DIETARY PRACTICE, NUTRITIONAL STATUS AND ASSOCIATED FACTORS AMONG PREGNANT WOMEN ATTENDING METTU KARL HOSPITAL, SOUTHWEST ETHIOPIA

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Abstract

***Background**: Adequate maternal nutrition is one of the best ways to ensure maternal and fetal wellbeing.. It further determines the health of the offspring throughout the lifecycle and prevents adverse health outcomes from the upcoming generation. Maternal achievement of optimal diet is one of the main targets for nutrition and public health interventions across the health sector. Thus, continuous monitoring of dietary and nutritional conditions of pregnant women should undertaken critically at all time and setting.*

***Objective**: This study is aimed at assessing the dietary practice and nutritional status and identify their associated factors among pregnant women attending antenatal care service of Mettu Karl Hospital, southwest Ethiopia.*

***Methods:** An institution-based cross-sectional study was conducted from March to April 2018. Systematic random sampling technique was employed to select 378 study participants. Data were collected by face to face interview using semi-structured questionnaire. Women Dietary Diversity Score (WDDS) was measured using a qualitative 24-hr dietary recall and nutritional status was assessed by Mid-upper arm circumference measurements. Logistic regression model was fitted to identify factors significantly associated with dietary practice and under-nutrition.*

***Result:** The prevalence of sub-optimal dietary practices was 22% and that of under-nutrition was 17.5%.Family size >5 [AOR=8.2, 95%CI: 12.383, 46.217] and severe food insecurity [AOR=3.661 1.289, 10.394] were significantly associated with sub-optimal dietary practice. Being non married woman[AOR= 3.188, 95% CI: 1.219, 8.336], lack of formal education [AOR=9.405, 95%CI: 1.079, 81.943], lack of iron supplementation [AOR=3.189, 95%CI: 1.513, 6.720], WDDS <6 [AOR= 4.057, 95% CI: 2.157, 7.634], not taking additional meal (3+) [AOR=2.267, 95%CI: 1.211, 4.244], skipping meal [AOR=3.856, 95%CI: 1.099, 13.530] were significantly associated with under-nutrition.*

***Conclusion and recommendation:** The present study revealed that there is a relative burden of suboptimal dietary practice and under nutrition among the studied participants. Predictors identified for suboptimal dietary practice were family size and household food insecurity . Similarly, under nutrition among the studied pregnant women was predicted by marital status, educational status, Iron supplementation, additional meal intake and meal skipping. Strategies to improve dietary practice and nutritional status of pregnant women should be designed at different levels of concerned bodies and other stakeholders considering factors identified in this study.*

***Keywords:** dietary practice, Ethiopia, mettu karl hospital, nutritional status, pregnant women,*

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List of Abbreviations and Acronyms

ANC-Anti natal care unit

EDHS-Ethiopian demographic health survey

FAO- Food and Agricultural organization

HHFIAS- Household Food Insecurity Access Scale

HIV/AIDS- Human immunodeficiency virus/Acquired immune deficiency syndrome

I/A/B- Ilu Abba Bora Zone

ICU- intensive care unit

MUAC- Mid upper arm circumference

NICU – neonatal intensive care unit

NGO- Non Governmental Organization

SNNPRS- Southern nation and nationalities people representatives

WDDS- Women Dietary Diversity Score

CHAPTER ONE: INTRODUCTION

1. BACKGROUND

Dietary practice is a series application of balanced and healthier diet which is very important part of leading a healthy lifestyle. For women of childbearing age, good nutrition is important for preparing the body for the demands of pregnancy. During pregnancy, a woman's macronutrient (energy) and micronutrient (e.g. vitamins, mineral) requirements increase, and it is even more important that consuming food which will give her both the energy and the specific micronutrients which are essential for maintaining her and her growing baby's health**.** A pregnant mother who combines proper physical activity with optimal dietary practice can reach and maintain a healthy weight, reduce risk of adverse birth outcome. A woman's nutritional status during pregnancy depends on the availability of nutritional reserves, that is, stores of particular micronutrients such as calcium and iron, which have been built up in her body from prior consumption of foods containing those micronutrients. As these reserves build up before a woman becomes pregnant, maintaining good dietary practice prior to conception is vital for ensuring adequate nutritional status during pregnancy. Women who are underweight and who have deficiencies in particular micronutrients rarely "catch-up" by improving their diet once they are pregnant, as at this stage their body already faces additional nutritional demands because of the growing baby(1).

Dietary practices play a significant role in determining the long-term health status of both the expectant mother and the growing fetus. Sub optimal dietary practices of pregnant women have apparently led to increased rates of stillbirths, premature birth, and low birth weight, maternal and prenatal death(2). Nutrition throughout life has a major effect on health. This is true for pregnant women as adequate maternal nutrition is one of the best ways to ensure maternal and fetal wellbeing in developed and developing countries. A mother's nutritional status at conception, during pregnancy and lactation, plays a key role in determining her health and well-being, as well as that of her child. Recent evidence suggests that it may also reduce the risk of chronic diseases later in life. During pregnancy and breast-feeding, the recommended intakes for most nutrients increase.(1)

Poor maternal nutrition, is associated with adverse birth effect including IUGR, which greatly increases the risk of neonatal deaths , (LBW), (PTB), and stunting (3). Available scientific evidence demonstrates that nutrient intake during pregnancy has a critical role in foetal

development and better maternal nutritional status(4,5). To ensure adequate nutrient intake, dietary diversification has been recommended as one of the best strategies. It is particularly highly recommended among pregnant women since they have increased nutrient requirements(5,6).

The burden of both maternal and child under nutrition along with the adverse outcomes are skewed to few countries in low and middle income regions in Africa and Asia(8).Near to one-third of children in these countries are either underweight or stunted, and more than 30% of the population suffers from micronutrient deficiencies(8). The sub-Saharan Africa and South Asia together stands for almost three-fourth of the world's stunted children; whereby, the former contributing for more than 40% and 10% of stunted and wasted children, respectively. Sub Saharan Africa is home to 98% of the 2.6 million annual third trimester still births(9,10).

A major reason for the widespread malnutrition and the associated consequences in Sub-Saharan Africa is the poor dietary practice which is monotonous, plant-based diets that may be inadequate to provide adequate nutrition during pregnancy(11). Diets in such setting consists mainly of cereal or root staples; with very little intake of animal source proteins, vegetables, and fruits and thus are poor sources of bio available mineral and vitamins critical for healthy pregnancy. These have been identified as significant contributors to global burden of maternal malnutrition. Further compromising efforts to improve dietary quality is the relatively high cost of nutrient-dense foods like Animal Source Foods (ASF), fruits and vegetables(12,13).The high nutrient demands of pregnancy put women of reproductive age in developing countries at high risk because consumption of low-quality, monotonous diets is common in these countries and thus these women risk a variety of micronutrient deficiencies(17).

Dietary Diversity is defined as the number of different foods or food groups consumed over a given reference period. Dietary diversity has long been recognized by nutritionists as a key element of high quality diets. Duplicating the variety of foods from different group and in between the food groups is recommended in most dietary guidelines, Western as well as internationally, Since it is Declared to ensure optimum intake of Basic nutrients and to promote good health. Dietary variety and nutritional adequacy with regard to the key vitamins and minerals, distribution of food within the household has been found to affect nutritional status of individuals. In addition preparation of food and feeding practices has affect on nutrition and in turn the health of an individual(14,15).

Pregnancy is the most nutritionally demanding period in a woman's life; consequently, pregnant women are advised to eat more diversified diet than usual, a variety of food and consumption of animal product like meat, and some vegetables during pregnancy in Arsi area of oromia region remained as low as the pre-pregnancy state, irrespective of the women's income and educational status.; Although not practiced by all, a number of food taboos and misconceptions related to consumption of green leafy vegetables, yogurt, cheese, sugar cane, and green pepper food items adversely affect nutritional status during pregnancy(15)**.**The promotion of women's health and other preventive health care practice should start before birth, during intrauterine life and extends throughout different phases of their lives in order to sustain their general as well as their reproductive health(16). Consistent evidence about why Ethiopian's women still have suboptimal dietary practice is lacking. Taking into consideration suboptimal dietary practice that continue to occur throughout pregnancy, it will be an issue to investigate and knowing the reason of suboptimal dietary practice that occur among Ethiopian pregnant women and identify the reason that vigorously associated with the dietary practice, to provide sufficient data for policy makers and planers in advising pregnant women on dietary practice and additional food intake during their pregnancy. Therefore, this study investigated sub-optimal dietary practice, nutritional status and associate factors among pregnant women.

1.1. Statement of problem

Nutrition throughout life has a major effect on health. This is true for pregnant women as adequate maternal nutrition is one of the best ways to ensure maternal and fetal wellbeing in developed and developing countries. A mother's nutritional status at conception, during pregnancy and lactation, plays a key role in determining her health and well-being, as well as that of her child. As the quality and quantity of her diet also plays vital role. Providing a nourishing diet for pregnant and lactating women therefore results in significantly better infant health outcomes(23). A pregnant woman needs a variety of diet to meet their nutritional requirements and thus improve their nutritional status. It has been obviously observed that a suboptimal diet that comprises inadequate intake of calories and nutrients, combined with a heavy workload, impacts adversely on the health of the mother, the developing foetus and the newborn. Mothers who didn't practiced the habit of eating snacks and carbohydrates between meals during their pregnancy, only 33.9% of the respondents were found to have optimal nutritional practices during their pregnancy. In Ethiopia many studies have focused on nutritional status of pregnant women(18). Consistent evidence about why Ethiopian's women still have suboptimal dietary practice is lacking. Taking into consideration suboptimal dietary practice that continue to occur throughout pregnancy, it will be an issue to investigate and knowing the reason of suboptimal dietary practice that occur among Ethiopian pregnant women and identify the reason that vigorously associated with the dietary practice, to provide sufficient data for policy makers and planers in advising pregnant women on dietary practice and additional food intake during their pregnancy.

Sub optimal has been identified as one of the severe problems among poor setting populations especially in countries where resources are limited and the results various forms of nutrition problems(19). Unfortunately, diets of pregnant women in low- and middle income countries (LMICs) are monotonous and predominantly plant-based with little consumption of micronutrient-dense animal source foods, fruits, and vegetable. Recognizing that such poor diets are likely to be deficient in multiple micronutrients, supplementation, particularly with iron or iron-folic acid (IFA), has been the mainstay of nutrition interventions targeting pregnant women(13).

A Poor dietary practice can have negative consequences on individuals' health, well-being and development, mainly by reducing physical capacities and resistance to infection. In addition,

cognitive development, reproductive and even social capacities may also be impaired(21,22)

Typically, most of the women in parts of sub-Saharan Africa, including Kenya, enter pregnancy with a poor nutrition status. It has been found that most of the time, the women may enter pregnancy with iron deficiency anaemia and may have other micronutrient deficiencies which adversely affect her health and that of the foetus (21). The fifth Millennium Development Goal (MDG) was to improve maternal health and thus reduce maternal mortality by three-quarters, and the fourth goal aims at reducing infant mortality by half by 2015(22).but now days there is still existing gap. Maternal poor dietary practice has intergenerational cyclic effect. It leads to un reversible effect on future generation. It account for approximately 50 percent of intrauterine growth retardation in developing countries. Most low birth weight in poor setting countries is due to intrauterine growth retardation and low pre-pregnancy weight and height, as shown in a meta-analysis of 25 studies of maternal anthropometry and pregnancy outcome from 20 countries. Low birth weight, which is primarily the result of maternal malnutrition (either before conception or during pregnancy) is an indirect indicator of women's nutritional status(23).

Ethiopia has an unacceptably high burden of maternal and neonatal morbidity and mortality rates(24). High level of multiple micronutrient deficiencies and thinness (underweight) among mothers, childhood stunting and wasting are key malnutrition related features signifying the extent and depth of nutritional problems in the country. High burden of adverse perinatal outcomes such as low birth weight, preterm and still birth are not uncommon(25).

Notably, despite the importance of dietary practice being well acknowledged in Ethiopia there is still sub optimal practice is continuing. So the current study focused on sub optimal dietary practice and nutritional status and associated factors.

1.2. Significance of the study

Sub optimal dietary practice and under nutrition among pregnant women are a major cause of health problems currently facing the communities. Information about pregnant mother dietary practice and nutritional status during pregnancy is important for deciding control strategies, more over data on dietary practice, nutritional status and associated factors are important indicators of major public health, since the consequences are intergenerational cyclic effect on both mother and fetus. Therefore, findings was enabled as to identify sub optimal dietary practice, nutritional status of pregnant women and factors associated among pregnant. The findings will be used to plan, implement, monitor and evaluate health service activities of maternal situation, nutritional policy and put a ground for further study. It can be used by Ministry of health, NGOs, local health planners, and other organizations working in the promotion of maternal health to implement programmes aimed at improving dietary practice among pregnant women as a way to improve maternal nutritional status in the Country and other areas with similar circumstances. The study has also contributed to knowledge on sub optimal dietary practice and under nutrition of pregnant women and factors related to it.

CHAPTER TWO

2. Literature review

2.1. Magnitude of sub optimal dietary practice and under nutritional

Proper food and good nutrition are essential for survival, physical growth, mental development, performance and productivity, health and well-being. Pregnancy is a critical phase in a woman's life, when the expectant mother needs optimal nutrients of superior food qualities to support the developing fetus.(1).

Optimal nutritional supply is of a great importance to satisfy the nutritional requirements of all human beings for body maintenance, growth, strength, physical work, cognitive ability, immunity and good health. During early life, the growth and development of the body as well as its maintenance are dependent on correct supply of all essential nutrients. During maturity, when development and growth are complete, the body requires food mainly for the purpose of work, body maintenance and repair. Mistakes made during the growth period can be continuous and irreversible. in reference to current global nutritional status, about one third of the population of all age and gender groups suffer from the deficiencies of micronutrients, particularly that of iron, zinc, iodine, selenium, and vitamin A (22).

Dietary diversity which is one of measurement of dietary practice has continued to gain widespread attention among the population since it has evidently been associated with nutrient adequacy. A diverse diet has been shown to reflect nutrient adequacy since no one food can meet the nutritional requirement of a person. Pregnant women have been considered vulnerable to malnutrition due to their increased nutrient requirement and therefore a variety of foods in their diet is considered imperative in ensuring adequate nutrient intake(27).

Dietary diversity score is considered as a measure of macro- and micronutrients adequacy irrespective of the level of food intake. in some study showed that, the combination of both low diversity and low food intake are given as the cause of nutrient inadequacy(28)**.** Dietary diversity which is defined as the consumption of an adequate variety of food groups has been accepted as an aspect of dietary quality and can indicate nutritional adequacy(29). It declare the ideas that increasing the variety of foods and food groups in the diet helps to improve and ensure adequate intake of essential nutrients and promotes good health and well being (30).

The study conducted in India shows that majority of women in the reproductive age group in a rural field practice area had dietary diversity score (DDS) and food variety score (FVS) score above 5 and 4 respectively. One third (28.6% ±6.5%) of them were malnourished. The mean waist circumference was 79.31±10.58cms. On application of logistic regression, those aged between 15-30 years had better odds of having DDS of 5 and above (aOR 2.348 CI 0.743-7.424). Subjects with normal BMI range also had better odds of having DDS of 5 and above (aOR 0.861 CI 0.154-4.799). The presence of widespread misconceptions about weight gain during pregnancy, the food taboos among some population segments, and the relatively low awareness about maternal nutrition may be some of the underlying reasons.(31).

According to study conducted in Malaysia**,** among pregnant women who attended Obstetrics and Gynaecology clinic during their antenatal care visits, knowledge, attitude and practice on food and nutrition questionnaire was utilized and observed that, there was significant positive but not strong correlation between nutrition knowledge and practices (r= 0.152, p=0.003), knowledge and attitude (r= 0.154, p=0.002) and attitude and practice (r=0.147, p=0.004)(32). Again form the study conducted in this area, the mean Food Variety Score (FVS) is similar for women (7.0$\pm$2.1) and children (6.9$\pm$1.9). The similarity in foods consumed by mothers and children was further confirmed by the significant correlation between the FVS of mothers and children (r=0.78, p<0.001). The number of food items consumed by both mothers and children over the 3 day period ranged from 2 to 13, indicating a diet with little variety. The most prevalent household type was normal weight mother/underweight child (31.9%), followed by overweight mother/underweight child (25.8%), overweight mother/normal weight child (25.3%), normal weight mother/normal weight child (14.8%) and underweight mother/normal weight child (2.2%)(40).

Study conducted in the village Bashahpur, Gurgaon depicted that BMI (Body Mass Index) showed a negative relation with the number and frequency of diseases, i.e. the frequency of diseases was found to be more among underweight females than females with normal BMIs. BMI was also found to be positively co-related with the general awareness of the females, i.e. the females with better awareness about health and hygiene had normal BMIs than the females with lesser awareness(43).

Study conducted in Southern Brazil showed that , there was a high prevalence of major depressive disorder among women with low fruit intake (43%, PR 1.43, 95%CI 1.04-1.95) and

high sweets and sugars intake(91%, PR 1.91, 95%CI 1.19-3.07). Women with a common-Brazilian dietary pattern had higher prevalence of major depressive disorder compared to those with a varied consumption pattern (PR 1.43, 95%CI 1.01-2.02). Low intake of beans was significantly associated with generalized anxiety disorder (PR 1.40, 95%CI 1.01-1.93)(35).

The study conducted in Kenya shows that, the mean dietary diversity score (DDS) was 7.49±1.43 with 20% having high dietary diversity. Significant differences showed in DDS based on marital status with the married more likely to have a higher DDS of 7.56±1.3b and the single had a lower DDS of 5.33±3.79a, (ANOVA, p= 0.027)(6). Again another study in these area (Kenya) reveal that, the mean Dietary Diversity Score (DDS) was 6.84 ± 1.46 SD. This study also touch that the mean intake of energy, carbohydrate, protein, fat, zinc, iron, folate and vitamin C was inadequate while those of Vitamin A and calcium were adequate. In respect to nutritional status, 19.3% were undernourished based on Mid-Upper Arm Circumference (MUAC) (36). According to dietary guidelines for Americans; appropriate and timely vitamin and mineral supplementation; avoidance of alcohol, tobacco, and other harmful substances; and safe food handling. Pregnant women with inappropriate weight gain, hyperemesis, poor dietary patterns, phenylketonuria, certain chronic health problems, or a history of substance abuse should be referred to a registered dietitian for medical nutrition therapy(37).

From study conducted on dietary diversity and nutritional status of pregnant women aged 15-49 years attending kapenguria district hospital west pokot county, Kenya, When Pearson correlation was done, DDS was negatively correlated with parity(r=- 0.114) and gestation(r=-0.099), however, the relationship was not significant (p>0.05). MUAC findings were negatively correlated with gestation in weeks (r=-0.184, p=0.027) and this shows that the nutrition status deteriorated with advancement of pregnancy. The deterioration in nutrition status may be attributed to the fact that a foetus's nutritional needs increase as they continue to mature in the womb and therefore if the mothers' dietary intake does not change, the foetus is likely to draw from the maternal stores leading to poor nutrition status for the pregnant woman. In this study, negative correlations were observed for gestation in weeks (r=-0.057) and parity (r=-0.052) and the Hb concentration of the pregnant women though the correlations were not statistically significant (P>0.05). Regression showed that the age of the mother and the numbers of births were significant predictors of the MUAC of the pregnant women. The MUAC increased with increase in age while it reduced with increase in the number of births.

(MUAC=19.767+0.21(Age)-0.393(Parity), p=0.001).The MUAC reading as an indicator of nutrition status is highly dependent on the socio economic status of a pregnant. The asset ownership was used as a proxy indicator of the socio economic status. Pearson, correlation was don and significant positive correlations between MUAC reading and the ownership of assets (*r*= 0.229, p = 0.006). The higher the number of assets owned, the higher the MUAC denoting a better nutrition status. According to this study, the most owned assets were radios (77%, land (65%), beds (99%) cell phone (85%), hoes (77%). Ownership of certain assets such as radios and cell phones indicates an improvement in access to information. Television sets (TV) were owned by 38% of the respondents. Ownership of radios and Television sets is indicative of an improved level of awareness on various issues with regard to health. Four out of every ten people owned paraffin stoves. Around 26% of the respondents owned Video Cassette Decoder (VCD)/Digital Video Decoder (DVD) and bicycles. The least owned assets were cars, oxen, and motorcycle as they were owned by less than 15(n=23) of the respondents. Morbidity was found to negatively correlate with nutrition status based on MUAC (*r*=-0. 108) though not significantly (p >0.05). A chi square test was performed and there was a relationship between nutrition status based on Hb and presence of morbidity (2=3.325, df=1, p=0.05). The study again detect that, In severely food-insecure households, 40% had 1.5 (95% CI, 1.17 to 1.92) times as likely as women in food-secure households to have poor dietary practice .(38).

From study that was assessed on simple indicators of dietary diversity, such as could be generated from large household surveys, to serve as proxy indicators of micronutrient adequacy for population-level assessment, 5 existing data sets (from Burkina Faso, Mali, Mozambique, Bangladesh, and the Philippine) shows that The higher risk of anemia among pregnant women in the inadequate WDDS group is not surprising and can be partly explained by a lower energy and nutrient intake than in the adequate group. from studies in Madagascar, young children in various countries showed nutrient intakes increased with an increase in dietary diversity(44,45).

A cross-sectional study conducted on health and nutrition knowledge, attitudes and of pregnant women attending and not-attending ANC clinics in Western Kenya depicted that nutrition knowledge, attitudes, and DDS were not significantly different between ANC clinic attending and non-attending women. Higher number of ANC clinic visits and higher maternal education level were significantly positively associated with maternal health knowledge. Unadjusted comparisons in nutrition and health knowledge scores, attitude score, and dietary diversity score

of women by ANC attendance. Overall, 46% of the women in the study had a level of nutrition knowledge, 44.6% had moderate health knowledge level, and 80.7% had moderate DDS. Attitude score was high (>7 out of 10) for 59.6% of the women. Health knowledge score was marginally higher among women who had attended ANC clinic compared to non-attendees (6.3 vs. 6.0, p = 0.045). In adjusted analyses, the number of ANC clinic visits was significantly associated with health knowledge score, controlling for maternal age, education level, and involvement in income generating activities. compared to no ANC clinic visits, <4 ANC clinic visits were positively associated with greater health knowledge (0.35, $p < 0.05$), with the magnitude of the association increasing significantly for ≥4 ANC clinic visits (0.89, $p < 0.001$)(41).

2.2. Factors Associated with suboptimal dietary practice and under nutrition

The main cause of multiple micronutrient deficiencies is a poor quality diet, often due to an inadequate intake of animal source foods (ASF) especially in developing countries. Women who avoid meat and/or milk in wealthier regions of the world are also at higher risk of micronutrient depletion during pregnancy and lactation(42).

The study conducted in Uganda showed that DDS decreased with progressively worse HFI, an association best explained by a derived household wealth index. Compared with women from food-secure households, women of mild, moderate, and severe HFI were less likely, in a dose-response fashion, to have consumed dairy products [adjusted ORs (95% CIs): 0.73 (0.69, 0.78), 0.62 (0.58, 0.66), and 0.52 (0.48, 0.55), respectively], eggs [0.81 (0.76, 0.85), 0.73 (0.68, 0.77), and 0.61 (0.57, 0.65)], meat [0.83 (0.79, 0.88), 0.73 (0.69, 0.78), and 0.60 (0.56, 0.64)], fish [0.87 (0.80, 0.94), 0.76 (0.70, 0.83), and 0.59 (0.54, 0.65)], legumes and nuts [0.88 (0.83, 0.93), 0.81 (0.76, 0.87), and 0.79 (0.74, 0.85)], and yellow and orange fruit and vegetables [0.85 (0.80, 0.91), 0.78 (0.73, 0.84), and 0.72 (0.67, 0.78)]. Neither intake of dark-green leafy vegetables nor of vegetable oil was associated with HFI status (63) .

A study done in Butajira, rural central Ethiopia indicates that, Dietary patterns adopted by the pregnant women were largely plant-based, predominantly cereal and legume-based. The nutrient-density of the foods was low and the overall dietary diversity was low. Mothers who consistently consumed ≥ 4 food groups (out of nine) had a lower risk of anemia [adjusted RR (ARR: 2.29; 95% CI: 1.62, 3.24], LBW (ARR: 2.06; 95% CI: 1.03, 4.11), and PTB (ARR: 4.61; 95% CI: 2.31, 919) but not of stillbirth (ARR: 2.71; 95% CI: 0.88, 8.36) deliveries than those who

consumed undiversified diets. Low or inconsistent consumption of dark green leafy vegetables (adjusted odds ratio (AOR), 2.012; 95% confidence interval (CI): 1.04; 3.87), dairy products (AOR, 2.64; 95% CI: 1.11; 6.30), and fruits and vegetables (AOR, 2.92; 95% CI: 1.49; 5.67) were associated with increased risk of APO(43).

Another cross-sectional study conducted at in Addis Ababa, Black lion Hospital, out of 395 respondents, 37% pregnant women had a habit of eating meat and animal products once per week, while 26% eat once in a month, 21% of them every other day and 11 were use once in a year. One hundred thirty three (33.67%) of the respondents had the habit of eating green leafy vegetables, 32%, 22%, and 9% had the habit of eating green leafy vegetables every other day, once per week and once in a month respectively. 73% of the study participant had the habit of drinking coffee/tea immediately after meal and 67% had the habit of eating fruits after meal. Multiple logistic regressions did not show statistically significant association between anemia and any of the dietary habits(45)**.**

Institution based cross-sectional study employed Mekelle town among 619 pregnant women have shown the prevalence of anemia was 20% and relationship with meal frequency less than two per day, Low and medium Dietary Diversity score and Meat consumption less than once per week were found to be factors associated with Anemia in pregnant **.**

Study conducted in Wondo Genet district of SNNPRS, Energy intake of study participants in 2nd and 3rd trimester's pregnancy were 2308 kcal for 2340 kcal and 1420.5 kcal for 2452 kcal. Vitamin A intake was 3 micro grams for 800 micro grams. Protein intake of the study respondents in 2nd and 3rd trimester pregnancy was 45.9 g and 31.5g for 71g. majority (75.2 %) of study participants did not take additional meal during pregnancy 69.3 % skipped one of their regular meals. Total of 9.2 % of the study subjects were undernourished. The study also showed strong association of number of pregnancy, consumption of cereal foods, household size, growing *khat* and vegetables with nutritional status and dietary practices. multiple pregnancy and no consumption of cereal-based foods have a significant association on the nutritional status (mid upper arm circumference) of the pregnant women with adjusted odds ratio (AOR) = 1.96, 95% confidence interval (CI) = (1.02-3.75) and AOR = 3.69, 95% CI = (1.11-12.29), respectively (47) .

Another study conducted in Wollega Zone showed only 33.9% of the respondents were found to have poor nutritional practices during their pregnancy. As indicated in the study, (59.9%) and

(70.9%) of the respondents did not practiced the habit of eating snacks and carbohydrates between meals during their pregnancy respectively. But (40.1%) and (29.1%) of the respondents had the practice of eating snacks and carbohydrate respectively between meals during their pregnancy(18).

Study conducted in Gondar town, from the total of study participant(580) responded for the questions to assess their dietary practices, 59.9% of them had poor dietary practice in which, less than half (39.9%) respondents had practiced avoiding food during their pregnancy. 73.5% and 64.6% of the respondents had practiced the habit of eating snacks and carbohydrates between meals during their pregnancy respectively. 26.5% and 35.4% of the respondents did not practiced eating snacks and carbohydrate (respectively) between meals during their pregnancy. The study showed that there was statistically significant association between family income and dietary practices of mothers. The likelihood of dietary practice during pregnancy among mothers who had monthly income of 1000-2000 was 2 times higher than those <1000 monthly income (AOR=2.18, 95% CI: 1.39, 3.39). The study also identified that educational status had strong statistical association with dietary practices of mothers during pregnancy. Relative to the pregnant women with no formal education women with educational level of diploma and above had nearly 3 times more likely to had good dietary practice during pregnancy (AOR=2.59, 95% CI: 1.38-4.85)(48).

Study conducted in South western Ethiopia depict that , the mean birth weight was 2989 grams (SD±504 grams), and the incidence of LBW was 17.88%. The mean birth weight of babies after unwanted pregnancy was 114 g lower compared to births from intended pregnancy. Similarly, mean birth weight for babies among women with symptoms of antenatal depression was 116 grams lower. Results of unadjusted log-binomial regression showed that unwanted pregnancy, prenatal depression and social support were associated with LBW(49). Hence, Women of reproductive age living in resource-poor settings are at high risk of inadequate micro nutrient intakes when diets lack diversity and are dominated by staple food.

2.3. Conceptual framework

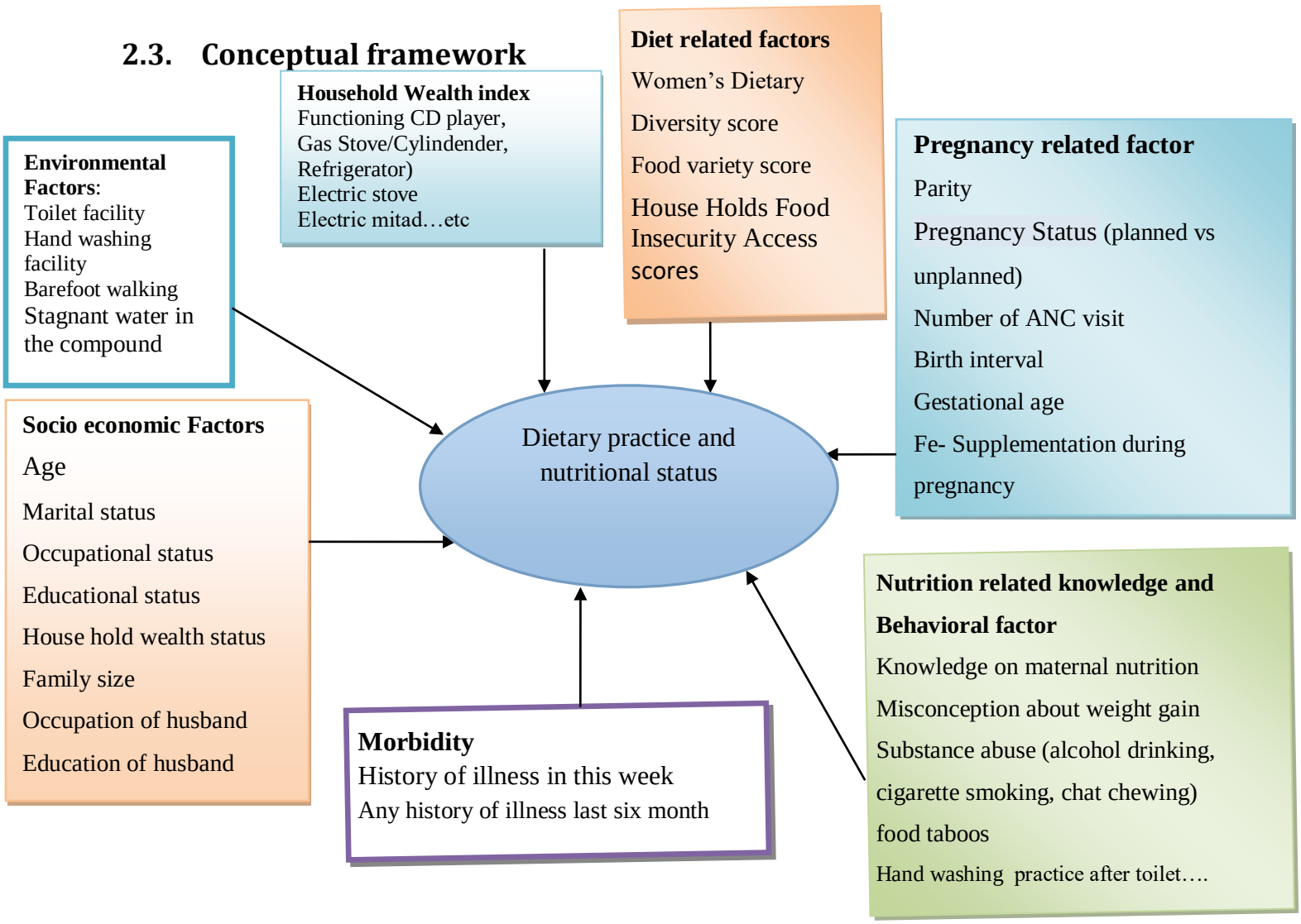

Figure 1. Conceptual framework for factors influencing maternal dietary practice and nutritional status (prepared from reviewed literatures)

CHAPTER THREE

3. Objectives

3.1. General objective

To assess the dietary practice, nutritional status and associated factors among pregnant women attending ANC service, in Mettu Karl referral hospital, south west Ethiopia, 2018.

3.2. Specific objectives

1. To assess the dietary practice of pregnant women
2. To determine nutritional status in the study population.
3. To identify factors associated with dietary practice in the study population.
4. To identify factors associated with nutritional status in the study population.

CHAPTER FOUR

4. METHODS AND MATERIALS

4.1. Study area and period

The study was conducted from March to April 2018 in Mettu Karl hospital which is located in Mettu town at 600 km in Southwest of the Country's Capital Addis Ababa. Mettu Town is the administrative center of Ilu-Aba-Bor zone; one of the 24 zones in Oromia Regional state. The town is surrounded by Tulube kebele in northwest, Kodo in north east, Sardo in north, Gaba Guda in south, Madalu in west, and Made in south West. The town is divided into 3 kebeles with an estimated total population of 1.5million under the catchment of the hospital. From total population (330,0000) in the catchment area, 30% (9,600) had been expected pregnancy over a year period. The hospital was established by the government in 1957 and renovated by NGO "Menschen fuer Menschen" during 1992 E.C. It has a total of 14 medical doctors, 5 specialized doctors in different fields, 12 laboratory professionals, 87 Nurses and 21 Midwives. The hospital has different wards including gynecology ward with 32 beds, medical ward with 41 beds, surgical ward with two operation rooms & 65 beds, pediatrics ward with 41 beds, and an adult and neonatal intensive care units. The Antenatal Care (ANC) clinic under the maternity ward provides different services including identification of pre-existing health conditions (e.g. checking for weight, anemia, hypertension, syphilis, HIV status); early detection of complications arising during pregnancy (e.g pre-eclampsia, gestational diabetes); health promotion and disease prevention (e.g., tetanus vaccine, prevention and treatment of malaria, , micronutrient supplements, family planning counseling); birth preparedness and complication planning (e.g. birth and emergency plan, breastfeeding counseling, antiretroviral for HIV positive women and reducing mother-to- child transmission of HIV.

4.2. ***Study Design***- An institution based cross-sectional study design was used.

4.3. ***Source Population***- All pregnant women attending ANC services in Mettu Karl hospital.

4.4. ***Study Population***- Selected subjects from pregnant women aged 15-49 years who attended the Antenatal Clinic in Mettu Karl hospital in March and April, 2018.

4.5. Eligibility criteria

4.5.1. Inclusions Criteria

Pregnant women attending the ANC service in MK hospital in reproductive age group (15-49) and who agreed to participate in the study

4.5.2. Exclusion Criteria

Pregnant women who came to the facility seeking health care other than ANC service, women who have been living in Mettu town for at least six months and above, women who were already included into the study during a previous ANC visit, or who had difficulty of completing the interview like in the case of mental health problems or other critical illness.

4.6. Sample Size Determination

In this study, sample size was determined by using the Epi Info™ 7.lnk. Taking poor practice (33.9%), under nutrition (9.2%) and dietary knowledge of pregnant (25%) during pregnancy to obtain the maximum sample size with 5% marginal error, 95% CI, a none response rate of 10%. Finally largest sample size (378) was used to take the study subject for this study.

4.7. Sampling procedure

A systematic random sampling technique was employed to select the study respondents. The sampling interval (k) of 2 was calculated based on an expected 800clinets per two months ANC attendants during the study period and the required sample size of 378 subjects. A lottery method was used to select the random start of the first ANC attendants. Then, subsequent study participants were selected by taking every 2nd ANC attendants in their order of arrival to the ANC clinic. The enrollment period was extended to two months to have more varied number of pregnant mothers.

4.8. Variables-

4.8.1. Dependent variables: Dietary practice and nutritional status

4.8.2. Independent variables:

- **Socio-demographic factors:** age, ethnicity, place of residence, educational status, religion, house hold wealth status, family size, occupational status, marital status, occupation of husband, education of husband.
- **Maternal nutrition related knowledge and behavioral factors:** knowledge of mothers about recommended dietary practice, food taboos, misconception about weight gain,

substance abuse (chat chewing, cigarette smoking and alcohol drinking), and house hold food insecurity access scale.

- **Pregnancy related factor parity:** gestational age, birth interval, types of pregnancy, number of ANC visit, iron supplementation.
- **Morbidity:** history of illness in last two weeks, any history of illness last six month, Having Intestinal Parasite(stool examination)
- **Environmental factors :** toilet facility in the compound , hand washing facility after toilet, barefoot walking in the compound, stagnant water in the compound

4.9. Data collection and measurements

Midwives working in the ANC Unit conducted face-to-face interview of study participants and carried out MUAC measurements after they received a two-days training, whereas two Clinical Nurses supervised the data collection. A pre-tested structured questionnaire initially prepared in English and translated into Afan Oromo was used to collect data on dietary practice, food-security status, and potential predictors of diet and nutritional status including demographic characteristics, wealth indicators, pregnancy related characteristics, morbidity, dietary related characteristics, and nutrition related knowledge, behavioral factors and environmental factors. . Before the start of data collection, the Afan Oromo version of the questionnaire was back translated to English by another person and cross-checked with the original version so that to see if there was any inconsistency in translation. Pre-testing of the questionnaire was perfumed on 19 pregnant women from a Mettu health center. Under the construct of nutrition knowledge, there were eight questions for the study. Nutrition knowledge questions aimed in assessing nutrition knowledge of pregnant women on the aspects of nutrition required during pregnancy. The questions assessed respondents' knowledge which was assumed to be measured through the following questions like balanced diet, iron rich food, different food groups, vitamin A rich food, disease protective diet and importance of diversified food. Accordingly, respondents were allowed to choose correct answers by indicating whether a given statement was yes or no. Finally, the knowledge of respondents on nutrition were scored and computed for the nutrition knowledge variables. One point was allocated to a correct response for all questions of nutrition knowledge in which the correct answers summed together (the sum of the total scores for nutrition knowledge varied from 0 up to 8 points maximum score and converted out of 100. Finally the level of knowledge scored and categorized as "well knows" (pregnant mother who

responded more than 50% questions) and otherwise considered as “moderately knows”. Household wealth status was assessed using wealth constructs reflecting household assets, utilities and housing characteristics adopted from the Ethiopian Demographic and Health Survey (61). The principal components analysis was used to generate latent factors representing the wealth data (29) with the first factor considered as household wealth score which was then categorized into wealth tertiles.

Household food-security status was assessed using the Household Food Insecurity Access Scale (HFIAS) that has been validated and used in other developing countries (56). The tool has nine questions enquiring about the household’s last month experience on three domains of food insecurity: feeling uncertainty of food supply, insufficient quality of food, and insufficient food intake and/or its physical consequences. A HFIAS sore ranging from 0 to 27 was calculated for each participant and then households were categorized into different levels food-security (food-secure and mildly, moderately, or severely food-insecure) according to the recommendation (56).

A 24-hour qualitative dietary recall was collected to calculate individual Women Dietary Diversity (WDD), a score based on nine food groups that are recommended as qualitative indicator of micronutrient adequacy of a diet were used (58). An index for optimal dietary practice during pregnancy was generated using information about the study participants’ DDS and their usual frequency of meals per day. Mothers were considered to have an optimal dietary practice if they had a DDS ≥ 6 and reported consumption of additional meal during pregnancy (+3 meals per day) and otherwise considered to have a sub-optimal dietary intake.

Mid-Upper Arm-Circumference (MUAC) measurement was taken on the left arm of participants to the nearest 0.1 cm using flexible and non-stretchable measuring tapes following the standard procedures (58). Mothers were considered under-nourished when their MUAC value was less than 21.0 cm and otherwise well-nourished.

4.10. Data Analysis

Data were cleaned and entered using EpiData version 3.5.1 and exported to IMB version 20 for analysis. Summary statistics of mean and percentages were used to describe the study population by the study outcomes and demographic characteristics and other relevant risk-factors. The principal components analysis was used to generate latent factors representing the wealth data (29) with the first factor considered as household wealth score which was then categorized into wealth tertiles. It involved replacing many correlated variables with a set of principal

uncorrelated 'principal components' which explain much of the variance and represented unobserved characteristics of the population. We fitted bivariate logistic regression models to assess the association between each of the study outcomes (sub-optimal dietary practice and under-nutrition) and the different potential risk-factors. Then, multivariable logistic models were fitted to identify independent determinants of sub-optimal dietary practice and under-nutrition prevalence. For the multivariable regression modeling, the covariates to be included in a model were selected based their univariate association with the outcome where variables with P-value< 0.25 were included. Adequacy of the models to predict the outcome variables was checked using the Hosmer–Lemeshow test. The presence multicollinearity among covariates in the multivariable models was also assessed. The strength of association between the different risk-factors and the study outcomes were reported using crude and adjusted odd ratios and the presence of statistically significant association was considered at alpha less than 0.05.

4.11. Ethical consideration

Ethical clearance was obtained from the Institutional Research Review Board of Jimma University and submitted to Mettu town health office. Prior to the start of data collection, verbal consent was requested from each of the study participants after information was provided about the nature and objective of the study. Participants were informed that they have the right not to participate in the study or can withdraw at any time point with no repercussion on the quality of ANC or other services they receive.

4.12. Dissemination of the result

The findings of this study will be presented and a comprehensive report will be submitted to Jimma University Institute of Health Sciences. The findings will also be disseminated to relevant stakeholders in the study area and attempts will be made to publish in a peer-reviewed scientific journal.

4.13. Operational Definition

- **Additional meal-** Consumption of one additional (3^+) meal per day during pregnancy to ensure proper nourishment of both pregnant and fetus
- **Dietary diversity scores:** is the number of food groups consumed by the participant during the period of 24 hours prior to the interview. The calculation considered nine food groups with potential score of 0 to 9. The food groups considered included cereal ,white roots &

tubers ; dark green leafy vegetables ; vitamin A rich fruits, vegetables & tuber ; other fruits and vegetables ; organ meat ; meat and fish ; eggs; legumes, nuts and seeds; milk and milk products.

- **Meal:** a food consumption in a day is considered to be a meal when prepared and served in certain occasion that takes place at a certain time like breakfast, lunch and dinner while is a portion of food, smaller than a regular meal, generally eaten between meals.
- **Optimal dietary practice**- A pregnant women was considered to have an optimal dietary practice when she had a DDS of more than 6 and a usual meal frequency of more than three, and otherwise considered as having a suboptimal dietary practice.
- **Under nutrition-** a pregnant women was considered to be under-nourished if her MUAC measurement is below 21.0 cm.

5. Results

5.1. Socio-demographic characteristics of the study participant

A total of 378 sampled pregnant women participated in the study giving a response rate of 100%. The mean (SD) age of participants was 28.9 (5.25) years. Majorities (62.4%) of the respondents were in the age range of 25-34 years and most of them were married (92.6%). Regarding the ethnic and religious composition of respondents, more than half (63.8%) of the respondent were from Oromo ethnic group and 165 (43.7%) were follower of Islam. About one in three respondents attended completed levels primary education 142 (37.6%) and were house wives by occupation 119 (31.5%). One hundred forty one (37.3%) of the respondent's husbands were merchant and 157 (41.5%) attended some level of primary education. More than (58.2%) of the respondents' were from a family of size was less than five members. (Table 1).

Table 1: Socio-demographic characteristics of pregnant women attending ANC service (n=378) at Mettu Karl referral Hospital, March to April 2018

Variable	Number (%)
Age in years	
15-24	85 (22.5)
25-34	236 (62.4)
35-44	57 (15.1)
Religion	
Muslim	165 (43.7)
Orthodox	100 (26.5)
Protestant	109 (28.8)
Catholic	4 (1.1)
Ethnicity	
Oromo	242 (63.9)
Amhara	66 (17.4)
Gurage	43 (11.30
Others	28 (7.4)
Maternal educational status	
No formal education	43 (11.4)
Primary education	142 (37.6)
Secondary education	128 (33.9)
Diploma and above	65 (17.2)
Marital status	
Currently married	350 (92.6)
Currently unmarried	28 (7.4)
Maternal occupational	
Civil servant	92 (24.3)
Farmer	54 (14.3)
Merchant	93 (24.6)
House wife	119 (31.5)
Un employed	20 (5.3)
Family size	
≤ 5	220 (58.2)
Occupation of husband	
Governmental worker	126 (33.3)
Farmer	54 (14.3)
Merchant	141 (37.3)
Un employed	57 (15.1))
Educational status of husband	
No formal education	23 (6.1)
Primary education	157 (41.5)
Secondary education	115 (30.4)
Diploma	83 (22)

(Silte, Kefa and Tigre)*

5.2. Maternal and pregnancy related characteristics

Nearly half (46.8%) of respondents visited the Antenatal care service twice and majority (64.6%) of them were taking iron supplement. More than three fourth of the study participants (78.3%) reported that the pregnancy was wanted and planned. Most of the respondents (70.1%) were in

their second trimester (13-28 weeks of gestation) and almost half (15.1%) of the respondent were Grandparous. The mean birth interval of study participants were 27.58 (20.6%). Among studied population, around 67 (17.7%) of pregnant women have faced illness in the last two weeks and twenty pregnant (5.3%) face illness in the last six months and only 3(0.8%), 11 (2.9%), and 16 (4.2%) of pregnant women practiced cigarette smoking, alcohol drinking and chat chewing respectively. Regarding knowledge maternal towards recommended dietary practice, more than three fourth (79.1%) of respondents has moderate knowledge. The majority (81.2%) of households experienced secured food in the month prior to the study and 32(8.5%) were severely food insecured. Though most (84.7%) of pregnant women had latrine facility in the compound, only 29.4% of the respondents had toilet provided with hand washing facility. Twenty three (6.1%) of participants reported there is stagnant water in their compound and 50 (13.2%) of the respondent had positive result of stool examination (Table 2).

Table 2: Dietary and nutritional related factors of pregnant women attending ANC service (n=378) at Mettu Karl referral Hospital, March to April 2018

Characteristics	Number (%)
ANC	
Ones	117 (30.9)
Twice	177 (46.8)
Three times and above	84 (22.2)
Took iron supplementation	329 (87%)
Frequency of iron intake (n=329)	
Daily	216 (57)
Sometimes	113 (30)
Types of pregnancy	
Wanted planned	296 (78.3)
Wanted unplanned	82 (21.7)
Gestational Age (in wks)	
First trimester (<12weeks)	13 (3.4)
Second trimester(13-28weeks)	265 (70.1)
Third trimester(>28weeks)	100 (26.5)
Number of pregnancy	
≤ 2	208 (55.0)
3-4	113 (29.9)
≥5	57 (15.1)
Birth interval	
Sub optimal (<3 yrs)	90 (23.8)
Optimal(≥ 3 yrs)	288 (76.2)
Sick during last two weeks	67 (17.7)
Sickness last six month	20 (5.3)
Substance abuse(30)	
Cigarette smoking	3 (0.80)
Alcohol drinking	11 (2.90)
Chat chewing	16 (4.20)
Knowledge of dietary related factor	
Moderately knows	299 (79.1)
Well knows	79 (20.9)
Household food-security status (HFIAS score)	
Food Secure	307 (81.2)
Mildly Food Insecure Access	16 (4.20)
Moderately Food Insecure Access	23 (6.10)
Severely Food Insecure Access	32 (8.50)
Have latrine facility in the compound	320 (84.7)
Have hand washing practice before meal, food preparation & after visiting toilet	111 (29.4)
Stagnant water in the compound	23 (6.10)
Stool examination result(positive ovum)	50 (13.2)

HFIAS: household food insecurity access scale

5.3. Dietary Practice and Nutritional status of pregnant Women

Nearly all (98.9%) of the study participants had consumed cereals in the previous 24 hours. Meat and organ meat consumption were reported by 120 (31.7%) and 50 (13.2%) of respondents respectively. The mean (SD) DDS of participants were 6.23(1.60) and 216 (59.5%) had DDS≥ 6. Consumption of additional meal (3^{+}) during pregnancy was reported by 241 (63.8%) study subjects. The respondents that reported a habit of skipping meal and avoiding prohibited foods during pregnancy were 25 (3.96%) and 8 (2.11%) respectively. A total of 85 (22.5%) respondents were found to have a sub-optimal dietary practice based on an individual WDDS< 6 and/or usual meal frequency of ≤3. Sixty-six (17.50%) study subjects were found to be undernourished (MUAC< 21.0 cm) (Table 3).

Table 3: Dietary practice and nutritional status of pregnant women attending ANC service (n=378) at Mettu Karl referral Hospital, March to April 2018

Variables	Number (%)
Minimum acceptable diet diversity (WDDS≥ 6)	216 (57.10)
Additional meal during pregnancy (3^{+}meals/day)	241 (63.75)
Skipping meal During pregnancy	15 (3.96)
Avoid prohibited foods during pregnancy	8 (2.11)
Sub-optimal dietary practice (DDS<6 and/or meal frequency ≤ 3/day)	85 (22.5)
Under-nourished (MUAC< 21.0 cm)	66 (17.5)

In general, the prevalence of sub optimal dietary practice was 22.5% among the studied participant and 17.5% of them were under nourished depending up on questions offered to them to assess practices of mothers' maternal nutrition during their pregnancy.

5.4. Factors affecting dietary practice and nutritional status of study participants

A) Bivaraite and multi variable analysis of sub optimal dietary practice

In this study, a total of seven variables were candidates for multivariable analysis. Maternal occupation, family size, husband occupation and education of husband were candidates among socio-demographic variables. Birth interval and knowledge about recommended diet from pregnancy related and Household food security status from dietary related factors were candidates.

In multivariable analysis, it was revealed that family size and Household food security status were significantly associated with sub optimal dietary.

The study revealed that family size was found to have statistically significant association with sub optimal dietary practice. The odd of sub optimal dietary practice is about 8 times higher in family size >5, compared to the family size ≤5 [AOR=8.2, 95%CI: (7.14, 19.2)].

The study showed that there statistically significant association between Household food security status and sub optimal dietary practice. Here, the odds of sub optimal dietary practice was 4 times higher in severely food insecured [AOR=3.661 (1.289, 10.394)] compared to food secured (Table 4)

Table 4: Factors affecting Sub optimal dietary practice of pregnant women attending ANC service (n=378) at Mettu Karl referral Hospital, March to April 2018.

Variables	Dietary practice		COR (95% CI)	AOR (95% CI)
	Sub optimal Number (%)	Optimal Number (%)		
Age cat				
15-24	25 (29.4)	60 (70.6)	1	
25-34	47 (19.9)	189 (80.1)	0.59 (0.34,1.05)	
35-44	13 (22.8)	44 (77.2)	0.71 (0.33,1.54)	
Maternal education				
No formal education	11 (25.6)	32 (74.4)	2.85 (1.01,8.069)	
Primary education	36 (25.4)	106 (74.6)	2.814 (1.178,6.721)	
Secondary education	31 (24.2)	97 (75.8)	2.648(1.096,6.399)	
Diploma and above	7 (10.8)	58 (89.2)	1.00	
Marital status				
Currently unmarried	6 (21.4)	22 (78.6)	0.0795(0.367,2.387)	
Currently married	271 (77.4)	79 (22.6)	1.00	
Maternal occupation				
Governmental worker	11 (25.6)	32 (74.4)	0.484 (0.224,1.048) *	
Farmer	367 (4.4)	106 (74.6)	1.359 (0.639,2.891)	
Merchant	31 (24.2)	97 (75.8)	1.00	
House wife	7 (10.8)	58 (89.2)	1.024 (0.55,1.9)	
Husband's occupation				
Governmental worker	21 (16.7)	105 (83.3)	0.34 (0.74,0.399) *	
Farmer	14 (25.9)	40 (74.1)	1.295 (0.624,2.688)	
Merchant	30 (21.3)	111 (78.7)	1	
Unemployed	20 (35.1)	37 (64.9)	2 (1.016,3.937)	
Family size				
>5	67 (42.4)	91 (57.6)	8.26 (5.041,16.06*	10.1 (7.14,19.2) **
<=5	18 (8.18)	202 (91.8)	1.00	1.00
Husband education				
No formal education	5 (21.7)	18 (78.3)	2.03 (0.616,6.672*	
Primary education	46 (29.3)	111 (70.7)	3.025 (1.436,6.372)	
Secondary education	24 (20.9)	91 (79.1)	1.925 (0.866,4.282)	
Diploma and above	10 (12)	73 (88)	1	

**Candidates variable in bivariate P<0.25) * * (Statistically significant predictor at P<0.05in multivariate)*

Factors affecting Sub optimal dietary practice ……..

Variables	Dietary practice		COR (95% CI)	AOR (95% CI)
	Suboptimal	Optimal		
ANC follow up				
Once	33 (28.2)	84 (71.8)	1.12 (0.62,2.23)	
Twice	31 (17.5)	146 (82.5)	0.64 (0.34,1.19)	
≥3 times	21 (25)	63 (75)	1.00	
Iron supplementation				
Yes	74 (22.5)	255 (77.5)	1.00	
No	11 (22.4)	38 (77.6)	0.99 (0.86,2.05)	
Frequency of iron supplementation(n=329)				
Daily	57 (20.4)	222 (79.6)	1.00	
Sometimes	10 (20)	40 (80)	0.97 (0.46,2.06)	
Condition of pregnancy				
Planned	65 (22)	231 (78)	1.00	
Unplanned	20 (24.4)	62 (75.6)	1.15 (0.646,2.036)	
Gestational age				
First trimester	2	11 (84.6)	1.00	
Second trimester	58 (21.9)	207 (84.6)	1.54 (0.33,7.15)	
Third trimester	25 (25)	75 (75)	1.83 (0.38,8.84)	
Number of pregnancy				
≤ 2	48 (23.10)	160 (76.90)	1	
3-4	24 (21.20)	89(78.80)	0.89 (0.52,1.56)	
≥5	13 (22.80)	44 (77.2)	0.98 (.049,1.97)	
Birth interval				
≥ 3 yrs	67 (23.3)	221 (76.7)	1.00	
< 3 yrs	18 (20)	72 (80)	0.83 (0.46,1.48) *	
Skip meal not to gain weight				
Yes	2	13 (13.3)	0.52 (0.12,2.35)	
No	83 (22.9)	280 (77.1)	1.00	
Yes	5	11		
No	80 (22.1)	282 (77.9)		
Sickness in the last 2 wks				
Yes	4	16 (80)	0.85 (0.28,2.63)	
No	81 (22.6)	277 (77.4)	1.00	
Sickness in the last 6 months				
Yes	18 (26.9)	49 (73.1)	1.34 (0.73,2.45)	
No	67 (2.5)	244 (78.5)	1.00	
Knowledge about RDP				
Poor	41 (26.1)	116 (73.9)	1.42 (0.87,2.31) *	
Good	44 (19.9)	177 (80.1)	1.00	
Household food security status				
Food secure	53 (17.3)	254 (254)	1.00	1.00
Mildly food insecured	5	11 (68.8)	0.29 (0.04,2.31)	0.15 (0.02,1.39)
Moderately food insecure	3	20 (87)	4.11 (1.73,9.79)	2.11 (0.63,7.02)
Severely food insecured	27(84.4)	5	5.1 (2.39,10.78)*	3.66 (1.29,10.39)**
Latrine facility				
Yes	72 (22.5)	248 (77.5)	1.00	
No	13 (33.4)	45 (77.6)	1.01(0.51,1.97)	

**(Candidates variable in bivariate P<0.25) * * (Statistically significant predictor at P<0.05in multivariate)*

B) Bivaraite and multi variable analysis of nutritional status (under nutrition) of pregnant women

In this study, a total of nine variables were candidates for multivariable analysis. Maternal education, marital status, occupation husband were candidates among socio-demographic variables. Gestational age and condition of pregnancy were from maternal related factors and iron supplementation, skipping meal during pregnancy, Dietary Diversity Score and taking one additional meal (3+) were from dietary related factors.

In multivariable analysis, it was revealed that marital status, maternal education, taking iron supplementation, Dietary Diversity Score, intake of one additional meal (3+) per day and skipping meal due to fear of gaining weight were significantly associated with under nutrition.

The study revealed that marital status was found to have statistically significant association with under nutrition. The odd of under nutrition is about 3 times higher in unmarried pregnant women, compared to married pregnant [AOR=3.188, 95% CI: (1.219, 8.336)].

The study showed that there statistically significant association between maternal education and Here, the odds of under nutrition was 9 times higher in pregnant women who have no formal education [AOR=9.405, 95% CI: (1.079, 28.943)] compared to pregnant women who were diploma level and above.

Iron supplementation was the other variable which showed statistically significant association with under nutrition. The odds of developing under nutrition was 3 times [AOR= 3.18; 95% CI: (1.51 – 6.72)] higher in non iron took pregnant women compared to iron taking.

Pregnant women's dietary diversity score was also found to have significant association with under nutrition. The odds of under nutrition is about 4 times [AOR= 4.05% 95%CI (2.16, 7.63)] higher in those dietary diversity score of less than six compared with those pregnant who had dietary diversity score of at least six.

The study revealed that taking at least one additional (3+) is significantly associated with under nutrition. The odds of under nutrition was 2.27 times [AOR – 2.267; 95%, CI (1.21, 4.24)] higher in those who do not have a practice eating one additional meal during their pregnancy compared to those who have eating additional meal practice.

The odds of under nutrition was 3.856 times [AOR – 3.856; 95%, CI (1.099, 13.530)] higher in those who skip meal due to fear of gaining weight during their pregnancy compared to those who have not skip. (Table 5)

Table 5: Factors affecting nutritional status (under-nutrition) of pregnant women attending ANC service (378) at Mettu Karl referral Hospital, March to April 2018

	Under nutrition		COR (95% CI)	AOR (95% CI)
	Ye	No		
Age cat				
15-24	16(18.8)	69 (81.2)	1.00	
25-34	38 (16.1)	198 (83.9)	0.83 (0.43,1.58)	
35-44	12 (21.1)	45 (78.9)	1.15 (0.5,2.66)	
Maternal education				
No formal education	15 (34.9)	28 (65.1)	8.17 (2.84,26.86) *	9.405 (1.079, 28.943)**
Primary education	27 (19)	115 (81)	3.58 (1.19,10.7)	2.966 (0.363, 24.254)
Secondary education	20 (15.6)	108 (84.4)	2.82 (0.92,8.6)	2.770 (0.335, 22.894)
Diploma and above	4	61 (93.8)	1.00	1.00
Marital status				
Currently unmarried	10 (35.7)	18 (64.3)	2.917 (1.28, 6.65)*	3.188 (1.219, 8.336)**
Currently married	56 (16)	294 (84)	1.00	1.00
Maternal Occupation				
Governmental worker	12 (13)	80 (87)	0.92 (0.39,2.15)	
Farmer	11 (20.4	38 (70.4)	1.78 (0.65,3.8)	
Housewife	30 (21.9)	107 (78.1)	1.15 (0.85,3.52)	
Merchant	13 (14)	80 (86)	1.00	
Family size				
>5	15 (14.2)	91 (85.8)	0.71 (0.38,1.34)	
<=5	51 (18.8)	221 (81.2)	1.00	
Husband's occupation				
Governmental worker	14 (11.1)	112 (88.9)	0.76 (0.37,1.57)*	
Farmer	14 (25.9)	40 (74.1	2.12 (0.98,4.56)	
Merchant	20 (14.2)	121 (85.8)	1.00	
Unemployed	18 (31.6)	37 (64.90)	2.94 (1.34,5.8)	
Husband education				
No formal education	8 (34.8)	15 (65.2)	5.79 (2.48,26.86)	
Primary education	36 (22.9)	121 (77.1)	3.23(1.12,10.7)	
Secondary education	15 (13)	100 (87)	1.62 (0.923,8.64)	
Diploma and above	7 (8.4)	76 (91.6)	1.00	
ANC follow up				
Once	33 (28.2)	84 (71.8)	5.12 (2.03,12.85)	
Twice	27 (15.3)	150 (84.7)	2.34 (0.93,5.91)	
>3 times	6 (7.10)	78 (92.9)	1.00	
Iron supplementation				
No	20 (40.8)	29 (59.2)	4.24 (2.22,8.12)*	3.189 (1.513, 6.720)**
Yes	46 (14)	283 (86)	1.00	1
Frequency of iron supplementation(n= 350)				
Daily	38 (13.6)	241 (86.4)	1.00	
Sometimes	20 (40)	30 (60)	4.22 (2.18,8.2)	

**(Candidates variable in bivariate P<0.25) * * (Statistically significant predictor at P<0.05in multivariate)*

Factors affecting nutritional status……

Variables	Under nutrition		COR (95% CI)	AOR (95% CI)
	Yes	No		
Condition of pregnancy				
Planned	45 (15.2)	251 (84.8)	1	
Unplanned	21 (25.6)	61 (74.4)	1.92 (1.07,3.46)*	
Gestational age				
First trimester	3	10 (76.9)	1	
Second trimester	51 (19.2)	214 (80.8)	0.79 (0.21,2.99)*	
Third trimester	12 (12)	88 (88)	0.46 (0.12,1.89)	
Number of pregnancy				
≤ 2	42 (20.20	166 (79.8)	1	
3-5	30 (26.5)	83 (73.5)	0.7(0.39,1.39)	
>5	14 (24.6)	43 (75.4)	0.77 (0.58,2.47)	
Birth interval				
>= 3 years	54 (18.8)	234 (81.2)	1	
Less than 3 years	12 (13.3)	78 (86.7)	0.67 (0.34,1.31)	
Sickness in the last 2 wks				
Yes	13 (19.4)	54 (80.6)	1.17 (0.59,2.3)	
No	53 (17)	258 (83)	1	
Sickness in the last 6 months				
Yes	1	19 (95)	0.24(0.03,1.80)	
No	65 (18.2)	293 (81.8)	1	
Knowledge about RDP				
Poor	28 (17.8)	129 (82.2)	1.05 (0.61,1.79)	
Good	38 (17.2)	18 3(82.8)	1	
Skip meal not to gain weight				
Yes	6	9 (60)	3.37 (1.15,9.81)*	3.856 (1.09,13.53)* *
No	60 (16.5)	303 (83.5)	1	1.00
WDDS				
<6	46 (28.6)	115 (71.4)	3.94 (2.22,6.98)*	4.05(2.13,7.63) **
≥ 6	20 (9.2)	197 (90.8)	1	1.00
Additional meal(3+)				
Yes	38 (15.8)	203 (84.2)	1	1
No	28 (20.4)	109 (79.6)	1.372 (1.099, 2.357)*	2.267 (1.211, 4.244)**
Household food security status				
Food secure	67 (21.80)	240 (78.20)	1	
Mildly food insecured	6 (37.5)	10 (62.50)	2.15 (0.73,6.53)	
Moderately food insecure	6 (26.10)	17 (73.9)	0.72 (0.21,2.50)	
Severely food insecured	7 (21.90)	25 (78.10)	1.00 (0.33,2.41)	
Latrine facility in the compound				
Yes	52 (16.2)	268 (83.8)	1	
No	14 (24.1)	44 (75.9)	1.64 (0.84,3.21)	
Hand washing facility in toilet				
Yes	8 (7.2)	103 (92.8)	1	
No	58 (21.7)	209 (78.3)	3.57 (1.65,7.76)	
Stagnant water in the compound				
Yes	3	16 (84.2)	0.88 (0.25,3.11)	
No	63 (17.5)	296 (82.5)	1	
Stool examination for I/P				
Negative	55 (16.8)	273 (83.2)	1	
Positive	11 (22)	39 (78)	1.4 (0.675,2.9)	

**(Candidates variable in bivariate P<0.25) * * (Statistically significant predictor at P<0.05in multivariate)*

6. Discussion

This study has determined the level of sub-optimal dietary practice and under-nutrition and associated factors among pregnant mothers attending antenatal care service at Mettu Karl Hospital, Southwest Ethiopia. The study showed that 85 (22.5%) of the respondents had sub-optimal dietary practice during their pregnancy. This figure is lower than the report of study conducted in Wollega where 33.9% of the pregnant women had poor dietary practices. The gap is may be due to different perception of pregnant and educational background. In our study about 11.4% of pregnant women have no formal education while 65.4% of study participants were illiterate in case of wollega. Pregnant perception was another significant differences observed between the study setting. In wollega 35.8% of pregnant avoid different type of meal due to some backgrounds like religion, culture, fear to make baby big, make birth difficult whereas in current study almost, there is no foods prohibited (47).

The result of our study also much lower than a study conducted in Gondar town, which showed that , more than half (59.9%) study participant had poor dietary practice which is much more figure from our current studies. The discrepancy may be due to the difference observed in socio demography like maternal education, dietary knowledge which significantly determines the level of dietary practice in Gonder town. Within this study the other difference is may be the tools used to define dietary practice. In our case dietary practice was defined as sub optimal for pregnant mothers who not ate at least one additional meal (3+) and having of dietary diversity score of less than six from the nine food group established in FAO. But in case of Gonder studies seven dietary practice questions were established and respondents classified as sub optimal for pregnant who gave responses below 75% of the question. (18).

Among pregnant women who had sub-optimal dietary practice (WDDS<6 and not having at least one additional meal +3) about 43 % of the respondents had DDS of less than six. This figure was also lower than the finding of study conducted in Kenya where 61% the pregnant women had DDS of less than six. As known antenatal clinic attendance is considered important for ensuring maternal and child health since counseling of recommended dietary practice, nutrition, hygiene, and self care. Based on this, the gap in the above figures may be due to the undisclosed differences in health care service utilization. In case our finding 46.8% of pregnant had twice visit for antenatal care service while only 23.2% of pregnant have twice visit in the study conducted in Kenya. Again the difference is also may be, health status is one of the major

conditions to have good appetite, appropriate dietary practice and nutritional status which again one of the gaps identified among both study. Illness in the last two weeks like heart burn and anorexia were higher (57.5%) in kenyas study while it was about only 17.7% in our study (6).

Even though health sectors developing different health and nutrition programs, results have shown that poor dietary practices during pregnancy are still problem in Ethiopia. The study conducted in Tigray, Northern Ethiopia showed that 56.4% of pregnant had WDDS DDS<6 which was lower from our current study (43%). The different figures might be due to dietary knowledge (improved knowledge on nutrition through nutrition education and integrated key nutrition messages) among pregnant women which showed that 61.4% pregnant had Good dietary knowledge while 79.1% in current studies. (18)

Regarding additional meal (3+ meals) utilization per day, current study display that 36.25% of pregnant women didn't eat additional meal as recommended. This figure have differences from study conducted in Gonder where nearly half (49.2%) of women reported that they didn't utilize an additional meal during their pregnancy (18). the difference may be due to the seasonal variation, Agricultural production system, study design (community versus institution) and study setting.

The study conducted in east Wollega zone showed more than half (59.9%) of the respondents didn't practiced additional meal eating during their pregnancy. This gap again cited due to differences in socio economic and demographic background. For example, about 31.5% pregnant mother in our study area was house wife while it was about 85.7% in Guto Gida of eas Wollega zone. Thus, maternal occupational have strong relationship with their current dietary practice and utilization of additional meal relative to pregnant women employed in different business sectors as they generate their own income and had an opportunity to follow recommendation rather than expecting their husbands' pocket .(47).

This study was in line with study conducted in Accra, Ghana where 41.7% of the respondents did not practice the habit of eating additional meal during their pregnancy (36).

The finding of this study also identified that family size have strong statistical association with dietary practices of mothers during pregnancy (P<0.001). Relative to the pregnant women with family size of ≤5, women with family size of > 5 had 8 times more likely to have sub optimal dietary practice during pregnancy (AOR=8.26, 95%CI: 5.041, 19.06) which is similar to the study conducted in East Wollega Zone, where family size 4 times predictor of sub optimal

dietary practice in pregnant women (AOR: 4.039, 95%CI: 3.6-14.35) (47). The different figures in this predictor's factor among both studies may be due to relatively large number of grand parous pregnant women in our study area.

The study conducted in Tigray showed there statically significant association between maternal dietary practice and family size. The odds sub optima/poor dietary practice was 2 times (AOR=2.32, 95% CI: 1.56, 3.43) high in pregnant women who have family size greater than six. The discrepancy of the two studies may be due to the fact that the differences between the study participants, in that the present study was conducted on urban communities (pregnant mothers) which can be better than rural mothers in terms of educational, economic status and more access to nutrition information during pregnancy. (18)

In addition the finding of this study revealed that Household food insecurity scale during pregnancy have strong statistical association with dietary practices of pregnant women (P<0.001). Women who had severely food insecured during pregnancy had 3.6 times (AOR=3.66 95% CI: 1.289, 10.394) more likely to sub optimal dietary practice than food secured households which is similar to the study conducted in Kenya where, severely food-insecure households had 1.5 times (AOR;1.5 (95% CI, 1.17-1.92) as likely as women in food-secure households to have poor dietary practice (38). This difference predictors figure was might be due to the fact that the seasonal variation that the studies was conducted and socio economic deference.

This study can be supported with research conducted in Jimma Zone which showed that as increased severity of Household Food Insecurity, there are reduced dietary diversity and a strong gradient in the risk of not consuming many nutritious foods with (64) and Disqualify the 1949 (G.c) ideas of Chinese government (Mao) which he tried to urge the Chinese to produce even more children by introducing ideas of "every stomach comes with two hands attached" for ideas raised from population experts to warn him that China would not be able to feed its growing masses.

This study also determined the level of Under-nutrition among pregnant mothers attending antenatal care service at Mettu Karl Hospital, Southwest Ethiopia. The study showed that 66 (17.5%) of the respondents had under-nutrition during their pregnancy. This figure is a little bit lower from the study conducted in Kenya (19.3 %) such discrepancy was may be different Socio economic status which was measured by use of ownership of assets and maternal education

which found to be significant factors affecting the nutrition status pregnant when compared to our study. (36).

The study conducted in Tanzania showed lower (11%) findings under nutrition prevalence of among pregnant compared to current study. The lower figures obtained might be due the study design and cutt off used to consider under nutrition (cluster random sampling, MUAC ≤ 22.5 in case of Tanzania while crossectional and MUAC ≤ 21) was quite different (65)

The report of study conducted in Wondo Genet district of SNNPRS showed that 9.2 % of the pregnant women were under nourished (18). The probable reason for this gap might be due condition of pregnancy (planned and un planned) and respondents access to information about nutrition during pregnancy.

The finding of this study showed the lower level of under nutrition compared to study conducted at Central Refit Valley of Ethiopia at community level which prevalence of under nutrition among pregnant women was 31.8% with MUAC of <21 cm (59). The difference may be due relatively a high proportion of study subjects 22.9% missed ANC service elements in this central part and 75% study subjects did not received services for birth preparedness and complication readiness which was lees better report of EDHS 2011 that was 80% of pregnant women were ill-equipped to make appropriate choices especially when they are in danger.

Pregnant from our study areas could be experienced with current under nutrition that was lower compared to study result (35.5%) conducted at Boricha distract Sidama zone (60). The discrepancy might be due to the inflation of market business that the country is facing nowadays and the other reason may be that, around 31.7% of pregnant in Sidama were from food insecured households.

The finding of this study identified that, marital status, education of pregnant, iron supplementation on current pregnancy, WDDS, taking one more additional meal (3+) and skipping meal due to fear of gaining weight were identified to be independently associated with nutritional status. Relative to married pregnant women, non married women were 3.2 times [AOR= 3.188, 95% CI: (1.219, 8.336)] more likely to be under-nourished during pregnancy. This similar with the study conducted in Kenya where living alone had increased risk of under nutrition (AOR = 1.32, 95% CI: 1.01, 1.72) (18). The probable reason for the above variation in odds of developing under nutrition may be due to a little interventions on maternal health, nutrition, early marriage, family planning and other a women empowering programs.

Women with no formal education were 9.4 times [AOR=9.405, 95%CI: (1.079, 81.943)] higher to be under nourished compared to women with diploma and other educational level which is similar to the study conducted in Gonder town where pregnant women who had no formal education had nearly 2 times more likely to have under nutrition (AOR=2.18, 95% CI: 1.39, 3.39) (48). The different odds observed here is probably the gap in different levels maternal education among the participants in the study area like primary to the higher educational level.

The odds of developing under nutrition was 3 times [AOR= 3.18; 95% CI: (1.51 – 6.72)] higher in non iron took pregnant women compared to iron taking. This study is in line with study conducted in Zimbabwe on Maternal Iron and Vitamin A Supplementation and the Nutritional Status of Children in the 2010-11 Zimbabwe Demographic and Health Survey which iron supplemented pregnant women less risk (AOR = 0.73; 95% CI = (0.58- 0.91); developing under nutrition compared to non supplemented pregnant women. But the difference observed here probably due to service utilization those and who weren't informed about the importance of iron supplementation during the pregnancy may not follow the regular schedule of the supplementation in our study area.

The odds of under nutrition is about 4 times [AOR= 4.05% 95%CI (2.16, 7.63)] higher in those dietary diversity score of less than six compared with those pregnant who had dietary diversity score of at least six. This is in line with study conducted in rural pregnant women in Abia State, Nigeria, which showed the odds of nutritional status 3.78 times [AOR= 4.05% 95%CI (2.16, 7.63)] higher in women who have DDS<6. A little bit difference may due to urban rural difference. (66)

The study revealed that taking at least one additional (3+) is significantly associated with under nutrition. The odds of under nutrition was 2.27 times [AOR – 2.267; 95%, CI (1.21, 4.24)] higher in those who do not have a practice eating one additional meal during their pregnancy compared to those who have eating additional meal practice. This is almost similar with study conducted in Guto Gida of east wolleag AOR= 2.51, 95% CI = (1.11-12.29) (18). Therefore both study support evidence that not having of one additional meal have prone to under nutrition since the requirements more increase especially in second and third trimester.

The odds of under nutrition was 3.856 times [AOR – 3.856; 95%, CI (1.099, 13.530)] higher in those who skip meal due to fear of gaining weight during their pregnancy compared to those who have not skip. The study conducted in Gonder showed that the odds of women having under

nutrition increase six time [AO: 6.264 (3.487-11.254)] in women who skip meal compared to not skipping.(48) This predictors numeric difference is may be due life style, living environments within families, religious and cultural pattern in the family and different food taboos.

7. Limitation of the study

Since the study design was a cross sectional descriptive and tendency of recall bias introduced due to a 24hr dietary assessment. A tool used to assess dietary knowledge was modified from literature which not validated. Mothers of first 12 weeks of gestation may not start ANC visit and therefore, they may didn't got an opportunity to participate in the study and other social desirability were concerned as limitation of the study,

8. Conclusion

The present study revealed that relatively there is burden of suboptimal dietary practice and under nutrition among the studied participants. Predictors identified for suboptimal dietary practice were family size and household food insecurity. Similarly, under nutrition among the studied pregnant women was predicted by marital status, educational status, Iron supplementation, additional meal intake and meal skipping. Lack of standardized questionnaire at national level and failure to assess food intake in terms of specific nutrients consumed.

9. Recommendations

Based on the findings, the following recommendations forwarded

- ***Government:*** the government and other stakeholders needs to strengthen their effort to include food insecure households in different social protection schemes and also give attention for implementing the existing health sector plan on dietary practice.
- ***Local government administration:***
  - Should be emphasized across different sectors such as education, culture and health to increase awareness about the multiple consequence of poor maternal nutrition on upcoming generation.

- Capacity building should undertaken including development of pregnancy related educational materials and building the capacity at all service unit in order to update health care provider.

❖ ***Local health sectors:***

- strength existing family planning system in order to innovative behavior change communication strategies tailored to pregnant women that can create public awareness toward controlling family size and proper nutrition .
- Strength capacity building of HEW regarding maternal nutritional assessment and delivering appropriate and key message about proper dietary practice at the community level.
- Increasing the availability of nutritional assessment tools and forum for interaction.
- Develop linkages with other programmes, and harmonize activities through effective partnership

Mettu Karl Hospital:

- Should strength the essential elements of a focused approach to antenatal care
- Enhancement of proper health education and others aspect of life style during pregnancy.
- Establishing links between the community and the facility which help to increase utilization of services, including ANC, and impact maternal related characters
- improve supplies and logistics for better performance at antenatal care service

Researchers*: Further community based studies should be conducted using better study design*.

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ANNEXE: I. Information Sheet and Consent Form

Research Title: To assess dietary practice, nutritional status and association factors among pregnant women in Mettu Karl Hospital, south west Ethiopia.

Hello, my name is _____I am working for _____ organization. We are doing a survey to dietary practice , nutritional status and association factors among pregnant women in Mettu Karl Hospital, Mettu town, south west Ethiopia. You are randomly chosen to participate in this study. Please feel free, if you aren't voluntary to participate in study and you have full right to with draw from study at any stage of the interview, and also you have the right to refuse to any questions that you don't want. Similarly you will not get any incentive for agreeing to participate in the study but, your honesty response to each question will benefit both for you and your community. The survey is a confidential exercise and your name will not be disclosed anywhere. It will last a maximum of 30-40 minutes if you are voluntary to provide necessary information, for the questions I am going to ask you.

Do you have any question?

We would like to thank you in advance for your help, are you willing to participate?

Yes [continues interviewing]

No [thank and stop interview]

Instructions for interviewer

Introduce yourself and read all the information given on the information sheet and consent form for the interviewee prior to interviewing

After the interviewee understand and show willingness to participate, take the verbal consent to confirm the voluntary participation and to respect the right of respondents

Read the questions for interviewee and circle the response in the choice part, write on space provide if needed by using Pen only **Thank you for your cooperation!!!**

Participant Identification
Address :_____Kebele;_____
Name of data collector _____sig._____ date _____
Name of Supervisor _____sig. _____ date ____
Date of interview (dd/mm/yyyy)____||____|____| Name of health facility_____

Part 1: ***socio economic characteristics of pregnant women***

S.No	Questions	Possible choices/Answers	Code	Remarks
101	Ag of respondent:	**_____ Years**		
102	Religion	1. Muslim 2. Orthodox 3. Protestant 4. Catholic 5. Other specify		
103	Ethnicity:	1. Oromo 2. Amhara 3. Gurage 4. Silte 5. Tigre 6. other specify___		
104	Educational status:	1. No formal education 2. Primary education 3. Secondary education 4. Diploma and Above		
105	Marital status:	1. Single 2. Married 3. Divorced 4. Widowed 5. Separated		
106	Occupational status:	1. Governmental worker 2. Farmer 3. Merchant 4. House wife 5. other specify__		
107	Family size (Total number of family members)_____			
108	Occupation of husband	1. Governmental worker 2. Farmer 3. Merchant 4. other specify__		
109	Educational status of the husband	1. No formal education 2. Primary education 3. Secondary education 4. Diploma and Above		

Part 2: <u>Pregnancy related characteristics</u>

S. No	Questions	Possible choices/Answers	Code	Remarks
201	Total number of pregnancy including the current? _____			
202	According to your count, how many months are you with this pregnancy?			
203	How many times did you visit antenatal care service with this pregnancy?	1. Ones 2. Twice 3. Three times 4. Four times 5. five times		
204	Types of pregnancy	1. wanted planned 2. wanted unplanned 3. unwanted unplanned		
205	How many years/months are there b/n the previous and the current pregnancy_			
206	Family size (Total number of family members)_____			
207	Have you taken iron supplementation?	1.Ye 2. No(skip to Q-208)		
208	If yes, how frequently were you taking it?	1. Daily 2. sometimes		
Nutrition knowledge of pregnant		2.		
209	Do you know about the main food groups?	1. Yes 2. No		
210	Do you know about food sources of protein	1. Yes 2. No		
211	Do you know that inadequate nutrition can be the cause of miscarriage and/or preterm birth	1. Yes 2. No		
212	Do you know that, husband or family member should not influence and decide on the type and frequency of taking food during pregnancy	1. Yes 2. No		
213	Knowledge about inadequate nutrition can be the cause of miscarriage and/or preterm birth	1 Yes 2 . No		
214	Knowledge about food sources of iron			
215	Do you think that it is important for pregnant to have diversified food?	1. Yes 2. No		
216	Have you been sick in the last two weeks	A. Yes B. No		
217	Do you get any parasitic infection during pregnancy?	1. Yes 2. No		
218	Could you have any history illness in last six months?	1. Yes 2. No		
219	Do you Smoke during your pregnancy?	1. Yes 2. No		
220	Do you drink Alcohol during your pregnancy?	1. Yes 2. No		
221	Do you chew chat during your pregnancy?	1. Yes 2. No		

222	Do you skip meal during your pregnancy due to fear of gaining weight?	1. Yes 2. No		
223	Are there any foods that are prohibited for pregnant women in your area	A. Yes B. No(if no go Q-226)		
224	If yes what type of food what types of foods prohibited	1. Cereal ,white roots & tubers 2. Dark green leafy vegetables 3. Vitamin A rich fruits, vegetables & tuber 4. Other		

Part 3: Household Wealth

Now I will ask you about some fixed assets that your household have			
Does the household have any of the following properties? **(Circle)**		**Yes**	**No**
301	Functioning radio/Tape recorder/CD player	1	0
302	Functioning Television	1	0
303	Gas Stove	1	0
304	Kerosene stove	1	0
305	Electric stove	1	0
306	Bicycle	1	0
307	Motor Cycle	1	0
308	Cart/Gari	1	0
309	Watch (Hand/Wall)	1	0
310	Mobile phone	1	0
311	Plough	1	0
312	Sofa	1	0
313	Spring mattress	1	0
314	Sponge/Foam mattress	1	0
315	Cotton mattress	1	0
316	Grass Mattress	1	0
317	Chair/Stool	1	0
318	Generator	1	0
319	Milling	1	0
320	Water pump	1	0
	Does the household have any of the following animals?	1.Yes 0. No	How many?
321	Oxen		
322	Cows		
323	Horse/mules		
324	Goats/Sheep		
325	Chickens		
326	Donkey		
327	Pig		

Part 4: House hold Food Insecurity Access Scale(HHFIAS) of pregnant women

Each of the questions in the following table is asked with a recall period of four weeks (30 days). The respondent is first asked an occurrence question – that is, whether the condition in the question happened at all in the past four weeks (yes or no). If the respondent answers "yes" to an occurrence question, a frequency-of-occurrence question is asked to determine whether the condition happened rarely (once or twice), sometimes (three to ten times) or often (more than ten times) in the past four weeks.

S.no	*House hold food insecurity question*	Possible choices/Answers	Code	Remark
401	In the past four weeks, did you worry that your household would not have enough food?	0= No (skip to Q2) 1 = Yes		
402	How often did this happen?	1.Rarely 2 Sometimes 3 Often		
403	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?	0. No (skip to Q2) 1. Yes		
404	How often did this happen?	1. Rarely 2. Sometimes 3. Often		
405	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?	No (skip to Q2) 1. Yes		
406	How often did this happen?	1. Rarely 2. Sometimes 3. Often		
407	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?	0. No (skip to Q2) 1. Yes		
408	How often did this happen?	1. Rarely 2. Sometimes 3. Often		
409	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?	0. No (skip to Q2) 1. Yes		

410	How often did this happen?	1. Rarely 2. Sometimes 3. Often		
411	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?	0. No (skip to Q2) 1. Yes		
411	How often did this happen?	1. Rarely 2. Sometimes 3. Often		
413	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?	0. No (skip to Q2) 1. Yes		
414	How often did this happen?	1. Rarely 2. Sometimes 3. Often		
415	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	0. No (skip to Q2) 1. Yes		
416	How often did this happen?	1. Rarely 2. Sometimes 3. Often		
417	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?	0 = No 1 = Yes		
418	How often did this happen?	1. Rarely 2. Sometimes 3. Often		

Part 5: Maternal Dietary Related characteristics

Please describe the foods (meals and snacks) that you ate yesterday during the day and night, whether at home or outside the home; Start with the first food eaten in the morning (Sunrise time yesterday to Sunrise today), Write down all food and drinks mentioned by the respondent.

No	**Food group**	**Examples**	**Over 24hr** **1-Yes 0- No**	**Over 7 day**
501.	Cereal ,white roots & tubers	Maize, teff, rice, wheat, sorghum, millet or any other grains or foods made from these (e.g. Injera, bread, noodles, pasta, macaroni, rice, porridge or other grain products) + insert names for the local foods e.g. porridge, injera, kinche, atmit, bread, local pasty and White potatoes, sweet potato, carrot, or other foods made from roots like godore, enset		
502	Dark green leafy vegetables	Dark green/leafy vegetables locally available vitamin A rich leaves such as cassava leaves, kale, spinach		
503	Vitamin A rich fruits, vegetables & tuber	ripe mango, apricot (fresh or dried), ripe papaya, dried peach, and fruit juice made from these Pumpkin, carrot, or sweet potato that are orange inside + other locally available vitamin A rich vegetables (e.g. red sweet pepper)		
504	Other fruits and vegetables	Other vegetables (e.g. tomato, onion, eggplant + *other locally available vegetables* other fruits, including wild fruits and 100% fruit juice made from these		
505	Organ meat	liver, kidney, heart or other organ meats or blood-based foods		

506	Meat and fish	beef, pork, lamb, goat, game, chicken, duck, other birds,		
507	Eggs	Eggs		
508	Legumes, nuts and seeds	Dried beans, dried peas Beans, lentils, nuts, seeds or foods made from these (eg. shiro wet, kik wet, misir wet, shimbra kolo, bakela ashuk, adenguare, boloke……)		
509	Milk and milk products Milk	Milk, cheese, yogurt or other milk products like aguat, arera…		
510	Women dietary diversity score (WDD indicate based the above food group has taken over 24hrs)		>6 1. ≤ 6	
511	Women food variety score (indicate based the number above food items has taken over seven days)		0. >30/k 1. ≤ 30/week	
512	Do you take additional meal during you pregnancy		0. Yes 1. No	

Part 6: Environmental factors, MUAC measurement and laboratory Result for pregnant women

S.no	***Environmental related question***	***Possible choices/Answers***	***Code***	***Remark***
601	Is there latrine facility in the compound?	1. Yes 2. No		
6.02	Is the toilet provided with hand washing facility?	1. Yes 2. No		
603	Is there any stagnant water in your compound or surrounding?	1. Yes 2. No		
604	Do you walk on bare foot in the compound?	1. Yes 2. No		
605	MUAC _____mm	0. >21 1.<21		
606	Stool examination	1. No ovum seen 2. Positive ovum (….)		

Name & Signature of data collector ---------- **Thank You**

ANNEXE: IV. ASSURANCE OF PRINCIPAL INVESTIGATOR

The undersigned agrees to accept responsibility for the scientific ethical and technical conduct of the research project and for provision of required progress reports as per terms and conditions of Institutional Health Science Research Review Board of Jimma University in effect at the time of grant is forwarded as the result of this application.

Name of the student: _____

Date._____

Signature _____

Approval of the Advisors

Name of the first advisor_____ Signature _____

Name of the second advisor_____ Signature _____