

Dietary Diversity Score and Its Association with Anemia Among Pregnant Women Attending Public Health Facilities in Hossana town, South Ethiopia



By

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ABSTRACT

Background: Anemia is a major public health problem among pregnant women in developing countries like Ethiopia. Nutritional deficiency related anemia is an important contributor to maternal mortality and poor fetal outcomes. This indicates urgent enhancements in dietary diversity and control of infectious diseases. Even if, limited studies were conducted in different parts of the country to assess dietary diversity and its association with anemia among pregnant women, the issue is not studied in Hossana town and Hadiya zone. Therefore, this study aims to assess prevalence of anemia and its association with dietary diversity score among pregnant women in public health facilities of Hossana town, South Ethiopia.

Methods: Institutional based cross-sectional study was conducted among pregnant women in Hossana town from March 15 to April 30, 2017. Systematic random sampling procedure was employed to select 314 study subjects. Data were collected using an interviewer administered pretested semi structured questionnaire supplemented by laboratory tests and analyzed using SPSS for window version 20. Descriptive statistics and multivariable logistic regression were done to isolate independent predictors of anemia.

Result: out of the total of 314 participants the prevalence of anemia among pregnant women was 24.2%, from this mild, moderate and severe anemia accounts for 43(56.6%), 31(40.8%) and 2(2.6%) respectively. The mean dietary diversity and food variety score of study participants were 7 and 22 respectively. The educational status of mother (AOR=10.5; 95% CI: 2.2, 57), occupation of spouse (AOR=9.3; 95% CI: 1.6, 53), nutrition during pregnancy (AOR=2.5; 95% CI: 1.5, 6.4) and women minimum dietary diversity score (AOR=18.6; 95% CI: 4.4, 78) were identified as factors associated with anemia among pregnant women.

Conclusions and Recommendations: Anemia is found to be a moderate public health problem in this study. Women education, occupation of spouse, nutrition during pregnancy and minimum dietary diversity score were significantly and independently associated with anemia among pregnant women. Empower women education and occupations of spouse, promotion awareness of healthy diets were recommended for reducing prevalence of anemia in the study area.

Keywords: Dietary diversity, Anemia, Pregnant, Hemoglobin

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LIST OF ABBREVIATIONS AND ACRONYMS

ANC: Antenatal care

EC: Ethiopian Calendar

EDHS: Ethiopia demography and health survey

FAO: Food and Agriculture Organization

HCT: Hematocrit

Hgb: Hemoglobin

HIV: Human Immunodeficiency Virus

IDA: Iron deficiency Anemia

NGO: Non-Government Organization

SPSS: Statistical Package for Social Sciences

WDDS: Women dietary diversity score

WHO: World Health Organization

WUNEMMH: Wachamo University of Nigist Eleni Mohammed Memorial Hospital

1. INTRODUCTION

1.1. Background

Anemia is a condition in which the hemoglobin content of the blood is lower than normal for a person's age, sex, smoking behavior, different stages of pregnancy and environment; give rise to the oxygen carrying capacity of the blood being reduced. WHO classifies anemia in pregnancy: mild anemia (hemoglobin 10-10.9 g/dL), moderate anemia (hemoglobin 7.0-9.9 g/dL) and severe anemia (hemoglobin <7g/dL. Mild anemia may not have any effect on pregnancy and labor, but progressively it become moderately to severely anemic. Moderate anemia enhances weakness, and decrease work performance; severe anemia is related with palpitations, breathing difficulty, cardiac failure, pre-term labor, pre-eclampsia and sepsis[1].

Anemia occurs at all stages of the life cycle but its risk higher in state of pregnancy due to an increased iron necessity, physiological need, infections and blood loss. In spite of having diverse causes of anemia nutritional deficiency is the prominent cause of anemia, Iron deficiency alone contributes to half of its problem and other micronutrients of importance include vitamin A, vitamin B12 and folate. High consumption of plant source diet as compare to animal source is common in Sub-Saharan countries, which is associated with a low intake of dietary iron the intestinal absorption of any dietary iron is likely to be reduced as a result of the high intake of phytates from grains such as millet and sorghum[2, 3]. The various factors required for erythropoiesis in pregnancy are proteins (erythropoietin), minerals (iron), trace elements (including zinc, cobalt and copper), vitamins (principally folic acid, vitamin B12, vitamin C, pyridoxine; and riboflavin), and hormones like androgens and thyroxin[4].

Dietary diversity has long been known as a key element of high value diets for the reason that all people need a variety of foods to have requirements for essential nutrients. Shortage of dietary diversity is a particularly severe problem in developing countries where diets are mainly based on starchy staples and little or no animal products all people need a variety of food groups like Cereals, White tubers and roots, Vegetables, Fruits, Meat, Eggs, Fish and other seafood, Legumes, nuts and seeds, milk and milk products, oils and fats sweets, spices, condiments and beverages to meet requirements for essential nutrients. Lack of diversified diets is a severe problem in the developing world, where diets are predominantly starchy staples with few animal products, seasonal fruits and vegetables, the nutritional status of a woman during pregnancy is important as a suboptimal diet impacts negatively on the health of the mother, the fetus and the newborn. Ethiopia is among the poorest country in Africa with high rates of food insecurity and malnutrition one may assume problems with iron deficiency anemia. Although Ethiopia has a wide range of agro-climatic conditions and grows a variety of cereals, root crops and vegetables, some of these are not fully utilized; there appears to be dependency on a single food crop by region although the specific crop varies in the different regions[4, 5].

The staple crops consumed in the North and Central part of Ethiopia are teff and cereals; in the South and Southwest staple crops are enset, cassava, maize, cereals and root crops; and in the East staple crops are sorghum and maize. The lack of dietary diversity results in a shortage of minerals and vitamins which suggests that the bio-availability of much of the iron in the average Ethiopian diet is restricted and this restriction presumably affects the iron status [5, 6]. The value of a different diet has long been known, the high nutrient burdens of pregnancy put women of reproductive age in Ethiopia at high risk of anemia because consumption of low-quality, monotonous diets, poor traditional dietary practice of the society which depends on single staple food rather than diversified diet and this results nutritional associated anemia among pregnant women in south part of Ethiopia including Hadiya Zone and Hossana town [6].

1.2. The Statement of Problem

Anemia is a global public health problem it affects approximately 2 billion people worldwide and is estimated to contribute to more than 115, 000 maternal deaths and 591, 000 prenatal deaths per year[7]. Worldwide prevalence of anemia among pregnant women is 38.2% and 19.4 million non-pregnant women and 0.8 million pregnant women had severe anemia and it's associated with substantially worse mortality and cognitive and functional outcomes. The prevalence of anemia is varied across different regions of the world, highest prevalence of anemia is recorded in Asia and African the problem is very high and serious among women's in developing countries this reflects the high magnitude of factors affecting anemia such as iron deficiency, malaria, and sickle cell anemia, in most developing countries anemia is considered as public health significance[8].

Increasing anemia incidence among pregnant women indicating urgent that countries review national policies, infrastructure and resources and act to public health strategies to prevent and control anemia include improvements in dietary diversity; food fortification with iron, folic acid and other micronutrients; distribution of iron-containing supplements; and control of infections and malaria. Achieving a 50% reduction in the prevalence of anemia among women of reproductive age by 2025 will require a relative reduction in the prevalence of anemia in this group of 6.1% per year. Recognizing the complexity of anemia can lead to the establishment of effective strategies, an integrated, multi-factorial and multi-sectorial approach is required to achieve this global target[9].

Intake of a diverse variety of foods has been a recommendation for achieving adequate nutrient intake and the recommendation appears in the dietary guidelines of many countries. The nutritional guidelines for the Philippines include a number of recommendations on dietary diversity and the United State advocates consumption of a variety of nutrient-dense foods and beverages within and among 5 basic food groups, with an item from each food group consumed daily [the 5 United State Development Agency food groups are: cereals, vegetables, fruit, dairy, and protein source foods (meat, fish, poultry, eggs, nuts, beans)][10]. Nutritional deficiencies of iron followed by folic acid deficiency are major causes of anemia in India. This is due to low dietary intake of iron (<20 mg/day), low folate intake (<70 mg/day) and poor bioavailability of iron due to high amount of phytates and tannins in the food. The other important contributing

factors are chronic blood loss due to hookworm infestation, recurrent malaria or heavy menstrual bleeding, tuberculosis, HIV and deficiency of other important nutrients such as vitamin B12, riboflavin and copper [11]. High prevalence of anemia during pregnancy leads to poor fetal iron stores at birth. Coupled with low breast milk concentration of iron, this is responsible for increased prevalence of anemia in early childhood. This childhood anemia is aggravated in adolescent girls at the onset of menstruation and early marriages as well as early pregnancy leads to further aggravation of anemia. Thus, there is an inter-generational self-perpetuating cycle of anemia in Indian population[12].

Poor dietary diversity intake because of consumption low-quality monotonous diets in developing countries can lead to maternal iron deficiency anemia that is most frequent nutritional deficiency in pregnancy, with an impact on maternal and fetal morbidity and mortality. It is regarded as the most important preventable cause of perinatal complications, such as premature delivery, intrauterine growth retardation and neonatal and perinatal death. The consequences of anemia in pregnancy include: abortion, still-birth, low birth weight and pre-term births, reduced work capacity, decreased mental performance, low tolerance to infections, death from anemic, pre-eclampsia, recurrent infection, preterm labor, heart failure and maternal deaths due to uncontrolled bleeding. In Ethiopian 29% pregnant women are anemic prevalence higher in rural areas that is 18% than those in urban areas 11%. Also, women in the Somali, Affar, Dire Dawa, Southern regions have a relatively high prevalence of anemia 44%, 35%, 29% and 22% respectively, anemia prevalence decreases as wealth status increases [4, 6, 13].

Pregnancy is the most nutritionally demanding period in a woman's life; consequently, pregnant women are advised to eat more diversified diet than usual, consumption of meat, fish, fruits, 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[14]. However, the level of diet diversity among pregnant women was significantly lower than non-pregnant women in Ethiopia; one possible explanation might be the presence of food taboos during pregnancy; according to a study in south Ethiopia 65% of women avoided at least one food type during their recent pregnancy[15]. Household

dietary diversity score in south part Ethiopia is five food groups' cereals are the most usually consumed food groups; Fish, egg and fruits, on the other hand, are the least consumed food groups. Animal source foods are eaten in greater amount among families with higher dietary diversity score, identifying nutritional status individual members of the family important for new technologies supporting agricultural practices to enhance both native production and improved consumption diversified diets in Hadiya Zone[5]. The purpose of this study was to assess the dietary diversity and its association with anemia among pregnant women in public health facilities in Hossana town, south Ethiopia and it might be used among all women of childbearing age using a large sample of the population.

2. LITERATURE REVIEW

2.1. Prevalence of Anemia among Pregnant Women

Globally the prevalence of anemia has estimated by regions and population groups, women and young children are most vulnerable to anemia; in Southeast Asia, 48% of pregnant women (18 million), 46% of non-pregnant women (182 million), and 66% of preschool children (115 million) suffer from anemia, the proportion of women and children is highest in the Africa region where 57% of pregnant women (17 million), 48% of non-pregnant women (70 million), and 68% of preschool children (84 million) are anemic, while the proportion of people with anemia lower in Southeast Asia, the numbers of people with anemia are higher than in the Africa region[16].

According to world Health Organization estimates, up to 56% of all women living in developing countries are anemic. In India, National Family Health Survey-2 in 1998 to 99 shows that 54% of women in rural and 46% women in urban areas are anemic. The relative prevalence of mild, moderate, and severe anemia is 13%, 57% and 12% respectively in India[17]. Studies carried out in India have also show the prevalence of anemia among pregnant women 65-75 percent, even higher than among higher income developing countries of population about 50 per cent of pregnant women are anemic[18].

A cross-sectional study done among pregnant women in Islamabad Pakistan has shown 28.1% of pregnant mothers were anemic[19]. Another study conducted in Nepal, Kathmandu University Hospital shown the prevalence of anemia with hemoglobin less than 11gm/dl was 37.74%, in other part a cross-sectional survey, which randomly selected 500 mother–infant pairs from Bhaktapur municipality, 20% of mothers had anemia hemoglobin less than 12.3 g/dl, but only one-fifth was explained by depletion of iron stores[20].The prevalence of Iron deficiency anemia among pregnant women was 24.52% and the prevalence of IDA among anemic pregnant women was 65%[21].

The cross-sectional survey conducted in four northern Nigerian states; Jigawa, Katsina, Zamfara and Yobe the prevalence of anemia was high across all states surveyed ranging between 61.2 to 88.7%[22]. In Ghana a study done on anemia in pregnancy in women of Reproductive Age in the Bolgatanga Municipality, Upper East Region of Ghana 50.4% was found to be anemic. Another

cross-sectional study conducted among pregnant women in rural Uganda 63.1% was found to be anemic[23].

A facility based cross-sectional study done in Gode the prevalence of anemia was 56.8% were anemic, 1.2% of them were severely anemic, 26.7% were moderately anemic, and 28.9% were mildly anemic[24]. According to another cross sectional study conducted at Azezo Health Center the prevalence of anemia was 83 (21.6%) [25]. Moreover a cross-sectional study was conducted in three districts around Gilgel Gibe Dam area in southwest Ethiopia 53.9% were anemic, the minimum, maximum and mean HCT values were 18%, 48% and 32.7%, respectively; of those 209 anemic women; 55%, 2.1%, and 2.9% had mild, moderate and severe anemia, respectively[26]. Finally another facility based cross-sectional study on pregnant women attending antenatal care clinic in Wolayita Soddo Otona Hospital the prevalence anemia was 39.9%. Among anemic pregnant women, 30.34% had mild anemia, 60% had moderate anemia, and 9.66% had severe anemia[27].

2.2. Factors Associated with Anemia

2.2.1. Socio-demographic and Socio-economic factors

A study done among Iranian Pregnant Women the overall estimate of anemia prevalence was 13.6%. The highest prevalence rates of anemia in pregnant women had been reported in Varamin 26%, a city near Tehran, and Bandar-Abbas 17.5%, a major city in southern Iran. The estimated prevalence of anemia during pregnancy in urban areas using random effect model was 10.75% and in mixed urban/ rural samples the estimated prevalence was 14.74%[28].

A Hospital based cross-sectional study conducted Kenya, Nairobi was all 2nd and 3rd trimester pregnant women aged 31 years and above were about 3 fold more likely to be anemic as compared to those aged 18 - 24 years. Government/private employed pregnant women had 2.9 times and those who were self-employed had 1.9 times more likely to be anemic compared to those who were housewives[29].

According to the cross sectional study conducted at Azezo Health Center, Northwest Ethiopia, the mean age of the study participants was 26.4 ± 0.12 year and assess possible relationship between anemia and socio demographic characteristics anemia was significantly associated with age groups ranged from 26-34 years old and age groups greater than 34 years old. Rural

residence were significantly associated with reduced anemic cases [25]. Another cross-sectional study at Boding Health Center, South Ethiopia have shown approximately 26%, 32.4%, 32.4% and 9% of the pregnant women who were in age range of 15-19, 20-24, 25- 29 and 30-34 years were anemic, respectively. Nearly half of the women with anemia were home makers, and had been educated at the elementary level[30].

2.2.2. Maternal related factors

The cross-sectional study conducted India Dakshina Kannada district of Karnataka showed overall prevalence of anemia to be 34.83%, among 55 anemic mother, the prevalence of anemia was found to be more 62.9% among women with an interval of 1-2 years between pregnancies followed by women with an interval of 2-3 years 37.1%, women with parity index more than 4 and among women with birth interval less than 2 years between two births, the association between parity index and anemia status was found to very highly significant at 0.1 % level of significance[31]. In Malaysia, IDA is solely or partly responsible for 75-80% all anemia in women of reproductive age, women of reproductive age have monthly menstrual blood and there by iron losses, during approximately 40 years and in addition women in Malaysia may have 3-4 pregnancies and child deliveries, which cause further iron losses due to iron depletion during pregnancy and iron losses due to bleeding at delivery[32].

A cross-sectional study conducted at Tikur Anbessa Specialized Hospital show the prevalence of anemia was 17.29% and 23.37% for primigravida and multigravida respectively. The prevalence of anemia in multipara was more 24.44% than primigravida 22.22% and in those who were nulliparous 17.48%. Anemia was also found to increase as the gestational age increases, showing the highest prevalence in the third trimester 35.48% than second 21.64% and first trimester 13.09%. Women with birth interval of less than two years had shown more prevalence of anemia 34.4% than those with an interval of greater than or equal to two years 18.23% and women with no history of delivery 16.08%. Place of delivery also showed difference in prevalence of anemia 28.9% in the pregnant women who delivered at home and 22.02% in women who delivered at health institution. Contraceptive users showed lower prevalence of anemia (18.04%) compared to none users[33]. Another cross-sectional study conducted pregnant women attending antenatal care at Sher-hospital, Ziway have shown the Prevalence of intestinal parasite infection in pregnant women was 58.2%. Prevalence of anemia in this study subjects was 51.9%. Anemic

women were 10 times likely to have hookworm plus other intestinal helminthic infection 2 times likely to have birth interval less than two years, 2 times likely not to have shoe wearing habit and 2 times likely not having taken iron during pregnancy, the prevalence of anemia among intestinal helminthic infected and non-intestinal helminthic infected pregnant women was 70% and 29% respectively[34]. Finally the study attended ante natal care at Boditii Health Center, south Ethiopia found to highest prevalence as the gestational age increases. Women with birth interval of greater than or equal to two years showed more prevalence of anemia, anemia was reported more commonly in women who didn't have chronic disease in a previous[30].

2.2.3. Dietary factors

A cross-sectional study comprising both quantitative as well as qualitative parts on assessment of dietary diversity and nutritional status of pregnant woman in Islamabad, Pakistan shown medium dietary diversity was observed in 89% of pregnant women, while only 5% showed low, and high dietary diversity. Dietary diversity was not associated with socio-demographic, or socioeconomic status and hemoglobin level of pregnant women. The dietary perceptions of females during pregnancy have shown to have an effect on their diet quality[19].

Accordingly to the study done at West Arsi Zone the consumption of animal products like red meat, organ meat and egg less than once per week, vegetables less than once per day, and taking of tea, coffee and khat always after meal had higher anemia in pregnancy[35]. In addition another cross-sectional study conducted at Tikur Anbessa Specialized Hospital 36.96% had the habit of eating meat and animal products once per week, 25.82% once in a month, 21% every other day and 11 once in a year. 33.67% of the respondents had the habit of eating green leafy vegetables 32.15%, 22.78% and 9.36% had the habit of eating green leafy vegetables every other day, once per week and once in a month respectively. 66.58% had the habit of eating fruits after meal[33]. Facility based quantitative cross-sectional study in Mekelle town shown the prevalence of anemia was 19.7% 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 affecting Anemia in pregnant women[36].

Hence, this study attempts to fill the gap of present information in study area and also considers socio-economic and demographic, pregnancy and health related maternal factors and dietary diversity to recognize they have a significant association or not with anemia during pregnancy.

2.3. Conceptual Framework

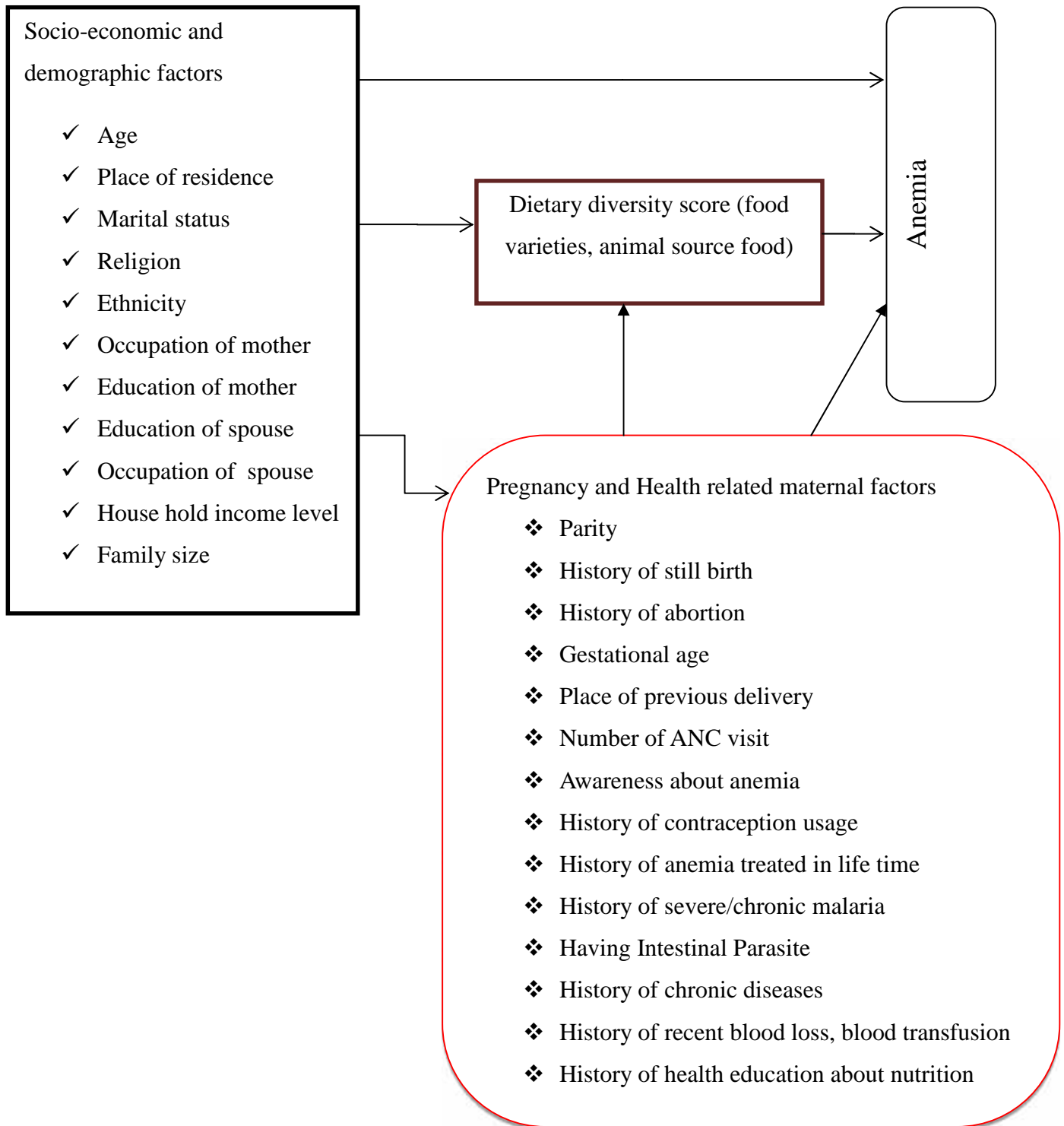


Figure 1: Conceptual Framework adapted from literature

Source: Developed after reviewing literatures

2.4. Significance of the Study

Anemia has become one of the major health problems currently facing the communities occurrence of nutritional related anemia during pregnancy is important for deciding control strategies, moreover data on prevalence and nutritional associated factors of anemia remain important indicators of public health since anemia causes morbidity and mortality in the population especially pregnant women. In Hossana town dietary diversity, food variety score and their association with anemia among pregnant women in public health facilities of Hossana town was not well known, it was important to study magnitude of anemia and its association with nutritional factors in order to provide information that can be used for action to alleviate the existing problems. Having data resulted low dietary diversity and less variety diet consumed is a proxy indicator of anemia and food insecure among pregnant women in the town. Furthermore, there are no studies on this topic at town and zonal level. Results of such a study would be relevant to, and could be used by, concerned stakeholders, policy makers, practitioners, decision makers, and program planners working on livelihood, agriculture, health, and nutrition at different levels of health system in the town.

3. OBJECTIVES

3.1. General Objective

- ❖ To assess dietary diversity score and its association with anemia among pregnant women in public health facilities found Hossana town, South Ethiopia

3.2. Specific Objectives

- To determine magnitude of anemia among pregnant women in public health facilities found Hossana town, South Ethiopia, 2017
- To describe the dietary practice of pregnant women in public health facilities found in Hossana town, South Ethiopia, 2017
- To identify contributing factors of anemia among pregnant women in public health facilities found in Hossana town, South Ethiopia, 2017

4. METHODS AND MATERIALS

4.1. Study Area and Period

This study was conducted from March 15 to April 30, 2017 in Hossana town public health facilities, South Ethiopia. Hossana town is the capital of Hadiya Zone, found in South state of Ethiopia. The town is situated 232 km Southwest of Addis Ababa and 194km northwest of the regional capital Hawassa. It has an average elevation of 2276 meters or 7466 feet above sea level and a total area of 23sq.km. It has weyna-dega climatic in the town. According to 2016 census the total population is estimated to be 101,849. Hossana town administration has 3 administrative Kifle Ketemas namely SechDuna, GoferMeda and Adis Ketema constituting a total of 08 kebeles altogether. One general hospital, three public health centers and 25 clinics of all types are situated in the town. The estimated total households in the town are 20,785 and women of child bearing age (15-49) are 23,731. For the majority of the population trade is their source of income. The main common food of the population in the town is wheat and teff [37].

4.2. Study Design

- Institution based cross sectional study design was used.

4.3. Source Population

- The source population were all pregnant women's attending ANC in public health facilities in Hossana town, Hadiya zone, South Ethiopia

4.4. Study Population

- The study population were all pregnant women's attending ANC in public health facilities during study period in Hossana town, Hadiya zone, South Ethiopia

4.5. Study participants

- The study participants were randomly selected pregnant women attending ANC at public health facilities of Hossana town during the study.

4.6. Inclusion and Exclusion criteria

Inclusion criteria

- All pregnant women who were attending ANC in public health facilities came from Hossana town.

Exclusion criteria

- Recently dewormed, repeatedly visit, severely ill and mentally disabled women were excluded from this study.

4.7. Sample size determination

The sample size for this study was calculated by using single population proportion formula at 95% confidence level (CI), ($Z (1- \alpha/2) = 1.96$), an expected prevalence of 62%[30] was taken from the previous study with 5% margin of error.

$$n = \frac{(Z_{1-\alpha/2})^2 \times p \times (1-p)}{d^2} = \frac{(1.96)^2 \times 0.62 \times (1-0.62)}{(0.05)^2} = \frac{3.8416 \times 0.62 \times 0.38}{0.0025} = 362$$

The desired sample size calculated using the following correction factor formula because the source population was 1448 which the total population was below 10,000.

Where, N_F = the sample size from a finite population

N = Finite population size

n = Sample size estimation of single population proportion

$$N_F = \left(\frac{n}{1 + \frac{n}{N}} \right) = \left(\frac{362}{1 + \frac{362}{1448}} \right) = 290$$

By adding non-response rate 10%, finally grand total sample size was 319.

4.8. Sampling techniques

All public health facilities were included in the study and desired numbers of study participants were allocated proportionally for each health facilities. Systematic random sampling procedure was used to select the study participants. The attendance which contains the list of pregnant women was sought with the reference of three months period as the sampling frame.

4.9. Sampling Procedures

In Hossana town there are three public health centers and one General Hospital all of those institutions were included in the study. Totally, in the previous three months, 1448 pregnant women visited public health facilities in Hossana town. Based on the previous data, 724 pregnant women were visited public health facilities (who were fulfilled the eligibility criteria) during the study period. Accordingly, the total number of proportionally allocated pregnant women who were studied for each health facilities were selected by systematic random sampling technique. Since the total numbers of expected pregnant women during study period is 724 and the total sample size is 319, every 2 pregnant mother were included in the study to reach final study subject used simple random sampling technique.

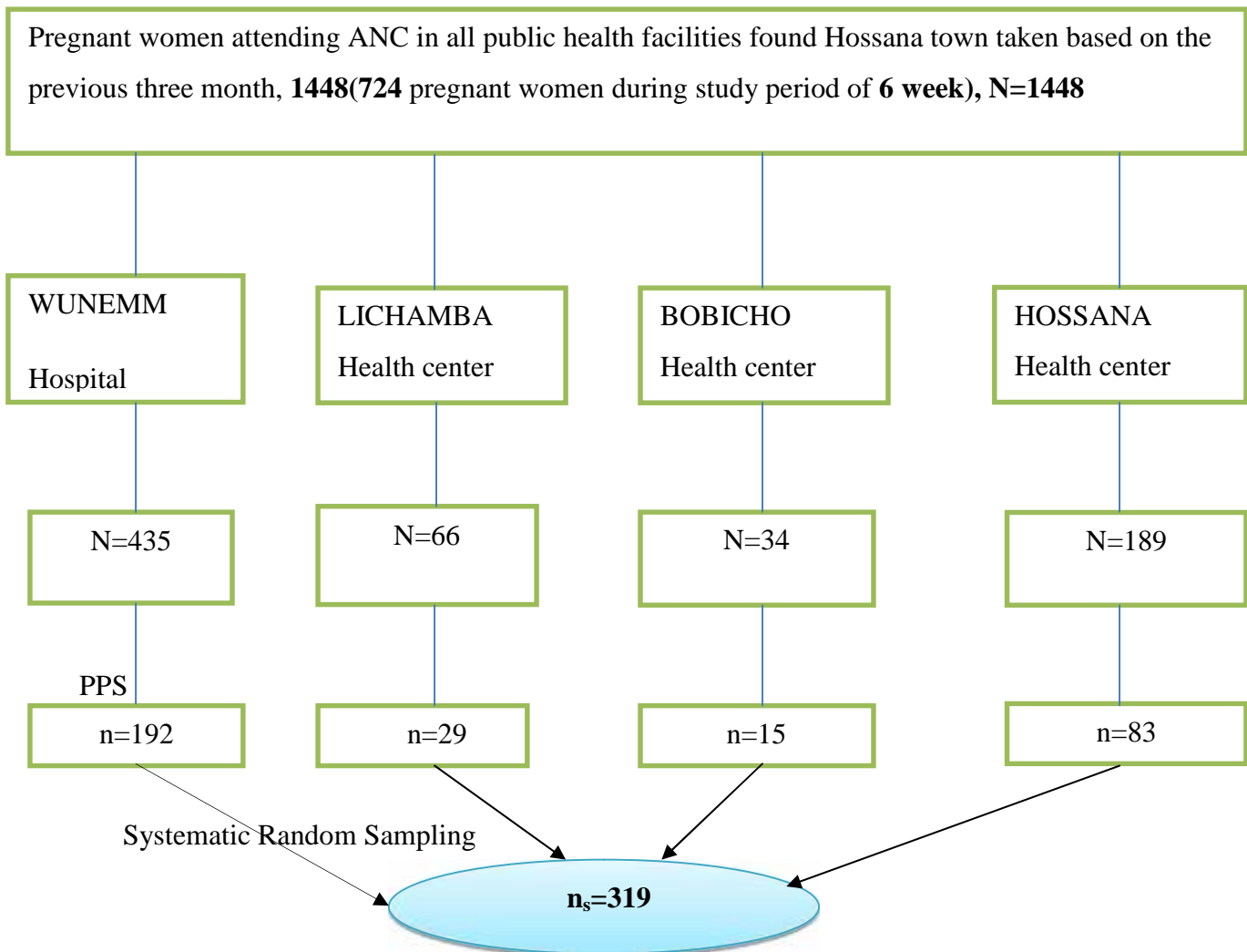


Figure 2: Schematic presentation of sampling procedure

4.10. Data Collection Tools and Procedures

Socio-economic and demographic factors, pregnancy and health related maternal factors or clinical characteristics and dietary intake information were collected from all selected participants using a pre-tested interview administered semi-structured questionnaire. 16(5%) of the questionnaire was pre-tested at health center surrounding Hossana town among similar population, which was not included in the actual study, in order to assess the appropriateness of the questionnaire. The blood sample was collected by Hem Cue® 301 system, the blood sample was collected into a special single-use micro cuvette whose walls were lined with the dry sodium deoxycholate reagents and the sample tested by Medical laboratory technician to identify the hemoglobin level of study subjects, stool examination was also done to identify intestinal parasites among studied women. Data were collected using pretested questionnaire which develop from standard previous similar study by interviewing study participants in all public health facilities in Hossana town based on client flow, the questionnaire was prepared in English translated into Amharic and Hadissa then it was re translated back to English to keep language consistency. A total of four midwives and four medical laboratory technician data collectors and two BSC nurses supervisors were participated in the study.

4.11. Study Variables

Dependent variable

 Anemia

Independent variables

Socio-economic and demographic factors

- ❖ Age
- ❖ Marital status
- ❖ Place of residence
- ❖ Ethnicity
- ❖ Religion
- ❖ Educational level of mother
- ❖ Occupation of mother
- ❖ Family size

- ❖ Education status of spouse
- ❖ Occupation of the spouse
- ❖ House hold income level

Pregnancy and Health related maternal factors

- 👤 Parity
- 👤 History of birth interval
- 👤 Gestational age
- 👤 History of still birth
- 👤 History of abortion
- 👤 Place of previous delivery
- 👤 Number of ANC visit
- 👤 Awareness of anemia
- 👤 History of anemia in her life
- 👤 History of contraception usage
- 👤 History of chronic or severe malaria
- 👤 History of chronic diseases
- 👤 Having Intestinal parasite
- 👤 History of blood loss on current pregnancy
- 👤 History of blood transfusion on current pregnancy
- 👤 History of health education about nutrition on current pregnancy
- 👤 History of health education about nutrition other than current pregnancy

Nutritional and Dietary intake Factors

- ❖ History of dietary diversity
- ❖ Nutritional factors

4.12. Operational definition of selected variables

- ✓ **Dietary diversity:** is the number of food groups consumed over one week by the women.
- ✓ **Minimum or low dietary diversity score:** when the women consume less than or equal to five out of ten food groups within one week before the survey.

- ✓ **High dietary diversity score:** when the women consume eight and above eight out of ten food groups within one week before the survey.
- ✓ **Adequate women dietary diversity:** When women consumed eight and above eight food groups within one week before the survey.
- ✓ **Inadequate women dietary diversity:** When women consumed less than eight food groups within one week before the survey
- ✓ **Food variety:** is the consumption of individual food items from the entire range of food groups (vegetables, fruits, cereals, eggs, meat, fish and dairy product)
- ✓ **Animal source foods:** any foods which are from animals like milk and milk products, egg, meat, poultry and fish
- ✓ **Nutritional factors:** are types of stable diet, meal frequency, intake of tea or coffee and others sources of food.
- ✓ **ANC:** is pregnancy check-up by health personnel, provision of iron/folic acid, tetanus toxoid vaccination and health education about nutrition and counseling.
- ✓ **Anemic:** refers to the hemoglobin concentration of pregnant women < 11g/dl.
- ✓ **Mild anemia:** is the hemoglobin level of pregnant women from 10-10.9g/dl.
- ✓ **Moderate anemia:** is the hemoglobin level of pregnant women from 7-9.9g/dl.
- ✓ **Severe anemia:** is the hemoglobin level of pregnant women < 7g/dl.
- ✓ **Still birth:** the women gave birth of the fetus that is in term pregnancy but not live.
- ✓ **Awareness of anemia:** the women will be classified to have awareness if she know the definition and list at least two clinical manifestation of anemia

4.13. Data quality management

To ensure quality of data, two days training was given to data collectors and supervisor data collection tools were pretested using 5% of similar population on other health institution which outside study facilities of the town, regular supervision was made during data collection. Collected data was manually checked for completeness, accuracy and clarity on daily basis before entering to the computer.

4.14. Data Processing and Analysis

Data were cleaned and checked for consistencies and completeness and entered to EpiData version 3.5.1 and exported to SPSS version 20 for analysis. Descriptive and binary logistic

regression analysis were done to see the association between the dependent and explanatory variables in bivariate analysis variables which have statistically significant results ($p\text{-value} < 0.05$) were entered in to multivariable logistic regression model to identify the independent effect of each explanatory variable on the outcome variable. The strength of statistical association was measured by AOR with 95% of CI, $p\text{-value}$ less than 0.05 were considered as statistically significant with anemia.

4.15. Ethical Consideration

Ethical clearance and permission were obtained from Research Review Board of Jimma University and offered to Hossana town health bureau and respective administrative officials. Information about the objective of the study, confidentiality, autonomy and justice were explained for the participants during data collection. Informed verbal consent was obtained from each study participants.

4.16. Dissemination Plan

The finding of this study submitted to Jimma University Institute of Health Science Graduate Studies and to department of Population and Family Health Department as part of MSC in Human Nutrition thesis on dietary diversity and its association with anemia among pregnant women in public health facilities found Hossana town. The finding of the study will be also disseminated to all governmental and non-governmental organizations who are working in the area of maternal health. Finally attempts will be made to publish the research in national and international journals.

5. RESULT

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

A total of 314 participants were included in this study with 98.4% response rate. The mean age of the attendants was 26.7 ± 3.98 . Majority (97.1%) of the respondents were married. Two hundred seventeen (69.1%) of the respondents were Hadiya. Only 27.1% of the respondents were can't read and write. Around two-third (68.5%) of women were house wife followed by government employees (15.6%). Majority (86%) of the respondents had less than five family members. The detail description shown below in table 1

Table 1: Socio-demographic and economic characteristics of the study participants in Hossana town, South Ethiopia, 2017 (n=314)

Variables	Categories	Frequency	Percent
Age group	15-19	2	0.6
	20-24	92	29.3
	25-29	158	50.3
	30	62	19.8
Marital status	Single(pregnant out of marriage)	5	1.6
	Married	305	97.1
	Separated	4	1.3
Ethnicity	Hadiya	217	69.1
	Kambata	53	16.9
	Silti	12	3.8
	Amhara	18	5.7
	Gurage	14	4.5
Religion	Orthodox	21	6.7
	Protestant	263	83.7
	Catholic	2	0.6
	Muslim	25	8
	Adventists	3	1
Maternal education	Can't read and write	85	27.1
	Primary level	124	39.5
	Secondary and above	105	33.4
Spouse education	Can't read and write	36	11.5
	Primary level	91	29
	Secondary and above	187	59.5
Mothers' occupation	House wife	215	68.5
	Merchant	32	10.2
	Government employee	49	15.6
	Students	18	5.7
Spouse occupation	Government employee	89	28.3
	Farmer	29	9.2
	Merchant	150	47.8
	Daily laborer	46	14.7
Family size	< five	270	86
	five	44	14
Household monthly income	Don't know	35	11.2
	< 1000	50	15.9
	1000-3000	78	24.8
	>3000	151	48.1

5.1.2. Pregnancy and Health related Characteristics

The mean age of women at marriage and first birth were 19.71 ± 2.47 and 20.66 ± 1.68 respectively. Among the total respondents 12(3.8%) and 6(1.9%) had experienced still birth and abortion respectively. The mean birth interval of the participants was 29.13 ± 7.6 months. More than two third of respondents 246 (78%) had previous history of pregnancy. 189 (77%) of them delivered at health facility while the rest delivered at home. During the data collection time, 84.3% of respondents were in the third trimester. Nearly half of the respondents 151(48.1%) had one or two ANC visits.

Respondents were also assessed for whether they had history of some morbidity such as Malaria, HIV, TB and intestinal helminthes infections during this study. Around 8% of the respondents had history of morbidity. All of them report history of malaria in the last one year whereas; none of the respondent was diagnosed to have any major infection during the current pregnancy. Additionally, sampled pregnant mothers were also asked about history of blood transfusion, HIV, TB, bleeding and previous anemia case in their life time and none of them report. Ninety percent of the women were heard about anemia. Eighty four (26.8%) of the women have got information about nutrition from their previous visits like iron source food, additional meal and healthy diets on current pregnancy, but only 32 (10.2%) have got information about nutrition from other sources.

Table 2: Pregnancy and health related characteristics of study participants in Hossana town, South Ethiopia, 2017 (n=314)

Variables	Category	frequency	Percent
Age at Marriage	18	96	30.5
	19-24	204	65
	25	14	4.5
Age of first birth	19	73	23.1
	20-24	235	74.9
	>25	6	2
Gap of pregnancy	< 2years	155	49.4
	2years	159	50.6
Number of pregnancy	Primi-gravida	72	22.9
	Multi-gravida	242	77.1
Place of previous delivery	Home	53	16.9
	Health institution	189	77
Gestational age	12 week	3	1
	13-24 week	46	14.7
	25 week	265	84.3
Number of ANC visit	1-2 times	151	48.1
	3 times	144	45.9
	4 times	19	6
Started ANC service	16 week	89	28.3
	17-24 week	176	56.1
	25 week	49	15.6
Utilized contraceptive method	Yes	223	71
	No	91	29
Types of contraceptive	Pills	22	7
	Injectable	172	54.8
	Long acting	29	9.2
Attended health education on current pregnancy	Yes	100	31.8
	No	214	68.2
Kinds of nutritional education	Iron source food	27	8.6
	Additional meals	56	17.8
	Healthy diets	1	0.3
Health education about nutrition outside this pregnancy	Yes	32	10.2
	No	282	89.8
Kinds of nutritional Health education	Iron source food	4	1.3
	Additional meal	16	5.1
	Healthy diets	11	3.5
	Folic acid tablets	1	0.3

5.1.3. Description of Dietary Intake

The mean 24hrs dietary food group intake of the respondents was 3.6 ± 2.27 . The mean of seven day's dietary food groups was 7.5 ± 1.3 . According to FANTA/FAO, 2016 classification guideline, from this study the finding of food groups were classified as 70(22.3%) of study participants as high dietary diversity score or had equal to or greater than eight food groups and 76(24.2%) consumed minimum dietary diversity score or less than six food groups.

Among study participants 99.4% consumed cereals while 99% pulses or legumes. More than half (57.6%) of pregnant women consumed milk and milk products while 48.7% of women have consumed meat, poultry and fish.

Table 3: Food groups consumption patterns of pregnant women in public health facilities in Hossana town, South Ethiopia, 2017 (n =314).

Food groups		Frequency	Percent
Milk and milk product		181	57.5
Egg		129	41.1
Cereals		312	99.4
Dark green leafy vegetables		305	97.1
Other vitamin A rich fruit, tubers and vegetables		260	82.5
Other fruits		262	83.4
Other vegetables		309	98.1
Meat, poultry and fish		153	48.7
Nut and seeds		19	6.1
Pulse or Legumes		311	99
DDS	High	70	22.3
	Medium	168	53.5
	Minimum	76	24.2
FVS	< 20	103	32.8
	20-24	109	34.7
	25-29	92	29.3
	30	10	3.2

DDS= Dietary diversity score, FVS=Food variety score

The mean food variety of the respondents was 22.23 ± 4.54 . The amount of the food varieties consumed within one week period was shown in Table 4. The participants have consumed teff (99.7%), wheat (96.5%), lentils (94.9%), potato (93 %), peas (91.4%) and tomatoes (90.4). Around half of the women ate below 50% of animal source food, however, butter (27.1%), meat (17.5%), oats (14%), Swiss chard (11.5%), millet (4.5%), kidney bean (2.5%), poultry (1.3%) and fish (0.6%) were the least consumed food items in the study participants.

Table 4: Food varieties consumption patterns of pregnant women in public health facilities in Hossana town, South Ethiopia, 2017(n=314).

<i>Food Varieties</i>	frequency	percent
<i>Whole milk</i>	156	49.8
<i>Cheese</i>	141	44.9
<i>Yoghurt</i>	94	29.9
<i>Butter</i>	85	27.1
<i>Wheat</i>	303	96.5
<i>Barley</i>	252	80.5
<i>Oats</i>	44	14
<i>rice</i>	203	64.6
<i>teff</i>	313	99.7
<i>Millet</i>	14	4.5
<i>Potato</i>	292	93
<i>kale</i>	249	79.3
<i>Swiss chard</i>	36	11.5
<i>Endive</i>	267	85
<i>Lettuce</i>	185	58.9
<i>Mango</i>	213	67.8
<i>Papaya</i>	154	49
<i>Orange</i>	144	45.9
<i>Lemon</i>	219	69.7
<i>Tomato</i>	284	90.4
<i>Chillies</i>	215	68.5
<i>Beef</i>	102	32.5
<i>Mutton</i>	55	17.5
<i>Goat</i>	41	13.1
<i>poultry</i>	4	1.3
<i>Fish</i>	2	0.6
<i>Peas</i>	287	91.4
<i>Chickpeas</i>	143	45.5
<i>Horse bean</i>	85	27.1
<i>Lentils</i>	298	94.9
<i>Kidney bean</i>	8	2.5
<i>Product of Enset</i>	269	86.2

5.2.1. Prevalence of anemia

The overall prevalence anemia among antenatal care attending pregnant women in Hossana town public health facilities with adjusted for altitude by subtracting from the value of women hemoglobin level, using the cut off point for hemoglobin level <11g/dl in first trimester and <10.5g/dl for both second and third trimester was 76/314 (24.2%), (95% CI: 19.4-28.7) and it is found to be a moderate public health significance. Prevalence of anemia in terms of severity; mild, moderate and severe were accounts 56.6%, 40.8% and 2.6% respectively.

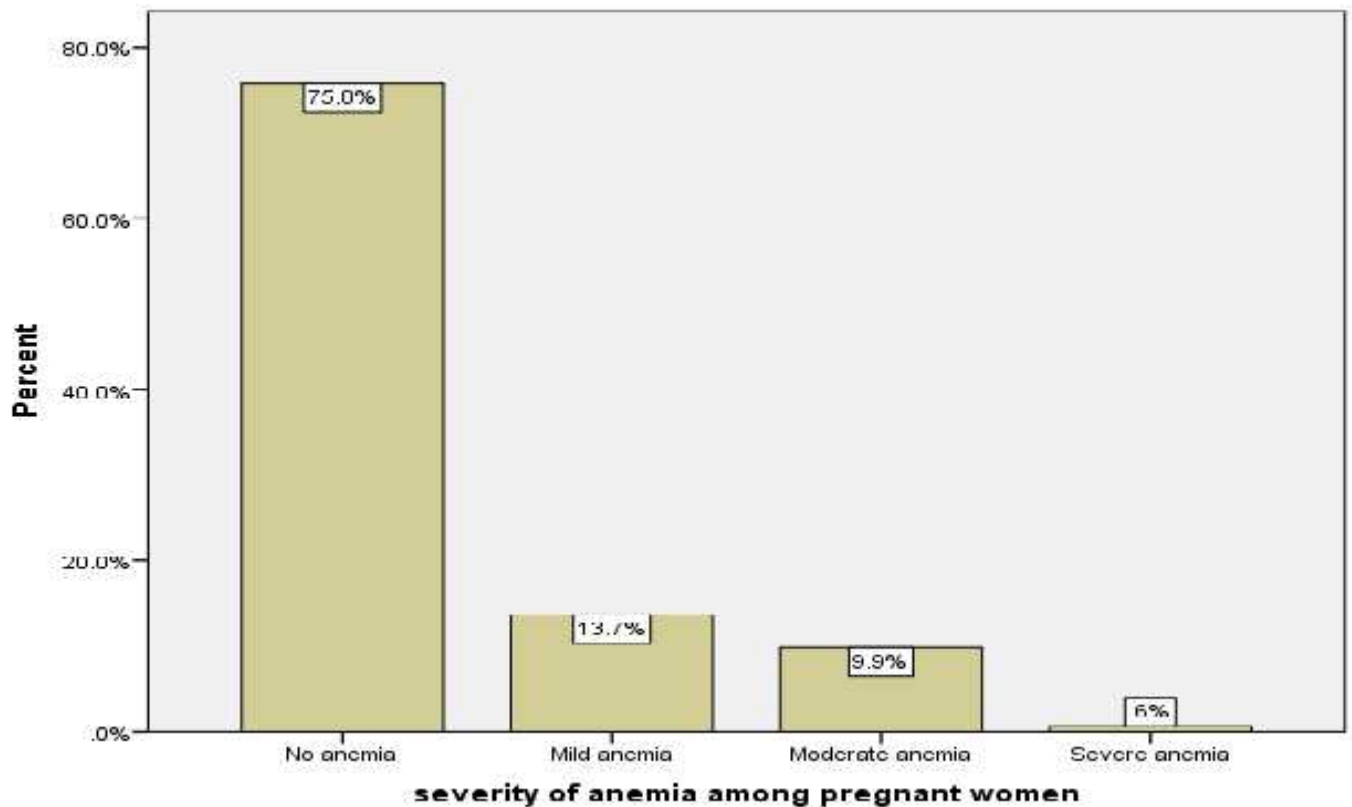


Figure 3: the severity of anemia among pregnant women in public health facilities in Hossana town, South Ethiopia, 2017 (n = 314)

5.2.2. Women Dietary Diversity Score

The food groups which used to construct WDDS was taken from WHO/FAO classification guideline and adapted to local food items. The women considered as consumption of the food items at least once in the past one week. The women dietary diversity score was constructed as the sum of numbers of food groups consumed over the past one week. Higher score shows higher diversity, as more food groups were consumed. In the current study, the minimum and maximum women dietary diversity was three and ten respectively. There is no conventional cut-offs to indicate adequate or inadequate dietary diversity within a week for the women, therefore, the score is converted into tertiles and the higher tertile of the score was taken as high dietary diversity score and low tertiles was as minimum dietary diversity score. Adequate women dietary diversity: when the women consumed at least eight or above food groups within one week before the survey. Inadequate women dietary diversity: when the women consumed less than eight food groups within one week before the survey.

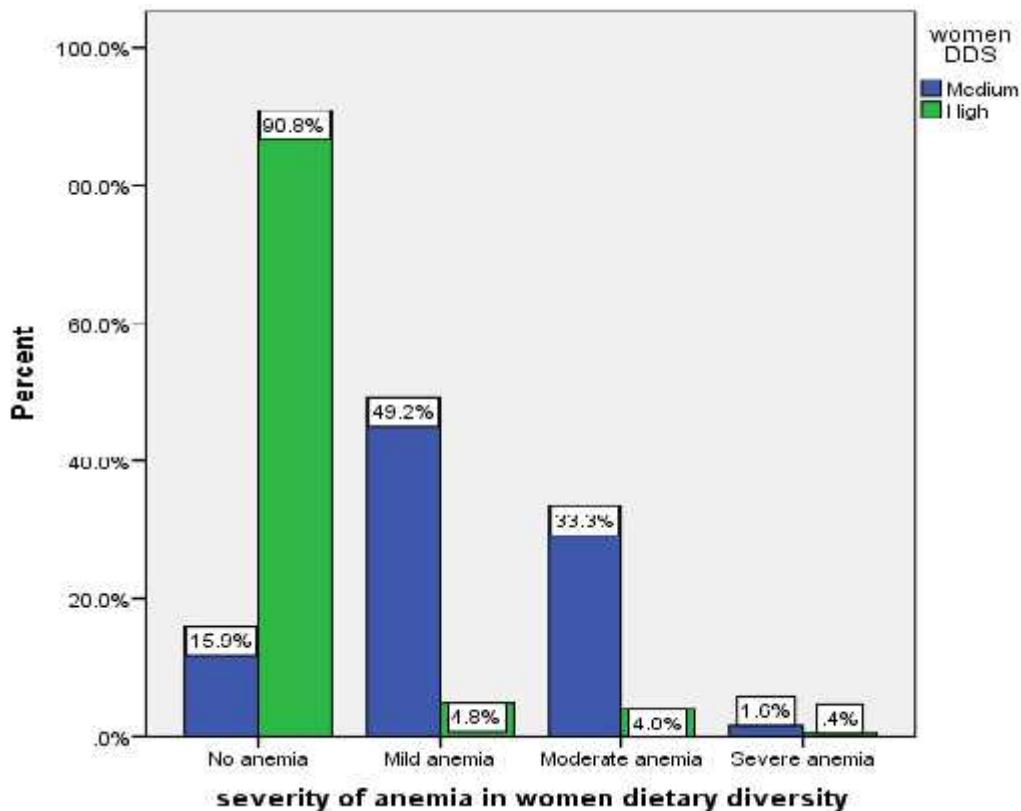


Figure 4: Food groups with anemia prevalence among pregnant women in public health facilities in Hossana town, South Ethiopia, 2017 ($n = 314$).

5.3: Factors Associated with Anemia among Pregnant Women

The demographic and socio-economic factors, clinical characteristics and seven days' prior to the survey nutritional related factors of the study participants which might have an association with anemia were analyzed.

First bivariate regression analysis was done to identify factors associated with anemia among pregnant women then; education of mother, occupation of the mother, spouse occupation, spouse education, gap between the previous and current pregnancy, heard about anemia, history of malaria in last one year, history of health education about nutrition during the current pregnancy, low monthly income of the family, nutritional education other than current pregnancy and minimum dietary diversity score were identified as the candidate for multivariable logistic regression analysis as shown in table 5 and 6, by excluding the variables which have P-value greater than 0.25.

Table 5: Bivariate analysis of socio-demographic and economic, pregnancy and health related factors of pregnant women in public health facilities Hossana town, South Ethiopia, 2017(n=314)

Variables	Category	Anemia		COR (95% CI)	P
		Yes (%)	No (%)		
Age group	20-24	25(27.2)	65(72.8)	1	
	25-29	34(44.7)	124(52.1)	1.4(0.9, 2.11)	0.303
	30	15(24.2)	47(75.8)	2.7(0.14, 3.14)	0.604
Ethnicity	Hadiya	51(23.5)	166(76.5)	1	
	Kambata	10(18.9)	43(81.1)	1.3(0.6, 2.8)	0.471
	Amhara	12(66.7)	6(33.3)	1.1(0.34,3.4)	0.902
Religion	Orthodox	11(52.4)	10(47.6)	1	
	Protestant	52(19.8)	211(80.2)	1.38(0.51, 3.7)	0.521
	Muslim	13(52)	12(48)	0.5(0.2, 1.8)	0.283
Family size	< five	64(23.7)	206(76.3)	1.2(0.6, 2.5)	0.609
	five	12(27.3)	32(72.7)	1	
Age at Marriage	18	23(24)	73(76)	1.08(.6, 1.8)	0.946
	>18	53(24.3)	165(75.7)	1	
Age of first birth	19	19(26)	54(74)	1.11(.6, 2.2)	0.762
	>19	57(23.8)	183(76.2)	1	
Number of pregnancy	Primi-gravida	18(26.5)	50(73.5)	1	
	Multi-gravida	58(23.6)	188(76.4)	1.2(0.6, 2.2)	0.578
Place of previous delivery	Home	11(17.7)	51(82.3)	1.6(0.76, 3.3)	0.256
	Health institution	47(25.4)	138(74.6)	1	
Gestational age	24 week	13(26.5)	36(73.5)	1	
	25 week	63(23.9)	201(76.1)	1.2(0.6, 2.3)	0.689
Number of ANC visit	< 3 times	56(37.1)	95(62.9)	1.2(0.4, 3.5)	0.722
	3 times	20(12.3)	143(87.7)	1	
Utilize contraceptive method	Yes	57(25.7)	165(74.3)	1.3(0.73, 2.4)	0.37
	No	19(20.7)	73(79.3)	1	

P = P-Value, COR = Crude odds ratio, CI = Confidence interval

Result of Multivariable logistic regression analysis; by taking other variables constant the women who attended primary level 8.9 times (AOR=8.9; CI: 1.6, 51) and can't read and write 10.5 times (AOR = 10.5; 95% CI: 2.2, 57) more likely to be exposed to anemia as compared to those secondary and above, occupation of spouse being daily laborer (AOR =9.3; 95% CI: 1.6, 53) were 9.3 times more likely to be anemic as compared to governmental employee, women's who didn't get health education about nutrition concerning iron source foods, additional meals and healthy diets on current pregnancy (AOR = 2.5; 95% CI: 1.5, 6.4) were 2.5 times more likely to be exposed to anemia as compared to those who got the information, moreover, women's with minimum dietary diversity score (AOR =18.6; 95% CI: 4.4, 78) were 18.6 times more likely to be exposed for anemia than women who had high dietary diversity, more shown in Table 6.

Table 6: Association of anemia with socio-demographic and economic, pregnancy and health related characteristics and dietary diversity score among pregnant women in public health facilities in Hossana town, South Ethiopia, 2017($n = 314$).

Variables	Category	Anemia		COR (95% CI)	AOR (95% CI)
		Yes (%)	No (%)		
Mothers' education	Can't read and write	31(36.5)	54(63.5)	16(3.3, 77) **	10.5(2.2,57) **
	Primary level	27(21.8)	97(78.2)	5.1(1.6, 16.2) **	8.9(1.6,51) **
	Secondary and above	18(17.1)	87(82.9)	1	1
Spouse education	Can't read and write	26(72.2)	10(27.8)	4.4(0.18, 16.1)	9.7(0.03, 5.1)
	Primary level	32(35.2)	59(64.8)	3.23(1.3, 22.5)	0.3(0.02, 6.)
	Secondary and above	18(9.6)	72(90.4)	1	1
Mothers' occupation	House wife	28(12.4)	196(77.6)	1	1
	Merchant	20(62.5)	12(37.5)	1.7(0.6, 5.2)	0.6(0.12, 3)
	Government employee	16(32.6)	33(67.4)	4.2(1.2, 14)	6.2(0.2, 16)
	Students	12(66.7)	6(33.3)	2.6(0.3, 21.9)	0.9(0.6, 7.1)
Spouse occupation	Government employee	14(15.7)	75(84.3)	1	1
	Farmer	15(51.7)	14(48.3)	3.9(1.3, 11.9) *	10.2(2.1, 52)
	Merchant	20(13.3)	130(86.7)	1.5(1.4, 5.9) *	4.8(1.03, 22)
	Daily laborer	27(58.7)	19(41.3)	11.9(3.4,40.9) **	9.3(1.6, 53) **
Gap between pregnancy	< 24 month	45(29)	110(71)	1.7(1.4, 3.2)	1.6(0.7, 3.7)
	24month	31(19)	128(81)	1	1
Household monthly income	< 1000	30(60)	20(40)	2.2(1.3, 4.9)	1.3(0.5, 3.6)
	1000-3000	17(21.8)	61(78.2)	0.7(0.3, 1.7)	0.6(0.2, 1.9)
	>3000	14(9.3)	137(90.7)	1	1
History of malaria in last one year	Yes	12(48)	13(52)	3.2(1.03, 11.9)	0.2(0.02, 3.3)
	No	64(22.1)	225(77.9)	1	1
Heard about anemia	Yes	66(23.2)	219(76.8)	1.9(0.9, 4.5)	1.2(0.3, 3.8)
	No	10(34.5)	19(65.5)	1	1
Nutrition education in current pregnancy	Yes	35(35)	65(65)	1	1
	No	41(19.2)	173(80.8)	3.4(1.6, 7.2) *	2.5(1.5, 6.4) *
Nutrition education previous pregnancy	Yes	13(40.6)	19(59.4)	1	1
	No	63(22.3)	219(77.7)	2.7(0.8, 9.3)	1.2(0.2, 6.7)
DDS	Minimum	50(65.8)	26(34.2)	30.8(11.8, 131) **	18.6(4.4,78) **
	High	14(20)	56(80)	1	1

* $P < 0.05$, ** $P < 0.01$, COR=Crude odds ratio, CI=Confidence interval, AOR=Adjusted odds ratio

6. DISCUSSION

Anemia is a major public health problem in developing countries as well as in Ethiopia, it cause different complication on the fetus and mother at the time of pregnancy. According to Ethiopia demography health survey report about one-fourth of women age 15-49 (23%) are anemic with mild, moderate and severe anemia accounts for 17, 5 and 1% respectively. The proportion of women with any anemia is notably higher in rural than in urban areas (25% versus 16%). According to this study anemia found to be a moderate public health significance which is consistent with the study done Gondar and Nekemt towns were 23.2% and 29% of pregnant women were anemic respectively[39, 40]. However, this figure was low as compared to the findings from Northern Nigeria, Gilgel Gibe dam southwest Ethiopia, Jimma University Specialized Hospital and Wolayita Soddo town were 61.2%, 53.9%, 38.2% and 39.94% pregnant women were anemic[22, 26, 27, 42]. This difference might be due to cultural and economic differences. This finding also higher as compared to the study done in Iran 13.1%, Mekelle 19.7% and Hawassa town 15% [28, 36, 43] this inconsistency between this study finding and the studies conducted on other parts of Ethiopia might be due to the differences with respect to socio-economic, geographic and eating habit of women's found in different regions, as well as the differences among the town inside Ethiopia and variation with study conducted other countries also might be because of dissimilarity in socio-cultural, socio-economic and geographical conditions among people of those countries.

This study show pregnant women who can't read and write were more likely to be anemic as compared to the women secondary and above school. This finding is similar with study done in Kenya and Tikur Anbessa Specialized Hospital Addis Abeba, Ethiopia [33, 41], this might be due to women's who achieved secondary and above school may have a better awareness about quality or healthy diet during pregnancy.

The occupation of spouse being daily laborer was found to be significantly associated with developing anemia as compared to the women whom husband were governmental employee. This finding is consistent with study done in Turkey and Arba Minch town [45, 46]. This consistency might be due to the economical level of merchants and other employees are higher than daily laborer. It also suggested due to women in low socioeconomic levels are likely to be poorly educated and regularly have financial constraints such women are likely to find it

challenging to access and afford quality food. Hence, they are more likely to suffer the adverse effects of poor/inadequate nutrition, chronic infections and worm infestations which related with anemia.

In this study history of attending health education about nutrition during pregnancy was significantly associated with anemia. Women who didn't get health education about nutrition during antenatal care were more likely to be exposed to anemia as compared to those who got the information. This is consistent with study conducted in Arba Minch town health institutions [46]. This similarity might be because of urban women are believed to be wide-open to updated information about the health benefits of a different food varieties through diverse media sources.

Finally the pregnant women who had minimum women dietary diversity score or less than six food groups were more likely to be anemic as compared to women ate high dietary diversity score within a week. This finding is similar with the study done in Mekelle town and Ghana [36, 47]. This is might be pregnancy is the most nutritionally demanding period in a woman's life cycle as a result their iron level decline, pregnant women are recommended to eat more diversified diet than common eating pattern of the family for compensating the normal physiological demand which is used by the fetus and mother.

7. CONCLUSION AND RECOMMENDATION

7.1. Conclusion

The current study found that the prevalence of anemia among pregnant women was moderate public health significance. This study revealed that the educational status of mother, occupation of spouse being daily laborer, history of health education about nutrition during current pregnancy and women minimum dietary diversity score had significance association with anemia during pregnancy. The mean dietary diversity showed that dietary diversity among the pregnant women was nearly adequate dietary diversity score but from this study many anemic women had less than six food groups which below expected eating standard food of pregnant women.

7.2. Recommendation

For education offices

- Adult learning should be strengthened to empower women educational level
- Promote Health education concerning healthy diets

For health offices

- Monitoring the magnitude of anemia among pregnant
- Encouraging the women to ate diversified diets
- Enhancing dietary diversity or food groups took the women hence it might be the proxy indicators for anemia prevention.

For policy makers and stakeholders

- ❖ Increase of anemia being public health significance click an attention of implementation of intervention strategies.
- ❖ Strengthening occupation of the spouse or the household

For health facilities

- 🍌 Promotion of awareness on nutritional benefits especially consumption of iron-rich foods, additional meals and healthy diets at pregnancy period
- 🍌 Integrated and multi-sectorial intervention should be considered mainly concerning the causes of anemia and its risk factors at ANC follow-up.
- 🍌 Monitoring the number of food groups took the women during ANC visit.

For health extension

- ❖ Health extension workers should underline ongoing strengthening intervention strategies to decline the risk of anemia among pregnant women.

For agricultural office

- 🍌 Improving production of diversified diets in urban agricultural programme

For researchers

- ❖ Further research should be done on prevalence and contributing factors of anemia during pregnancy with quantitative measurement of strong study design.

8. LIMITATION OF THE STUDY

8.1. Limitation of the study

- ✓ Recall and/or social desirability bias during subjects were demanded to provide dietary information on food frequency questionnaire and monthly income of the family.
- ✓ Most women consumed food from a common bowl or mixed dish which is challenging to quantify specific intake food items.
- ✓ In the current study quantitative measurement of nutrients were not done due to absence of dataset or measurement used that provide information on the amount of food consumed by pregnant women to counted as among ten food group
- ✓ The study was cross sectional and may not show variations of dietary practices the women by different seasons of the years.

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ANNEXE: I. INFORMATION SHEET AND CONSENT FORM

Research Title: To assess dietary diversity score and its association with anemia among pregnant women in public health facilities of Hossana town, South Ethiopia.

Hello, my name is _____ I am working for _____ organization. We are doing a survey to assess dietary diversity score and its association with anemia among pregnant women in public health facilities of Hossana town, South 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. Please feel free to answer these questions as they will help in futures village development of nutritional status. It will last a maximum of 20 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.

SECTION: 2. Pregnancy and Health Related Maternal Factors

S. No	Questions	Coding categories
111	Age at marriage?	_____year
112	Age at first birth?	_____year
113	Total number of pregnancy including the current one?	_____.if Primigravida → 120
114	How many of the pregnancies were given still birth?	_____.
115	Do you have an experience of abortion?	1. Yes 2. No
116	If yes question 115, how many times?	_____.
117	How many months are there b/n the previous and the current pregnancy?	_____.
118	If she is not primigravida, history of ANC at previous pregnancy?	1. Yes 2. No
119	If she is not primigravida, place of delivery for previous pregnancy?	1. Home 2. Health facility
120	Last normal menstrual period of the women, gestational age in week?	_____weeks.
121	How many times did you visit antenatal care service with this pregnancy?	_____.
122	At what month of current pregnancy did you start to go for ANC service?	_____month.
123	Have you ever used family planning methods?	1. Yes 2. No
124	If yes question 123, what type of family planning method you used?	1. Pills 2. Injectable 3.Long acting method 4. Other specify_____.
125	Have you been treated with intestinal helminthes on current pregnancy?	1. Yes 2. No
126	Have you been treating with malaria on current pregnancy?	1. Yes 2. No
127	Have you ever been heard about anemia?	1. Yes 2. No
128	Have you ever been treated with anemia in your life?	1. Yes 2. No
129	Have you ever been treated with tuberculosis infection?	1. Yes 2. No
130	Have you ever been screened/treated with HIV?	1. Yes 2. No
131	Do you have history of bleeding on current pregnancy?	1. Yes 2. No
132	Do you have history of blood transfusion on current pregnancy?	1. Yes 2. No
133	Have you ever taken Health education about Nutrition during pregnancy?	1. Yes 2. No
134	If yes question 133, what kinds of information did you get?	1. Iron source food 2. Additional meals 3. Healthy diets
135	Have you ever taken H/E about Nutrition for the current pregnancy?	1. Yes 2. No

136	If yes question 135, what kinds of information did you get?	1. Iron source food 2. Additional meals 3. Healthy diets 4. Folic acid tablets 5. Other specify_____
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SECTION: 3. Nutrition related and Dietary intake Factors

3.1. Maternal 24 Hours Dietary Recall

Steps	Multiple pass 24 hours	Food eaten	Remark
First pass	Quick List		
Second pass	Detailed description		
Third pass	Review		

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.

Meal	Breakfast	Snack	Lunch	Snack	Dinner	Snack	Remark
Food items (Eaten with in the last 24hrs)							

When the respondent recall is complete, fill in the food groups based on the information recorded above, for any food groups not mentioned.

3.2. Food Frequency Questionnaire

S. No	Question	Possible alternatives	Remark
137	How many meals per day do you eat on current pregnancy?	1. Once 2. 2 times 3. 3times 4. 4 times 5. 5 times 6. I don't know	
138	Do you take milk & milk product?	1. Yes 2. No	2 → 141
139	What types of dairy, milk and milk products do you take?	1. Whole milk 2. Cheese 3. Powdered milk 4. Yoghurt 5. Butter milk 6. Low fat milk 7. Butter	

140	How many times do you take dairy, milk and milk products?	1. Daily 2. 2 – 3/week 3. 4 – 6/week 4. 1x/week 5. Once/month 6. Seldom 7. Never	
141	Do you eat egg?	1. Yes 2. No	2 → 144
142	What types of egg do you eat?	Hen, duck or any other egg	
143	How many times do you eat eggs?	1. Daily 2. 2 – 3/week 3. 4 – 6/week 4. 1x/week 5. Once/month 6. Seldom 7. Never	
144	Do you eat cereals& ready-to-eat?	1. Yes 2. No	2 → 149
145	Do you eat white tubers & roots?	1. Yes 2. No	
146	What types of Cereals, white tubers and roots or Starchy staples do you eat?	A. Cereals and grains including ready-to-eat; 1. Wheat (such as whole meal/white bread) 2. Barley 3. Oats/aja 4. Rice 5. Maize 6. Spaghetti/pasta 7. Macaroni 8. Sorghum 9. Teff 10. Other (millet, sago, semolina, triticale) B. White tubers and roots; potatoes, yams, cassava (White), godere, boyna or other foods made from roots	
147	How many times do you eat like potato, cassava, godere, boyna?	1. Daily 2. 2 – 3/week 3. 4 – 6/week 4. 1x/week 5. Once/month 6. Seldom 7. Never	
148	How many times do you eat cereals?	1. Daily 2. 2 – 3/week 3. 4 – 6/week 4. 1x/week 5. Once/month 6. Seldom 7. Never	
149	Do you eat Dark Green Leafy Vegetables?	1. Yes 2. No	2 → 152
150	What types of Dark Green Leafy Vegetables do you eat?	1. Kale 2. Swiss chard 3. Endive 4. Lettuce 5. Pumpkin leaves 6. Spinach 7. Cassava leaves 8. Mustard greens 9. Broccoli 10. Others_____.	
151	How many times do you eat Dark Green Leafy Vegetables?	1. Daily 2. 2 – 3/week 3. 4 – 6/week 4. 1x/week 5. Once/month 6. Seldom 7. Never	
152	Do you eat ripe mangoes, papaya, bananas and peaches (dried, raw)?	1. Yes 2. No	2 → 155
153	What types of other Vitamin A rich Fruits, Tubers and Vegetables	Mango, papaya (Ripe, fresh and dried), pumpkin, carrots, sweet potatoes, red sweet pepper, red palm fruit/pulp,	

	do you eat?	passion fruit, melon, deep yellow or orange-fleshed bananas, peaches (dried, raw)	
154	How many times do you eat other Vitamin A rich Fruits, tubers & Vegetables which mention above?	1. Daily 2. 2 – 3/week 3. 4 – 6/week 4. 1x/week 5. Once/month 6. Seldom 7. Never	
155	Do you eat other fruits and vegetables?	1. Other fruits; 1. Yes 2. No 2. Other vegetables; 1. Yes 2. No	2 → 158
156	What types of other fruits and Vegetables do you eat?	1. Fruits items; avocado, apple, mandarin orange, Dates, white/cream-fleshed bananas, strawberry, Grapes, Pears, not ripe mango or papaya, orange, lemon, pineapple, cherries, olive, peach, guava, citron, casimire, Wild fruits 2. Vegetables items; Beet root, common cabbage, onion, green beans, Cucumber, tomatoes, peas (fresh), green pepper, cauliflower, garlic, mushroom, chillies, green maize, leek, beets, ginger, wild vegetables.	
157	How many times do you eat other fruits and Vegetables?	1. Daily 2. 2 – 3/week 3. 4 – 6/week 4. 1x/week 5. Once/month 6. Seldom 7. Never	
158	Do you eat meat, poultry and fish?	1. Yes 2. No	2 → 161
159	What types of organ meat, meat and poultry, and fish/seafood do you eat?	1. Liver, kidney, heart or all other organ meats like tripe 2. Lamb, mutton, beef, veal, goat 3. Poultry (e.g. chicken, guinea fowl) 4. Fresh or dried fish, seafood	
160	How many times do you eat organ meat, other meat, poultry and fish?	1. Daily 2. 2 – 3/week 3. 4 – 6/week 4. 1x/week 5. Once/month 6. Seldom 7. Never	
161	Do you take Nuts and seeds?	1. Yes 2. No	2 → 164
162	What types of Nuts and seeds do you eat?	1. Almond 2. Sunflower 3. Linseed 4. Melon seeds 5. Sesame 6. 4 th 7. Other specify_____.	
163	How many times do you eat Nuts and seeds?	1. Daily 2. 2 – 3/week 3. 4 – 6/week 4. 1x/week 5. Once/month 6. Seldom 7. Never	
164	Do you take Pulses or legumes?	1. Yes 2. No	2 → 167
165	What types of pulses or legumes	1. Peas 2. Chickpeas 3. Horse bean 4. Lentils	

	do you eat?	5. Vetch 6. Haricot beans 7. Kidney bean 8. Niger seed 9. Fenugreek 10. Other specify_____	
166	How many times do you eat pulses or legumes?	1. Daily 2. 2 – 3/week 3. 4 – 6/week 4. 1x/week 5. Once/month 6. Seldom 7. Never	
167	Do you take fats and oils?	1. Yes 2. No	2 → 170
168	What types of fats and oils do you take?	1. Margarine, salad oil 2. PUFA oil or የኑግዘይት 3. Oil, fats or butter added to food or used for cooking	
169	How many times do you take fats and oils?	1. Daily 2. 2 – 3/week 3. 4 – 6/week 4. 1x/week 5. Once/month 6. Seldom 7. Never	
170	Do you take beverages?	1. Yes 2. No	2 → 174
171	What types of beverages?	1. Non-alcoholic (Tea, Coffee, Cocoa) 2. Alcoholic	
172	How many times do you take alcoholic beverages?	1. Daily 2. 2 – 3/week 3. 4 – 6/week 4. 1x/week 5. Once/month 6. Seldom 7. Never	
173	How many times do you take non-alcoholic beverages?	1. Daily 2. 2 – 3/week 3. 4 – 6/week 4. 1x/week 5. Once/month 6. Seldom 7. Never	
174	Do you eat products of Enset?	1. Yes 2. No	2 → 177
175	What items of Enset do you eat?	Atakano, bulla, kocho, amicho	
176	How many times do you eat Enset?	1. Daily 2. 2 – 3/week 3. 4 – 6/week 4. 1x/week 5. Once/month 6. Seldom 7. Never	
177	Women dietary diversity score (based on above food group taken)	_____ food groups	
178	Women food variety score (based the above food items has taken)	_____ food items (put the numbers of food items took within a week)	

SECTION: 4. Maternal Laboratory Status Check list

S. No	Variable	Result	Category (Severity)	Remark
179	Maternal Hemoglobin level	_____ g / dl.	1. No anemia 2. Mild anemia 3. Moderate anemia 4. Severe anemia	
180	Maternal Stool Examination	_____.	1. HW 2. Ascariasis 3. Others_____	

Name of lab technician. _____ .Sign. _____

113	የመጀመሪያእርግዝናዎካልሆነአስካሁንለምንያህልጊዜአርግዘውያውቃሉ?	_____ ጊዜመጀመሪያ → 120
114	በስንቶቹእርግዝናውስጥህይወትየሌላቸውልጆችወልደዋል?	_____ ጊዜ
115	አስካሁንውርጃአጋጥሞትያውቃል?	1. አዎ 2. አይደለም
116	ምንያህልጊዜአስካሁንውርጃአጋጥሞትያውቃል?	_____ ጊዜ
117	ከዚህቀደምየነበሩትንልጆችዎንሲወልዱበመካከላቸውየስንትዓመትልዩነትነበራቸው?	_____ ዓመት
118	የከዚህቀደምበነበረውእርግዝናዎወሊድእንክብካቤአግኝቶዋል?	1. አዎ 2. አይደለም
119	የከዚህቀደምበነበረውወቅትወሊድእንክብካቤየትነበርያገኙት?	1. ቤት 2. ጤናተቃም
120	አሁንያረገዙትንስንተኛወሩላይነው?	_____ ወር
121	በአሁኑእርግዝናዎቅትምንያህልጊዜየቅድመወሊድእንክብካቤለማድረግሄዱ?	_____ ጊዜ
122	በአሁኑእርግዝናዎቅትየቅድመወሊድእንክብካቤማድረግየጀመሩትበስንተኛወርነው?	_____ ወር
123	የቤተሰብምጣኔዘዴዎችተጠቅመውያውቃሉን?	1. አዎ 2. አይደለም 2 → 125
124	ምንአይነትየቤተሰብምጣኔዘዴዎችተጠቅመውያውቃሉን?	1. የሚዋጥ 2. በመርፈያሚሰጥ 3. ለረጅምጊዜየሚሰጥ 4. ሌላካለይጥቀሱ_____.
125	በአሁኑእርግዝናዎቅትአንጀትትላትልታክመውነበር?	1. አዎ 2. አይደለም
126	በአሁኑእርግዝናዎቅትለወጣሽታታክመውነበር?	1. አዎ 2. አይደለም
127	ስለደምማነስምንነትያውቃሉን?	1. አዎ 2. አይደለም
128	በህይወቶዎደምማነስታክመውያውቃሉን?	1. አዎ 2. አይደለም
129	በህይወቶዎለሳንባ-ነቀርሳበሽታታክመውያውቃሉን?	1. አዎ 2. አይደለም
130	በህይወትዘመነኖለአድስበሽታታክመውያውቃሉን?	1. አዎ 2. አይደለም
131	በአሁኑእርግዝናዎቅትደምፈሶትያውቃሉን?	1. አዎ 2. አይደለም
132	በአሁኑእርግዝናዎቅትደምተሰጥቶዎትወይምሰጥቶያውቃሉን?	1. አዎ 2. አይደለም
133	በአሁኑእርግዝናዎቅትስለስነ- ምግብትምህርትተሰጥቶዎትያውቃልን?	1. አዎ 2. አይደለም 2 → 135
134	ምንአይነትየስነ- ምግብትምህርትተሰጥቶዎትያውቃሉን?	1. ስለአይረንያላቸውምግብ 2. ስለተጨማሪምግብ 3. ስለጤናማምግብ 4. ሌላካለይጥቀሱ_____.
135	በህይወቶዎስለስነ- ምግብትምህርትተሰጥቶዎትያውቃልን?	1. አዎ 2. አይደለም 2 →
136	ምንአይነትየስነ- ምግብትምህርትተሰጥቶዎትያውቃሉን?	1. ስለአይረንያላቸውምግብ

		2. ስለተጨማሪምግብ 3. ስለጤናምግብ 4. ስለፎሊትያላቸውምግብ 5. ሌላካለይጥቀሱ_____
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ክፍል ሶስት. የእናቲቱን የአመጋገብ መረጃ በተመለከተ መጠይቅ

3.1. በ24 ሰዓት ጊዜ የወሰዱት የምግብ አይነት ይዘርዝሩ (ከትናንት ጠዋት ጸሃይ ከወጣ በትእስከ ዛሬ ጠዋት ጸሃይ የወጣ በትያለዉ)

ምግብ	ቁርስ	ብለኞች	ምሳ	መክሰስ	እራት
የምግብ አይነት ዝርዝር					

3.2. የእናቲቱን የሰፊ ወሳምታ ዊየአመጋገብ መረጃ በተመለከተ መጠይቅ

ተ.ቁ	ጥያቄ	መልስ	
137	በእርግጥ ወቅት በቀን ምን ያህል ጊዜ ይመገባሉ?	1. አንድ ጊዜ 2. ሁለት ጊዜ 3. ሦስት ጊዜ 4. አራት ጊዜ 5. አምስት ጊዜ 6. > 6 ጊዜ	
138	ወተት ናየወተት ተዋፅኦቶችን ወስዳሉን?	1. አዎ 2. አይደለም	2 → 141
139	ምን አይነት ወተት ናየወተት ተዋፅኦቶችን ወስዳሉን?	1. ወተት 2. አይቤ 3. የታሸገ ወይም የዱቄት ወተት 4. እርጎ 5. የተናጠወተት 6. አጓት 7. ቅቤ	
140	ምን ያህል ጊዜ ወተት ናየወተት ተዋፅኦቶችን ወስዳሉን?	1. በየቀኑ 2. በሳምንት ከ2-3 ጊዜ 3. በሳምንት ከ4-6 ጊዜ 4. በሳምንት 1 ጊዜ 5. በወር 1 ጊዜ 6. አልፎ አልፎ 7. በጭራሽ ተመግቤ አላውቅም	
141	እንቁላል ይመገባሉ?	1. አዎ 2. አይደለም	2 → 141
142	ምን አይነት እንቁላል ይመገባሉ?	1. የዶሮ 2. የጅግራ፣ የዳክዩ 3. ሌላ ካለይጥቀሱ_____	
143	ምን ያህል ጊዜ እንቁላል ይመገባሉ?	1. በየቀኑ 2. በሳምንት ከ2-3 ጊዜ 3. በሳምንት ከ4-6 ጊዜ 4. በሳምንት 1 ጊዜ 5. በወር 1 ጊዜ 6. አልፎ አልፎ 7. በጭራሽ ተመግቤ አላውቅም	

144	የብእርወይምከብእርየተሰሩምግቦችንይመገባሉ?	1. አዎ 2. አይደለም	2 → 149
145	ምንአይነትየብእርወይምከብእርሰብሎችየተሰሩምግቦችንይመገባሉ?	1. ማሽላ 2. ገብስ 3. በቆሎ 4. ሩዝ 5. ፓስታ 6. ስንዴ 7. ማክሮኒ 8. ጤፍ 9. ሌላካለይጥቀሱ_____	
146	ምንያህልጊዜየብእርወይምከብእርሰብሎችየተሰሩምግቦችንይመገባሉ?	1. በየቀኑ 2. በሳምንትከ2-3 ጊዜ 3. በሳምንትከ4-6 ጊዜ 4. በሳምንት 1 ጊዜ 5. በወር 1 ጊዜ 6. አልፎአልፎ 7. በጭራሽተመግቤአላውቅም	
147	ምንአይነትየስራስርወይምከስራስርሰብሎችየተሰሩምግቦችንይመገባሉ?	1. ድቡልቡልድንች 2. ስካርድንች 3. ቦይና 4. ጎደሬ5. ሌላካለይጥቀሱ_____.	
148	ምንያህልጊዜየስራስርወይምከስራስርሰብሎችየተሰሩምግቦችንይመገባሉ?	1. በየቀኑ 2. በሳምንትከ2-3 ጊዜ 3. በሳምንትከ4-6 ጊዜ 4. በሳምንት 1 ጊዜ 5. በወር 1 ጊዜ 6. አልፎአልፎ 7. በጭራሽተመግቤአላውቅም	
149	ጥቁርአረንጋዴቅጠላቅጠልያላቸዉወይምDGLV ምግቦችንይመገባሉ?	1. አዎ 2. አይደለም	2 → 152
150	ምንአይነትጥቁርአረንጋዴቅጠላቅጠልያላቸዉወይምDark Green Leafy Vegetables ምግቦችንይመገባሉ?	1. አበሻጎመን 2. ቆስጣ 3. ጥቅልጎመን 4. ሰላጣ 5. የዱባቅጠል 6. ጎመንሰፒናሽ 7. ካሳባቅጠል 8. ስናፍጭ 9. አበባጎመን 10. ሌላካለይጥቀሱ_____.	
151	ምንያህልጊዜጥቁርአረንጋዴቅጠላቅጠልያላቸዉወይም DGLV ምግቦችንይመገባሉ?	1. በየቀኑ 2. በሳምንትከ2-3 ጊዜ 3. በሳምንትከ4-6 ጊዜ 4. በሳምንት 1 ጊዜ 5. በወር 1 ጊዜ 6. አልፎአልፎ 7. በጭራሽተመግቤአላውቅም	
152	የበሰሎማንጎወይምፓፓያ፣ካሮት፣ወዘተ...ምግቦችንይመገባሉ?	1. አዎ 2. አይደለም	2 → 155
153	ምንአይነትየበሰሎማንጎወይምፓፓያ፣ካሮት፣ወይምየተሰሩምግቦችንይመገባሉ?	1. የበሰሎማንጎ, ፓፓያ 2. ካሮት 3. የበሰሎሙዝ 4. ኮከ 5. ቃሪያ 6. ሀብሀብ 7. ዱባ 8. ስካርድንች 10. ጥሬፖም	
154	ምንያህልጊዜከላይየተጠቀሱትምግቦችንይመገባሉ?	1. በየቀኑ 2. በሳምንትከ2-3 ጊዜ 3. በሳምንትከ4-6 ጊዜ 4. በሳምንት 1 ጊዜ 5. በወር 1 ጊዜ 6. አልፎአልፎ 7. በጭራሽተመግቤአላውቅም	
155	ሌሎችአታክልትወይምፍራፍሬዘሮችይመገባሉን?	ፍራፍሬ፣ 1. አዎ 2. አይደለም አታክልት፣ 1. አዎ 2. አይደለም	2 → 158
156	ምንአይነትሌሎችአታክልትወይምፍራፍሬዘሮችይመገባሉን?	ፍራፍሬ፣ብርትኳን፣ሙዝ፣ሎሚ፣አናናስ፣ወይን፣አሾካዶ፣ ዘይቱን፣ትርንጎ፣ካዝሚር፣እንጆሪ፣ተምር፣ኮከ፣ ሌላካለይጥቀሱ_____. አታክልት፣ቀይስር፣ጎመን፣ቀይሽንኩርት፣ሚጥሚጣ፣የፈረንጅዱባ፣ቲማቲም፣ያ ልበሰለአተር፣የሱፍ፣ንጭሽንኩርት፣እንጉዳይ፣ፎሰሊያ፣ባሮሽንኩርት፣ ሌላካለይጥቀሱ_____.	

157	ምንያህልጊዜሌሎችአታክልትወይምፍራፍሬዘርቸይ መገባሉን?	1. በየቀኑ 2. በሳምንትከ2-3 ጊዜ 3. በሳምንትከ4-6 ጊዜ 4. በሳምንት 1 ጊዜ 5. በወር 1 ጊዜ 6. አልፎአልፎ 7. በጭራሽተመግቤአላውቅም	
158	ሥጋ፣የዶሮሥጋ፣ወይምአሣይመገባሉን?	1. አዎ 2. አይደለም	2 → 161
159	ምንአይነትየሥጋአካል፣የዶሮ፣አሣ፣ወይም ሌሎችሥጋአይነትይመገባሉን?	1. የበግ፣ላም፣በሬ፣ጥጃ፣ፍየል2. የዶሮ፣ጅግራ3. ጉበት፣ኩላሊት፣ልብወይምሌላ ካለይጥቀሱ_____ 4. አሳይምባህርምግብ	
160	ምንያህልጊዜየሥጋአካል፣የዶሮ፣አሣ፣ወይም ሌሎችሥጋአይነትይመገባሉ?	1. በየቀኑ 2. በሳምንትከ2-3 ጊዜ 3. በሳምንትከ4-6 ጊዜ 4. በሳምንት 1 ጊዜ 5. በወር 1 ጊዜ 6. አልፎአልፎ 7. በጭራሽተመግቤአላውቅም	
161	ለወዝ፣ዘር; ሌሎችለወዝዘርቸይመገባሉን?	1. አዎ 2. አይደለም	2 → 164
162	ምንአይነትለወዝ፣ዘርአይነትወይምሌሎችለወዝዘር ቸይመገባሉን?	1. ለወዝ 2. ሱፍ 3. ተልባ 4. ሀብሀብዘር 5. ሰሊጥ 6. ፈጦ 7. ሌላካለይጥቀሱ_____.	
163	ምንያህልጊዜለወዝ፣ዘርአይነትወይምሌሎችለወዝ ደቸይመገባሉ?	1. በየቀኑ 2. በሳምንትከ2-3 ጊዜ 3. በሳምንትከ4-6 ጊዜ 4. በሳምንት 1 ጊዜ 5. በወር 1 ጊዜ 6. አልፎአልፎ 7. በጭራሽተመግቤአላውቅም	
164	ቅባት፣ጥራጥሬወይምከቅባት፣ጥራጥሬየተሰሩምግቦችንይመገባሉን?	1. አዎ 2. አይደለም	2 → 167
165	ምንአይነትቅባት; ጥራጥሬዎችንወይምከጥራጥሬ፣ቅባት፣የተሰሩምግቦችንይመገባሉ?	1. አተር 2. ሽንብራ 3. ባቄላ 4. ምስር 5. ጓያ 6. ቦሌቄ 7. አደንጓሬ 8. ኑግ 9. አብሽ 10. ሌላካለይጥቀሱ_____.	
166	ምንያህልጊዜጥራጥሬዎችንወይምከጥራጥሬየተሰሩ ምግቦችንይመገባሉ?	1. በየቀኑ 2. በሳምንትከ2-3 ጊዜ 3. በሳምንትከ4-6 ጊዜ 4. በሳምንት 1 ጊዜ 5. በወር 1 ጊዜ 6. አልፎአልፎ 7. በጭራሽተመግቤአላውቅም	
167	በዘይት፣በቅቤወይምበላትየተሰሩምግቦችንይመገባሉ?	1. አዎ 2. አይደለም	2 → 170
168	ምንአይነትዘይት፣ቅቤወይምላትምግቦችንይመገባሉ?	1. ማርጋሪን 2. የኑግወይምፈሳሽዘይት 3. ዘይት፣ቅቤወይምላትምግብላይተጨምሮ	
169	ምንያህልጊዜዘይት፣ቅቤወይምላትየተሰሩምግቦችን ይመገባሉ?	1. በየቀኑ 2. በሳምንትከ2-3 ጊዜ 3. በሳምንትከ4-6 ጊዜ 4. በሳምንት 1 ጊዜ 5. በወር 1 ጊዜ 6. አልፎአልፎ 7. በጭራሽተመግቤአላውቅም	
170	ከመጠጥዘርቸይወስዳሉን?	1. አዎ 2. አይደለም	2 → 174
171	ምንአይነትመጠጥዘርቸይወስዳሉ?	1. ከአልኮል፣ጸክሆኑት (ቡና፣ሻይ፣ለስላሳ...) 2. አልኮልያላቸው	
172	ምንያህልጊዜ(በሲኒ) ከአልኮል፣ጸክሆኑት (ቡና፣ሻይ፣ለስላሳ...) መጠጥዘርቸይወስዳሉ?	1. በየቀኑ 2. በሳምንትከ2-3 ጊዜ 3. በሳምንትከ4-6 ጊዜ 4. በሳምንት 1 ጊዜ 5. በወር 1 ጊዜ 6. አልፎአልፎ 7. በጭራሽተመግቤአላውቅም	
173	ምንያህልጊዜአልኮልያላቸውመጠጥዘርቸይወስዳሉ(1. በየቀኑ 2. በሳምንትከ2-3 ጊዜ 3. በሳምንትከ4-6 ጊዜ 4.	

	በጠርመዝ.....)?	በሳምንት1 ጊዜ 5. በወር 1 ጊዜ 6. አልፎአልፎ 7. በጭራሽተመግቤአላውቅም	
174	ከእንሰትየተሰሩምግቦችንይመገባሉን?	1. አዎ 2. አይደለም	2 → 177
175	ምንአይነትየእንሰትዉጤትምግብይመገባሉ?	1. አተካና 2. ቡላ 3. ቆጮ 4. አሚቸዉ 5. ሌላይጥቀሱ_____.	
176	ምንያህልጊዜየእንሰትዉጤትምግቦችንይመገባሉ?	1. በየቀኑ 2. በሳምንትከ2-3 ጊዜ 3. በሳምንትከ4-6 ጊዜ 4. በሳምንት 1 ጊዜ 5. በወር 1 ጊዜ 6. አልፎአልፎ 7. በጭራሽተመግቤአላውቅም	
177	የምግብግሩፓብዛት	_____.	
178	የምግብአይነትብዛት	_____.	

ክፍልአራት; የእናቲቱንየላብራቶሪመረጃመመዘንብያ

ተ.ቁ	ጥያቄ	መልስ	ክፍል
179	የእናቲቱንየላብራቶሪመረጃመጠን	_____.	
180	የእናቲቱንሰገራዉጤት	_____.	

የላብራቶሪቴክኒሻያኑስም _____ . ፊርማ: _____

II.IV. Hadiyyissifinto'oxa'imcha

XamamanAnanaxXigo	
Woradaa : _____	Qabale ____ ____ Ambaa'a : _____
Dataawixa'anch sum _____	Furma'a _____ Bala _____
Daadesanch sum _____	Furma'a _____ Bala _____
Xamchbal (BB/AA/HHH)____ ____ ____	Name of Health Facility _____

BAXANCH- 1:GAAT OGORAA ANNANTO XAMOO XA'IMCHAA

Xigo.	Xamicha	Maarebaxancha
101	Dabachauwanchumurmee'o?	____ ____ Hincho (Matimatixigofarqaqaanekitabee)
102	Kabaakiebaqanchogoomaha'a?	1. Minee isaamo 2. Minee isumoyoo 3. Aroo/areetirakoohane/tito'ohane 4. Mineearoo/areelehakoothane/leto 5. Ananiihakoothane/ikohane 6. Mulane(cakisee)
103	Shumoo'ocakisee	1. Hadiyya 2. Kambataa3. Silitaa 4. Amarrao5. Gurragaa 6. Mulane (cakisee)_____
104.	Haymanott'ocakisee	1. Ortodoxx 2.Muslimmaa 3. Protesttatti 4. kattolikka 5. Mulane (cakisee)_____
105.	Ki lossanbaxanchmee'o?	1. Qanana'imate'imkitabima xanomoyoo 2. Baxancha 1-4 3. Baxancha 5-8 4. Baxancha9-10 5. Baxancha 11-12 6. Colejaa/Univerisitee'e
106.	Ki lossanbaxanchmee'o?	1. Qanana'imate'imkitabima xanomoyoo 2. Baxancha 1-4 3. Baxancha 5-8 4. Baxancha9-10 5. Baxancha 11-12 6. Colejaa/Univerisitee'e

121	Kaba godaphitakko'I ammane hiki ammanene qarimmi gasaka uwakammi aboyato sidimmina makoki?	_____ aganna
122	Kaba godaphitako'i ammane qarimmi gasakka uwwakkami aboyato asheetakokki mee'I aganannette?	_____ aganna
123	Abaroosa qoodimma awaxxitakka laqakkammo?	1. oyya 2. Ihisayyo
124	Hink hagari abaroosa qoodimma awaxxitakka laqakkammo?	1. duqakkammokka 2. Qasakammokka 3. Qeeralli ammaninna uwakkamokka 4. Muliki yoolasi qadallehe
125	Kaba godaphitakohanonne hileeni woronne yoo'I daqurinna qarare alaka hee'ukko?	1. oyya 2. Ihisayyo
126	Kaba godaphitakohanonne kachis jabbina qarare alakaa hee'ukko?	1. Oyya 2.ihisayyo
127	Xiqqi hofeechi mahomma laqakkammo?	1. Oyya 2.ihisayyo
128	Umur doolenne xiqqi hofeecha moo'	1. Oyya 2.ihisayyo
129	Umur doolenne afali jabbina qarare alaka laqakammo	1. Oyya 2.ihisayyo
130	Umur doolenne harech jabo moo'antaka laqakammo?	1. Oyya 2.ihisayyo
131	Kaba godaphitakohanonne xigi dunamma la'o?	1. Oyya 2.ihisayyo
132	Kaba godaphitakohanonne xiga alaka te'im uwwitaka laqakammo?	1. Oyya 2.ihisayyo
133	Kaba godaphitakohanonne hurbaxxi bikkina losanno uwaka la'akammo?	1. Oyya 2.ihisayyo
134	Hinki hagar hurbaxxi losanni uwwamma la'o?	1. Ireeni yoo hurbata 2. Edaka itaka hurbata 3.fayya'omi hurbatta

		4. muleki yoha qadalehhe_____
135	Umur doolene hurbaxxi bikkina losanni alaka laqakammo?	1. Oyya 2.ihisayyo
136	Hinki hagar hurbaxxi losanni uwwamma la'o?	1. Ireeni yoo hurbata 2. Edaka itaka hurbata 3.fayya'omi hurbatta 4. Foolet yoo'I hurbata 5. muleki yoha qadalehhe_____

Baxanchi saso- amokichoka hurbata ichcha wixite moo'o xamichcha

3.1. 24 saa'at woronne aako'I hurbaxxi hagar tako'o

hurbata	Ginjira	shomora	hoshsho	qunqora	Himi hurbata
Hurbaxi hagar tako'o					

3.2. amokichoka saanti hurbati ichchi wixite moo'o xamichcha

xigo	Xamichcha	dabacha
137	Kaba godaphitako ammane mati bala mee'I kore itakammo?	1. Mati kore 2. Lami kore 3. Sasi kore 4. Soori kore 5. Onti kore 6. >lohi kore
138	Ado adi amado tuutichi hurbata alaka laqakammo?	1. Oyya 2.ihisayyo
139	Hinki hagar Ado adi amado tuutichi hurbata alaka laqakammo?	1. Ado 2. Salalo 3.ifisamako te'imbuli ado 4.ginna 5. Axusamakko ado 6. Goolo'ancho 7. buuro
140	Hinkani kore Ado adi amado tuutichi	1. balina balina 2. Saanta2-3 kore 3. Saanta 4-6

	hurbata alaka laqakammo?	kore 4. Saanta mati kore 5. Adanna mati kore 6. Higa higa 7.hore'emi ita la'ommoyyo
141	Quunqa itaka laqakammo?	1. Oyya 2.ihisayyo
142	Hinkido'I hagari quunqa itakammoki?	Antabakichika 2. Muli ci'ika 3. Mule yoha kule_____
143	Hinkani kore quunqa itakka laqakammo?	1. balina balina 2. Saanta2-3 kore 3. Saanta 4-6 kore 4. Saanta mati kore 5. Adanna mati kore 6. Higa higa 7.hore'emi ita la'ommoyyo
144	Wixi hurbata teim wixi hurbati saramu luwwa itaka laqakammo?	1. Oyya 2.ihisayyo
145	Maha hagari Wixi hurbata teim wixi hurbati saramu luwwa itaka laqakammoki?	1. Sarata 2.so'o 3. Boqolla 4. Ruza 5. Pasta 6. Arasa 7. mokorone 8. Xaafe 9. Mule yoha kule_____
146	Mee'I kore Wixi hurbata teim wixi hurbati saramu luwwa itaka laqakammoki?	1.balina balina 2. Saanta2-3 kore 3. Saanta 4-6 kore 4. Saanta mati kore 5. Adanna mati kore 6. Higa higa 7.hore'emi ita la'ommoyyo
147	Hinkido'I lugumo teim lugumi baxamu hurbata itakamoki?	Dinicho 2. Shuukare dincho 3. Boyyina 4.boyyina 5. Mule yoha kule_____
148	Mee'i kore lugumo teim lugumi baxamu hurbata itakamoki?	1.balina balina 2. Saanta2-3 kore 3. Saanta 4-6 kore 4. Saanta mati kore 5. Adanna mati kore 6. Higa higa 7.hore'emi ita la'ommoyyo
149	Hemachi shano buyyi yoo hurhata itaka laqakamo?	1. Oyya 2.ihisayyo
150	Hinkido'I Hemachi shano buyyi yoo hurhata itaka laqakamo?	1.Shana 2. Qosixa 3.winxu shana 4. Salaxa 5.lele'I horore 6.shani saphina 7. Suxi shana 8 .sinafa 9. Fito shana 10. Mule yoha kulehe____
151	Mee'I kore Hemachi shano buyyi yoo hurhata itaka laqakamo?	1.balina balina 2. Saanta2-3 kore 3. Saanta 4-6 kore 4. Saanta mati kore 5. Adanna mati kore 6. Higa higa 7.hore'emi ita la'ommoyyo
152	Li'akko mango te'im papaya,carrota...m.k	1. Oyya 2.ihisayyo

	hurbata itakammo?	
153	Hinki hagar li'akko mango te'im papaya, karoot te'im baxamako hurbata itakammo?	1.Li'ako mango,papaya 2. Karoot 3.li'ako muuza 4.koki 5. Qaree 6.habihabi 7.lele 8. Shukare 10. Li'u
154	Hinkani amanne hanani wocamu hurbata itakamoki	1.balina balina 2. Saanta2-3 kore 3. Saanta 4-6 kore 4. Saanta mati kore 5. Adanna mati kore 6. Higa higa 7.hore'emi ita la'ommoyyo
155	Muli Kashuwa te'im misha itakammo?	Misha 1. Oyya 2. Isoyyo Kashuwa 1. Oyya 2. Isoyyo
156	Hinkido hagar kashuwa te'im mishuwwi shummo itakammo	Misha,birtukana,mango' muuza,lomee,ananas,woyi na,abukado,zayitona,tirango,kazimira Kashuwa-kashari lugummo,shana, kashari shunkurita,shikiso luwwa, faranji lele, timatima, li'u bee'I otongora, tumba,
157	Hinkan amanne kashuwa te'im mishuwa itakammo?	1. balina balina 2. Saanta2-3 kore 3. Saanta 4-6 kore 4. Saanta mati kore 5. Adanna mati kore 6. Higa higa 7.hore'emi ita la'ommoyyo
158	Maara,anitaba maara te'im quurixumme	1. Oyya 2.ihisayyo
159	Hinkido'I hagar maara anitaba,quurixume,te'im muli maari hagara itakammo/	1. Gerebi,sayikka,mirgo'ika,aduwika,fela'ika 2. Anitaba 3. Afare ,muro,wodano, te'im muleki_____4.quurixume te'im dabali hurbata
160	Hinkan kore itamakommo maara anitaba'ika,quurixume te'im muli maari hagara	1. balina balina 2. Saanta2-3 kore 3. Saanta 4-6 kore 4. Saanta mati kore 5. Adanna mati kore 6. Higa higa 7.hore'emi ita la'ommoyyo
161	Ocholona,muliken ocholoni fikana itakamonne?	1. Oyya 2.ihisayyo
162	Hinkido'I hagar ocholona,fikana hagar te'im mulikeen ocholoni fikanuwwa itakamoki?	1. Ocholona2. Sufa 3.talaba 4. Habahabi fikana 5. Faxa 6.mulikeen_____
163	Hinkani ammane ocholona,fikana hagar	1. balina balina 2. Saanta2-3 kore 3. Saanta 4-6

	te'im mulikeen ocholoni fikanuwwa itakamoki?	kore 4. Saanta mati kore 5. Adanna mati kore 6. Higa higa 7.hore'emi ita la'ommoyyo
164	Lintali.wixi hurbata te'im lintalii,wixi hurbati baxamu hurbata itakammo?	1. Oyya 2.ihisayyo
165	Hinkido'I hagar Lintali.wixi hurbata te'im lintalii,wixi hurbati baxamu hurbata itakammo?	1. Atara 2.gite 3. Baqella 4.mishira 5.guya 6.boloke 7.otongora 8.salixa 9. Luga 10.abisha 11. Muliki_____
166	Hinkani ammane Lintali.wixi hurbata te'im lintalii,wixi hurbati baxamu hurbata itakammo?	1. balina balina 2. Saanta2-3 kore 3. Saanta 4-6 kore 4. Saanta mati kore 5. Adanna mati kore 6. Higa higa 7.hore'emi ita la'ommoyyo
167	Lintali ,buri teim baxamu hurbata itaka laqakammo?	1. Oyya 2.ihisayyo
168	Hinkido'I hagar Lintali ,buri teim baxamu hurbata itakammo?	1.marigarini 2.lugi te'im dado lintali 3.lintali,buri hane edakamma
169	Hinkani ammane Lintali ,buri teim baxamu hurbata itakammo	1. balina balina 2. Saanta2-3 kore 3. Saanta 4-6 kore 4. Saanta mati kore 5. Adanna mati kore 6. Higa higa 7.hore'emi ita la'ommoyyo
170	Agi fikannuwi agakammo?	1. Oyya 2.ihisayyo
171	Hinkido'I agi hagara masitakammoki?	Dinbiso agi kora'I ihakokoka(buna,shaye,lasilasha....) 2.dinbisho agaa
172	Hinkani ammane dinbiso bee'e agaa agaka laqakammo?	1. balina balina 2. Saanta2-3 kore 3. Saanta 4-6 kore 4. Saanta mati kore 5. Adanna mati kore 6. Higa higa 7.hore'emi ita la'ommoyyo
173	Hinkanni ammane dinbiso(gesho'i) yoo'o aga agakammo(xarimuza)	1. balina balina 2. Saanta2-3 kore 3. Saanta 4-6 kore 4. Saanta mati kore 5. Adanna mati kore 6. Higa higa 7.hore'emi ita la'ommoyyo
174	Weesi fikannuwwi sarako'I hurbata itaka laqakammo?	1. Oyya 2.ihisayyo
175	Hinkido hagari weesi fikanni hurbata	1. Atakan 2.bu'o 3.waasa 4. Hamicho 5.mulika_____

	itakammo?	
176	Hinkani ammane weesi fikanni hurbata itakammo?	1. balina balina 2. Saanta2-3 kore 3. Saanta 4-6 kore 4. Saanta mati kore 5. Adanna mati kore 6. Higa higa 7.hore'emi ita la'ommoyyo
177	Hurbaxi wixxit dutomma	_____
178	Hurbaxi hagari dutomma	_____

baxanchi sooro-amokichchi laboratoore'i sawite wixancho

xigo	xammichcha	dabachcha	baxancha
179	Amokichi heemogiloobin qaxomma	_____	
180	Amokichi waasi shumi sido	_____	

ANNEXE: V. DECLARATION

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 _____