than 74% of pregnant women gained less than recommended level of weight gain.(25)

In Malawi for every 100 000 live births, 807 mothers die partly as a result of malnutrition which contributes to nutritional deficiencies and pregnancy complications(7)

Study conducted Nigerian Community A total of 1387 pregnant women (910 in the urban area and 477 in the rural areas) were recruited for the study Among Pregnant Women in a Poor nutrition in pregnancy in combination with infections is a common cause of maternal and infant mortality and morbidity, low birth weight and intrauterine Growth Retardation (IUGR) (8). One study conducted in 2012 in Zimbabwe reported that were that 24% of the vulnerable pregnant women had a MUAC of less than 22 cm, which according to WHO and WFP standards is an indication of malnutrition(7).

Undernutrition is a serious problem in Ethiopia, and women and children are the most affected segments of the population. One of every four (26%) women of reproductive age in Ethiopia is undernourished, twice the sub-Saharan average of 13.3% . Comparing the nutritional status of Ethiopian women with that of women in 29 other sub-Saharan African countries, based on the most recent DHS conducted between 1998 and 2008, the prevalence of Undernutrition in Ethiopia is higher than in any other country (23). One study conducted in Harames district in eastern Ethiopia b/n April and June in 2010 with total sample of 1731 pregnant women reported that 19.06% of subjects were malnourished and 23.3% study participants were underweight. Women in the second and third trimester had a 66% and nearly two fold increased risk of malnutrition compared with their counterparts in the first trimester respectively (20). One study conducted in Gusto Gide Worde with the ample size of 422 pregnant women, East College Zone, Ethiopia during January to June of the year 2013only (57.8%) of the respondents had nutritional information during their pregnancy. There was a positive significant relation between information about nutrition, educational status of mothers and family income and nutrition knowledge of mothers during pregnancy ($p<0.001$). Information about nutrition, family income and educational status of mothers had a positive significant relation with mothers' nutrition knowledge in the study area (1).One study conducted in wondogenet on March 2011 among 153 pregnant women reported that 9.2%of study participants were undernourished (13).

2.3. Conceptual frame work Undernutrition and associated factors among pregnant women

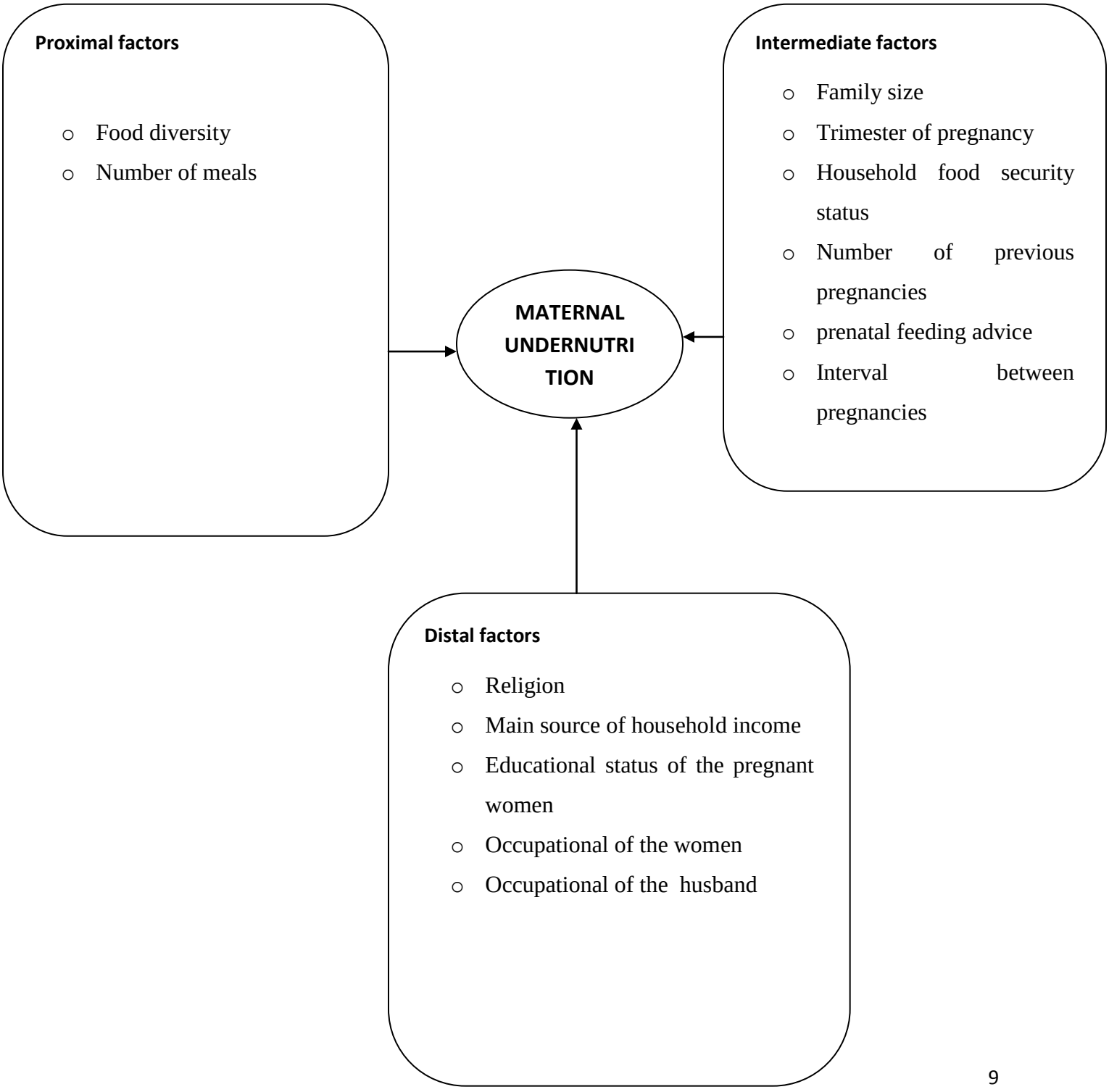

Figure 1 : Conceptual framework for the causes of Undernutrition (Source-adapted from different Literatures)

2.3. Significance of the study

Since Undernutrition among pregnant women is a serious problem in Ethiopia, actions to improve women's nutritional status should be given a priority at any time in the reproductive life of women. Well-nourished mothers are more likely to have infants with healthy birth weights, and such children are less likely to ever suffer from malnutrition and infectious diseases. Moreover, it will break intergenerational cycle of malnutrition. Although there are studies on maternal Undernutrition, they have not included factors like household food security status, meal pattern and dietary diversity. This study will fill the knowledge gap concerning maternal Undernutrition to some extent and will serve as base line information for researchers, policy makers, and planners to design appropriate interventions related to maternal Undernutrition in the study area.

3. OBJECTIVES

3.1General objectives

- To assess under-nutrition and associated factors among pregnant women attending ANC at Ingest Ellyn Mohamed General Hospital, Hosanna Central South Ethiopia, from March to April 2015.

3.2Specific objectives

- ✓ To determine magnitude of under-nutrition among pregnant women from March to April, 2015.
- ✓ To identify factors associated with under-nutrition among the pregnant women from March to April, 2015.

4. METHODS AND MATERIALS

4.1 Study area

The study was conducted at NEMMGH which is one of the Hospitals in SNNPR. It is one of the early established Governmental Hospitals during Dreg regime. The Hospital is found in hosanna town and it was located at 230 and 194 kilometers away from the capital city of Ethiopia (Addis Ababa) and SNNPR (Hadassah), respectively .The weather condition of the hosanna is Woina-dega. NEMMGH currently is in transition period to be Wachemo university hospital which is serving in four major clinical fields i.e. Internal medicine, pediatrics, surgery and gynecology. There are also some minor specialized fields like dental care service, ophthalmology, dermatology services. This hospital also renders MCH related services including EPI, PNC, FP and ANC services in separate room.

4.2 Study design and period

Institution based cross-sectional study was conducted from March1 to April 30, 2015.

4.3. Sample size determination and Sampling Technique

4.3.1 Sample size determination

Sample size was determined using a formula for estimation of single population proportion With the following assumptions:

$$n = \frac{(Z\ a/2)^2 P\ (1-P)}{d^2}$$

Where n= sample size

Z=z a a standard normal variable value corresponding to a 95% level of significance=1.96

P=expected proportion of undernutrition during pregnancy=19.8%=0.198

Q= (1-p) = (1-0.198) =0.802

d = Margin of sampling error tolerated (absolute precision) (5%)

None response rate=10%

Therefore, from the above sample

$$Ni = \frac{(1.96)^2 \ 0.198(1-0.198)}{(0.05)^2} = 244$$

N=920

NC=n/1+n/N=244/1+244/1975=192

When 10% contingency is added to the total sample size, the final sample size becomes 211.

Assumption: P = 19.8 %(Magnitude and determinants of malnutrition among pregnant women in eastern Ethiopia)(20)

4.3.2 Sampling technique

A systematic sampling technique was implemented to select pregnant women for inclusion in the study. By dividing the potential number of ANC attendants during the study period by the sample size (211) a sampling interval (K) of 3 was obtained. Therefore, every forth women coming to the ANC service was included in the study.

4.4 Population

4.4.1 Source of population

- ✓ All pregnant women who visited Nigest Ellieni Mohamed Hospital during data collection period for antenatal care services.

4.4.2 Study population

- ✓ Sampled pregnant women who visited Nigest Ellieni Mohamed Hospital during data collection period included in the study.

4.5. Inclusion criteria and Exclusion criteria

Inclusion criteria

- ✓ Pregnant woman who attending ANC during the study period.
- ✓ All pregnant women who gave consent.

Exclusion criteria

- ✓ Pregnant women who were seriously ill and disabled

4.6 Study variables

4.6.1 Dependent Variables

- ✓ Maternal undernutrition

4.6.2 Independent variables

Proximal factors

- ✓ Dietary diversity
- ✓ Number of meals

Intermediate factor

- ✓ Family size
- ✓ Household food security status
- ✓ Trimester of pregnancy
- ✓ Number of previous pregnancies
- ✓ Prenatal feeding advice
- ✓ Interval between pregnancies

Distal factors

- ✓ Monthly income of women
- ✓ Main source of income
- ✓ Educational status
- ✓ Occupational status of the husband
- ✓ Occupational status of the woman

4.7 Data collection

Trained nurses/public health professionals who can speak the local language collected data from the mothers using a structured questionnaire. The data collection process was supervised by the principal investigator. The structured questionnaire generated information on the socio-demographic and economic factors, dietary and reproductive factors.

4.7.1 Anthropometric Measurements

Maternal anthropometric measurements were performed according to the standards. MUAC of each woman measured at the mid-point between the tip of the shoulder (olecranon process) and tip of the elbow (acromion process) of the left arm. An adult MUAC tape that is non-elastic and non-stretchable was used to take the measurements, after checking that the tape was applied with correct tension (not too loose or not too tight). The MUAC of the woman was readed and recorded to the nearest 0.1cm. MUAC measurement was performed by the clinical nurse/public health professional following standard instructions and steps. A range below 22cm is an indicator of undernutrition and a range of > or equal to 22cm is for normal nutritional status.

4.8 Methods for assessing food consumption of individual

4.8.1 A 24 hours recall method

The purpose of assessing the dietary intake is to evaluate the nutritional quality of the diet. A 24-hrs recall dietary method provides quantitative information on food intake. Nine lists of food groups were used to assess the 24-hr recall(26). The score of 1 were given for those who responded yes and the score of zero were given for those who responded no for the food groups listed. Finally those who got the DDS score of less than 5/9 were classified as having less diversified diet and those who got the score of greater than or equal to 5/9 were classified as as having well diversified food.

4.8.2 Household food security status

The household food insecurity status of the respondents was assessed with HFIAS using nine questions adapted from FANTA guideline. The HFIAS consists of two types of related questions. The first question type is called an occurrence question. There are nine occurrence questions that ask whether a specific condition associated with the experience of food insecurity ever occurred during the previous four weeks (30 days). Each severity question is followed by a frequency-of-occurrence question, which asks how often a reported condition occurred during the previous four weeks. Each occurrence question consists of timeframe for recall, the body of the question, and two response options (0 = no, 1 = yes). There is also a 'skip code' next to each "no" response option. This code instructs the enumerator to skip the related frequency-of-occurrence follow-up question whenever the respondent answers "no" to an occurrence question. Each HFIAS frequency-of-occurrence question asks the respondent how often the condition reported in the previous occurrence question happened in the previous four weeks. There are three response options representing a range of frequencies (1 = rarely, 2 = sometimes, 3 = often). Finally those respondents who were coded as (1) and (0) were categorized as food in secured and food secured respectively.

Occurrence Questions asked were:

1. In the past four weeks, did you worry that your household would not have enough food?

2. In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?

3. In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?

4. In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?

5. In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?

6. In the past four weeks, did you or any household member have to eat fewer meals in a day because there was not enough food?

7. In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?

8. In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?

9. In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food? (27)

4.9 Data quality Control

In order to assure the quality of data the following measures were be taken;

- ✓ Questionnaire was prepared in English and translated to Amharic.
- ✓ One day training was given for the data collectors and the supervisor about the data collection process prior to the actual work.
- ✓ Pre-test were done in 5% of the total sample size.
- ✓ Close supervision of anthropometric measurements and repeat measurement of doubtful cases were made

4.10 Data processing and analysis

Data were entered into Epi data Version 3.2.1 and exported to SPSS version 20.0 for analysis. Descriptive statistics like frequency, mean and standard deviation were implemented. Inferential statistical tests like bivariate and multivariable logistic regression analyses were performed.

The variables with p-value less than 0.25 in bivariate logistic regression analysis were considered as candidates for multivariable logistic regression analysis. In multivariable logistic regression analyses, test p-values less than 0.05 was taken as cut off value for significant association among the dependent and independent variables.

The result was discussed and compared with different literatures on prevalence of undernutrition and associated factors among pregnant women. Hosmer and Lemshowe goodness of test was done to assess model fitness. Finally, the result was presented using narratives, tables, and graphs.

4.11 Ethical considerations

Ethical clearance was obtained from Jimma University Ethical Review Committee and official permission letter to conduct the study was obtained from Nigest Ellieni Mohamed General Hospital administrators. Verbal informed consent was taken from each study subjects after clear orientation of the study objective.

4.12 OPERATIONAL DEFINTION

Undernutrition: was defined in this context as having a MUAC of less than 22cm.

Prenatal feeding advice: Prenatal dietary advice is an advice that is given to the pregnant women about nutritionally important foods that must be frequently consumed during pregnancy during her visits to the health institutions for different reasons. It is constructed by combining three items that asked the women whither she received advices on three issues

- ✓ advised to eat more
- ✓ advised to eat balanced diet
- ✓ advised to eat different fruits and vegetables in this pregnancy

Number of meals per day: Those pregnant women who consumed meals three times per day categorized as those with optimal pattern and those who consumed less than three meals per day categorized as having non optimal meal pattern.

Individual Diet Diversity Score: is defined as having 5 food groups out of the 9 food groups based FAO classification (26)

Food secure: pregnant women who have any of mild, moderate or severe food insecurity were categorized as food insecure. The different stages of food insecurity were defined as follows:

Mildly food insecure: household worries about not having enough food sometimes or often, and/or households unable to eat preferred foods, and/or households eats a more monotonous diet than desired and/or some foods considered undesirable, but only rarely but they didn't experience three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating)

Moderately food insecure: household sacrifices quality more frequently, by eating a monotonous diet or undesirable foods sometimes or often, and/or has started to cut back on quantity by reducing the size of meals or number of meals, rarely or sometimes. But it does not experience any of the three most severe conditions

Severely food insecure household: any household that experiences one of these three conditions even once in the last four weeks (30 days) is considered severely food insecure **or** has experience cutting back on meal size or number of meals often, and/or experiences any of the three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating), even as infrequently as rarely (27)

5. Results

5.1 Socio-demographic and economic characteristics of the study participants.

Out of the 211 sampled pregnant women to be included in this study all of them responded to the questionnaire making a response rate of 100%. The mean age (± SD) of the participants was 28 (±1.98) years, while the age ranged from 24 to 34 years. However, considerably high proportions of the respondents 180 (85.3%) were between the age intervals of (15-24) years. Besides, most study respondents were married 209 (99.0%).

Considering the educational and occupational status of women 15(7.1%) of participants were illiterate, 113(53.6%) participants were housewife, respectively.

Regarding the family size majority, 129 (61.1%) of the respondent's family size were in the interval of one to four.

Ninety eight (46.4%) of the respondents earn income from formal employment, 89(42.2%) engaged in business, 18(8.5%) from farming and 6(2.8%) from other sources.

Regarding monthly income of women, 86(40.8%) of the participants were with an estimated monthly income of less than one thousand Birr.

Table 1: Socio-demographic and economic factor among pregnant women (n=211) at ANC clinic in Nigest Ellieni Mohamed Hospital, Hosanna, 2015.

Variables	No (%)
Age in years	
15-24	180(85.3)
25-34	31(14.7)
Marital status	
Married	209(99.0)
Separated	1(0.5)
widow	1(0.5)
Educational status of women	
Illiterate	15(7.1)
Primary	56(26.5)
Secondary	70(33.2)
Diploma and above	70(33.2)
Occupational status of women	
Government Employee	64(30.3)
Housewife	113(53.6)
Business	26(12.3)
other	8(3.8)
Occupational status of husband	
Government Employee	94(44.5)
Business	91(43.1)
Farmer	14(6.6)
NGO	12(5.7)
Religion	
Muslim	23(10.9)
Protestant	135(64.0)
Orthodox	42(19.9)
Catholic	10(4.7)
Any other(joba)	1(0.5)
Family size	
1-4	129(61.1)
>=4	82(38.9)
Main source of household income	
Formal employment	98(46.4)
Business	89(42.2)
farming	18(8.5)
other(causal labor, petty trade)	6(2.8)
Respondent monthly income	
<1000	86(40.8)
1000-2000	50(23.7)
>2000	75(35.5)

5.2 Magnitude of Undernutrition in the study participants

The overall prevalence of Undernutrition in this study was 52 (24.6%)

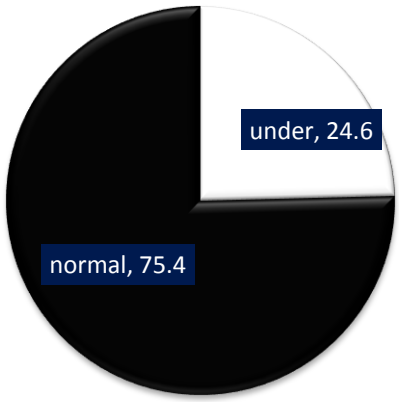

Figure 2 Magnitude of Undernutrition of the respondents

From the study, observations were that fourteen (6.6%) of the study participants had four and above pregnancies before the current one and seventy seven (36.5%) of the study participants had never been pregnant before that was their first pregnancy. Hundred twenty (56.9%) of the study participants had one to four pregnancies.

Results from the research showed that 174 (82.5%) of the study participants never experienced birth interval of fewer than two years and only 37(17.5%) experienced birth interval of fewer than two years.

With regard to trimester of pregnancies 99 (46.9%) of the study participants were in the second trimester of pregnancies.

The number of meals that an individual consumes contributes to that person's nutritional status. The standard is that a person should consume at least three meals per day. Findings from the study were that the majority 180 (85.3%) of the respondents normally consumed greater than three meals per day. Only 31(14.7%) of the respondents indicated that they consumed less than three meals per day. The number of meals usually consumed by a person contributes to MUAC of the respondents.

One hundred eighty one (85.8%) of the study participants were food secured where as 30(14.2%) of participants were food insecure.

One hundred forty four (68.2%) of the study participants scored DDS of less than five and 67(31.8%) of participants scored DDS of greater than 5.

Table 2: Reproductive and Dietary factors among pregnant women (n=211) at ANC clinic in Nigest Ellieni Mohamed Hospital, Hosanna, 2015

Variables	No (%)
Number of previous pregnancies before the current one	77(36.5)
None (0)	120(56.9)
One-four	14(6.6)
>four	
Any birth interval of < 2 years	37(17.5)
Yes	174(82.5)
No	
Trimester of pregnancy	43(20.4)
First	99(46.9)
Second	69(32.7)
Third	
Number of meals/ day	31(14.7)
Less than three meals	180(85.3)
Greater than three meals	
History of	104(49.3)
nausea or vomiting	107(50.7)
Yes	
No	
Prenatal dietary advice	94(44.5)
yes	117(55.5)
no	
House hold food security	181(85.8)
Food secure	30(14.2)
Food insecure	
Dietary diversity score	144(68.2)
DDS<5	67(31.8)
DDS≥5	

Associated factors of Undernutrition of mothers during pregnancy

In this study variables that were candidate for multivariable logistic analysis were:

- ✓ Women educational level
- ✓ Family size
- ✓ Main source of household income
- ✓ Estimated monthly household income
- ✓ Number of meals per day
- ✓ Number of previous pregnancies before the current one
- ✓ Household food insecurity and
- ✓ Dietary diversity score.

Table 3: Predictors of Undernutrition in multivariable logistic model among pregnant women (n=211) at ANC clinic in Nigest Ellieni Mohamed Hospital, Hosanna, 2015

Predictors	UNDERNUTRTION			
	Yes	No	COR(95%CI)	AOR(95%
Educational status				1
Illiterate	7	8	1	1.776(0.469-6.724)
Primary	25	31	0.922(0.294-2.891)	0.630(0.152-2.620)
Secondary	10	60	0.190(0.056-0.642)	1.013(0.222-4.621)
Diploma and above	10	60	0.190(0.056-0.642)	0.654(0.235-1.821)
Family size				1
1-4	28	101	0.670(0.356-1.263)	
>=4	24	58	1	
Main source of income	15	83	1	
Employment	29	60	2.674(1.320-5.420)**	1.614(0.680-3.832)
Business			3.521(1.177-10.532)*	1.594(0.414-6.140)
Farming	7	11	1.107(0.121-10.152)	0.751(0.045-12.625)
Other(petty trade, daily labor)	1	5		
Monthly income	27	59	1	1
<1000	17	33	1.126(0.536-2.363)	0.804(0.336-1.924)
1000-2000			0.261(0.110-0.618)**	0.319(0.113-0.903)**
>2000	8	67	5.031(2.265-11.172)***	2.601(1.036-6.535)*
Number of meals				1
<3	17	14	1	
>=3	35	145	0.305(0.094-0.986)*	0.791(0.130-4.829)
Previous pregnancies	18	59	0.290(0.094-0.900)*	0.430(0.101-1.825)
None	27	93		
1-4				
>4	7	7	1	1
Household food security			0.426(0.189-0.957)*	0.640(0.213-1.918)
Food secured	40	141		
food insecure	12	18	1	1
DDS			17.287(4.062-73.571)***	12.393(2.607-58.920)*
<5	50	94		
>=5	2	65	1	1

****=P<0.001, ** =P<0.01 and *=P<0.05*

6. Discussion

In this study we used MUAC, 24-hr dietary recall method, and the household food insecurity access scale to measure the magnitude of malnutrition and as indicator of nutritional status, to assess the quality/diversity of the food, to assess the household food insecurity among pregnant women.

Our result revealed that 24.6% of pregnant women were undernourished The magnitude of undernutrition observed in this study was greater than the studies conducted in Haremaya district of eastern Ethiopia (19.8%) (20) and sidama zone of southern Ethiopia(9.2%) (13). This difference might be due to sample size difference, geographical and other differences between the populations in the different studies. But it is consistent with the findings from the study conducted in Zimbabwe where a significant number of respondents (76%) had a MUAC of equal or greater than 22 cm and only 24% had a MUAC of less than 22 cm (7).

Those pregnant women who consumed meals less than three times per day were more than two times more likely to be undernourished than those who consumed meals for greater than or equal to three times. This is in line with World Health Organization (28) recommendation that pregnant women consume at least three meals a day with two snacks to help meet the increased caloric demands during pregnancy. Having less frequent meals could lead to inadequate intake essential nutrients leading to under nutrition.

The income status or the income of respondent is an indicator of access to adequate food supplies which is prime determinant of maternal nutritional status. Lower risk of undernutrition observed among women with monthly respondents income of greater than two thousand Birr in present study,which is not in line with the previous study of pregnant women from East Wollega Zone, Ethiopia. In the other studya monthly respondent's greater than two thousand Birr wwa a risk factor for Undernutrition (1). This discrepancy might be due to differences in the control of income within the household. As the study in Wollega is done in a cash crop area, most of the income might be controlled by men as opposed to the study area where there no cash crops and usually men tend to spend cash mosly on non-food items. Low dietary diversity among pregnant women was one of the factors contributing to Undernutrition. In this study those women with dietary diversity score of less than five was twelve times more likely to be undernourished than those women with dietary diversity score of greater than five . This finding is in line with reports of a study conducted in Pakistan(25) among pregnant women. It was deduced that for

an increase dietary diversity by one, the pregnant women gained 0.24 kg in the second trimester. In third trimester 0.71 kg is gained for an increase of one score in dietary diversity. For an increase of every one score of dietary diversity they gained 0.02 Kg per week.. This could be due to the fact that as pregnant women get diversified diet they will be well nourished that will directly have beneficial role in breaking the intergenerational cycle of malnutrition.

Although the national nutrition program, the bygone millennium development Goals and the national nutrition strategy consider maternal nutrition during pregnancy to be a key factors in preventing intergenerational cycle of malnutrition, maternal and infant mortality, large proportion of pregnant women are still having under nutrition. The implication of Undernutrition during the first 1000 days is far reaching. Therefore, the findings call for strengthening the existing initiatives to adders the rate Undernutrition among pregnant women in the study area.

7. Strength and limitations of the study

7.1 Strength

Different nutritional assessments such as 24-hr dietary recall, and their household food security status among pregnant women were assessed according to the standard.

7.2 limitations

The study involved only women coming for ANC which limits its external validity. Measuring under nutrition in the community setup could uncover even more prevalence of Undernutrition as women coming to health facilities are expected to be the ones better off.

8. Conclusion

Based on the findings of the present study, it can be concluded that 24.6% of pregnant women had undernourished in the study area. In general estimated monthly income of the household, individual dietary diversity score and frequency of eating during pregnancy (number of meals per day) showed statistically significant association with Undernutrition. In general, the feeding practices, dietary intakes and nutritional status of the pregnant women in the study area were short of the national and international recommendations and were not adequate to support their increased energy and nutrient requirements. This implies the need for a sustained health and nutrition education to the women regarding increased food intake, proper dietary practices and dietary diversification during their pregnancy time in order to improve their health and nutrition outcomes. Thus, efforts should be made to improve diversify diet, and increase consumption of more diversified foods.

9. Recommendations

Based on the findings of the study the following recommendations were made

To the staff

Nutrition education/counseling during antenatal care: on

- ✓ Nutrition education about locally available food sources
- ✓ Importance of adequate nutrition during pregnancy.
- ✓ Increased nutrient requirements.
- ✓ Nutrient rich dietary sources.

To NGO

- ✓ Malnutrition is difficult to detect without regular assessments, on-going nutritional surveillance by different NGOS collaborating with Zonal Health Office, to check continuously on nutritional status of the pregnant women.

To the local government

- ✓ work together with the private sector and NGOs to create employment opportunities for women in the area to improve access of income to households, and this again can go a long way in improving food security, hence reducing the nutritional vulnerability of the pregnant women.

To the researcher

- ✓ It is recommended for the researchers to assess the nutritional status of the pregnant women especially on their micronutrient status using a community based study.

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ANNEX I. CONSENT FORM

Consent form (English version)

My name is ADDISALEM GIZACHEW and I'm from Jimma University. We are conducting a research on Undernutrition and associated factors among pregnant women at Nigest Ellieni Mohamed General Hospital. As part of this study you are kindly requested to be included in this study which has great importance improving this sector. The interview will take a maximum of 30 minutes. The information concerning you, you're MUAC and your IDDS result as an individual will not be passed to another individual or institution. Your participation will be on your willingness and you have the right not to participate fully or partially. If you agree to be included in the study, I will start my question by asking general identification questions.

Thank you for your cooperation!!!

Name of interviewer _____ date _____ signature _____

Name of supervisor _____ date _____ signature _____

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QUESTIONNARIE

Jimma University

College of Health Sciences

Department of population and Family health

This questionnaire is designed to collect socio-demographic, dietary and reproductive information about Undernutrition and associated factors among pregnant women at Nigest Ellieni Mohamed hospital.

Ser. No	**Question to be asked**	**Response**
Socio-demographics and economic factors		
1.	Age	
2.	Educational status of women	
3	Occupational status	1)Government employee 2) House wife 3) other specify…….
4	Respondents husband occupation	1.Gov`t Employee 2.Business 3.Farmer 4.NGO
5	Marital status	1.Married 3.Separated 4.Widow
6	Religion	1.Muslim, 2.protestant, 3. orthodox 4. Catholic 5.Any other

		Specify……..
7	Ethnicity	1.Oromo 2.Amahara 3.Tigre 4.Hadiya 5.Gurage 6.Other specify……..
8	Household Size	
9	What is the main source of income for your household?	1.Formal employment 2.Petty trade 3.casual labor .4.farmming 5. Other specify……
10	Monthly respondents income (in Eth. Birr)	
Reproductive and dietary factors		
11	How many pregnancies did you have before this one?	
12	Any birth interval of less than 2 years?	1) Yes 2) No
13	Trimester of pregnancy	1.First 2.Second 3.Third
14	Prenatal dietary advice	1.Yes 2.No
15	Number of meals/day	
Household Food security assessing questions in the past 30 days.		
16	In the past four weeks, did you worry that your household would not have enough food?	1. never 2.rarely (once or twice), 3.sometimes (3-10times) 4. Often (more than 10 times?

17	In the past four weeks, were you or any household member not able to eat the kinds of Foods you preferred because of a lack of resources?	1. never 2.rarely (once or twice), 3.sometimes (3-10times) 4. Often (more than 10 times?
18	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	1. never 2.rarely (once or twice), 3.sometimes (3-10times) 4. Often (more than 10 times?
19	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	1. never 2.rarely (once or twice), 3.sometimes (3-10times) 4. Often (more than 10 times?
20	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	1. never 2.rarely (once or twice), 3.sometimes (3-10times) 4. Often (more than 10 times?
21	In the past four weeks, did you or any household member have to eat fewer meals in a day because there was not enough food?	1. never 2.rarely (once or twice), 3.sometimes (3-10times) 4. Often (more than 10 times?
22	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	1. never 2.rarely (once or twice), 3.sometimes (3-10times) 4. Often (more than 10 times?

23	In the past four weeks, did you or any household member go to sleep at night hungry Because there was not enough food?	1. never 2.rarely (once or twice), 3.sometimes (3-10times) 4. Often (more than 10 times?
24	HFIAS score	
DIETARY DIVERSITY QUESTIONNAIRE (24 hour recall) <u>Please say= 1 if your answer is Yes and 0 if your answer is No Yes if you ate listed food items in the previous 24-hr</u>		
25	CEREALS Corn/maize, rice, wheat, sorghum, millet or any other grains or foods made from these (e.g. bread, noodles, porridge or other grain products	0.no 1.yes
26	WHITE TUBERS AND ROOTS white potatoes, white yams, white cassava, or other foods made from roots	0.no 1.yes
27	VEGETABLES dark green/leafy vegetables, including wild ones + *locally* available vitamin-A rich leaves such as, cassava leaves, kale, etc	0.no 1.yes
28	FRUITS ripe mangoes, ripe papaya, + other locally available vitamin A-rich fruits	0.no 1.yes
29	FISH	0.no 1.yes

30	MEATS Beef, lamb, goat, wild game, chicken, duck, or other birds	0.no 1.yes
31	EGGS chicken, duck, or any other egg	0.no 1.yes
32	LEGUMES, NUTS AND SEEDS, beans, peas, lentils, nuts, seeds or foods made from these	0.no 1.yes
33	MILK AND MILK PRODUCTS milk, cheese, yogurt	0.no 1.yes
34	OILS AND FATS oil, fats or butter added to food or used for cooking	0.no 1.yes
35	DDS	
Anthropometric measurements		
36	MUAC(in centimeter)	