



WALLAGA UNIVERSITY

INSTITUTE OF HEALTH SCIENCES

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**UNDERNUTRITION AND ASSOCIATED FACTORS AMONG
PREGNANT WOMEN IN NEKEMTE TOWN, WEST ETHIOPIA.**

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**Thesis Submitted to Department of Public Health, College of Medical and Health
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May, 2025

Nekemte, Ethiopia



UNDERNUTRITION AND ASSOCIATED FACTORS AMONG PREGNANT WOMEN IN NEKEMTE TOWN, WEST ETHIOPIA

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Approval Sheet



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STATEMENT OF THE AUTHOR

I Mr. /Miss/Mrs. Amelework Biru Ayana hereby declare and affirm that the thesis entitled “**Undernutrition and Associated Factors Among Pregnant Women In Nekemte Town, West Ethiopia**” is my own work conducted under the supervision of Advisors Dr. Gudina Egata (PhD) and Mr. Haile Bikila. I have followed all the ethical principles of scholarship in the preparation, data collection, data analysis and completion of this thesis. All scholarly matter that is included in the thesis has been given recognition through citation. I have adequately cited and referenced all the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and I have not misrepresented, fabricated, or falsified any idea / data / fact / source in my submission. This thesis is submitted in partial fulfillment of the requirement for a degree from the Post Graduate Studies at Wallaga University. I further declare that this thesis has not been submitted to any other institution anywhere for the award of any academic degree, diploma or certificate.

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As members of the Board of Examining of the Final M.A. /M.Sc. thesis open defense, we certify that we have read and evaluated the thesis prepared by **Amelework Biru Ayana** under the title **“Undernutrition and Associated Factors Among Pregnant Women In Nekemte Town, West Ethiopia”** and recommend that the thesis be accepted as fulfilling the thesis requirement for the **Degree of Master of Public Health in Reproductive Health.**

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Abbreviation and acronyms

ANC	Antenatal Care
AOR	Adjusted Odds Ratio
ARR	Adjusted Risk Ratio
CI	Confidence Interval
COR	Crude Odds Ratio
CSA	Central Statistical Agency
DDS	Dietary Diversity Score
EDHS	Ethiopian Demographic and Health Survey
ETB	Ethiopian Birr
FAO	Food and Agriculture Organization
FATNA	Food and Nutrition Technical Assistance
HFIAS	Household Food Insecurity Access Scale
HH	House Hold
IFA	Iron-folic Acid
MDD-W	Minimal Dietary diversity women
MUAC	Mid-Upper Arm Circumstance
RH	Reproductive Health
SPSS	Statistical Package for Social Science
PCA	Principal Component Analysis
UNICEF	United Nations Integrated Children's Emergency Fund
VIF	Variance inflation factors
WHO	World Health Organization
WU	Wallaga University

Abstract

Background: Maternal undernutrition is a global health concern, particularly impacting women in developing nations. Pregnant women are especially vulnerable, as acute malnutrition during pregnancy can increase the risk of anemia, miscarriage, fetal death, preterm birth, and maternal mortality. Although several studies have been conducted among pregnant women, the majority are institution-based, which may not accurately reflect the true magnitude of the problem at the community level.

Objective: This study aimed to assess the prevalence of undernutrition and associated factors among pregnant women in Nekemte Town, West Ethiopia.

Methods: A cross-sectional study was conducted among systematically selected 682 pregnant women in four kebeles of Nekemte Town from Feb15 to March, 2025. Data was collected using an interviewer-administered pretested structured questionnaire and anthropometric measurement. Bivariable and multivariable Binary logistic regression analysis were employed to identify factors associated with the outcome of interest. Adjusted odds ratios alongside a 95% confidence level; (CI) were estimated to measure the strength of the association. The level of statistical significance was declared at a p-value less than 0.05. Results were displayed using text, tables, and figures.

Results: The prevalence of undernutrition among pregnant women in this study was 34.2% ,95% CI:(31%, 38%). First trimester of pregnancy [(AOR=0.19 , 95% CI:(0.09,0.39)], maternal age over 35 years [(AOR=3.60, 95% CI: (2.09-7.48)], lack of ANC follow-up [(AOR=3.93, 95% CI: (2.58-7.55)], food taboos practices [(AOR=3.13, 95% CI: (1.78-5.51)], low level wealth category [(AOR=4.64, 95% CI: (2.35-9.36)], household food insecurity [(AOR=4.64, 95% CI: (2.35-9.36)], a birth interval of two years or less [(AOR=2.03, 95% CI: (1.55-5.79)], and inadequate dietary diversity [(AOR=2.04, 95% CI: (1.66-4.50)] were factors significantly associated with undernutrition among pregnant women.

Conclusion: The study revealed a high burden of undernutrition among pregnant women in Nekemte town, with over one-third affected. Trimester of pregnancy, Maternal age, ANC follow-up, Food taboo, Wealth Status, House hold food insecurity, Dietary diversity, and Birth spacing were identified as significant factors associated with it. Strengthening early ANC registration, Promoting Family planning utilization and community based nutrition education is mandatory.

Key words: Under nutrition, pregnant women, Magnitude, associated Factors, Nekemte, Ethiopia

1. INTRODUCTION

1.1. Background

Undernutrition is a type of malnutrition caused by insufficient food intake or quality, frequent illness, or inadequate energy, protein, and micronutrients to support basic bodily functions, growth, and development [1]. Insufficient food, poor care, and infections contribute significantly to maternal and child health problems, particularly under nutrition. Pregnant women are especially susceptible to nutritional deficiencies due to their increased needs and potential dietary changes [1-2].

Pregnant women need nutrient-rich, high-quality foods throughout their pregnancy to support the developing fetus [2]. The mother's ability to provide her fetus with adequate oxygen and nourishment is crucial for its survival. This ability depends on her nutritional status, body size, and composition, all of which are shaped during her fetal development [3].

A woman's nutritional needs increase more during pregnancy and breastfeeding than at any other point in her adult life. During pregnancy, additional nutrients are needed to support both the developing fetus and the maternal tissues that enable fetal growth [3]. The rapid growth and development of the fetus rely on nutrients from the mother's diet. The health of both the mother and newborn, as well as the child's future health, is significantly influenced by the mother's nutrition during pregnancy. A balanced diet is essential to provide enough energy for fetal growth without depleting the mother's tissues [1,4].

Good nutrition is essential for a healthy pregnancy, benefiting both the mother and the developing fetus. It supports optimal growth and development throughout infancy and beyond. Nutritional needs vary based on age, gender, and physiological changes, such as those experienced during pregnancy (body composition changes, weight gain, alterations in blood and metabolic processes, and adaptive responses). Overall, energy needs increase by 13% during pregnancy, while protein requirements rise by 54%. Additionally, vitamin and mineral needs increase by 0-50%. To meet these elevated demands, most nutrient requirements are increased during pregnancy [5]. During fetal development, all nutrients are obtained through the placenta. Additionally, maternal tissues like the breast and uterus require increased energy for tissue growth [2,6].

Pregnant and lactating women are particularly vulnerable to nutritional deficiencies due to the physiological demands of these periods. Both mothers and their children may experience negative

health consequences from inadequate dietary intake before, during, and after pregnancy [3],[5]. Improved maternal physical and nutritional health before and during pregnancy can lead to a healthier fetus, better labor and delivery outcomes, increased prenatal survival, and potentially long-term health benefits for both mother and child. However, in many resource-limited settings, pregnant women often have poor-quality diets and significant gaps between their nutrient intake and their needs [6], [7].

Previous studies done among pregnant women identified several risk factors for undernutrition, such as the age of the mother, educational status, marital status, family size, food insecurity, iron supplementation during pregnancy, the frequency of daily meals, trimester of pregnancy, dietary diversity, food taboo [8]-[9].

1.2. Statement of the problem

Undernutrition among pregnant women is a serious public health concern, especially in low- and middle-income countries. Worldwide about 10% of women suffer from under nutrition [7]. In low and middle-income countries, an estimated 240 million women experience maternal under nutrition each year. The rate of maternal under nutrition varies across regions, with higher rates in Sub-Saharan Africa (27-51%) compared to global averages (10-19%) [6],[10]. The recent systematic review done in Africa also reveals that the total pooled prevalence of maternal under nutrition in Africa is 20%, [11]. Nonetheless, there appears to be significant variation in the prevalence of under nutrition across Africa. According to a study conducted in Kenya, for instance, 60% of women were found to be moderately to severely malnourished [6]. In Ethiopia despite Pregnant women's undernutrition declined from 30% in 2000 to 22% in 2016, it remained one of the most significant public health issues [12].

To maintain their health and ensure the healthy growth and development of the fetus, pregnant women need to get sufficient nutrition [2]. In low- and middle-income countries, undernutrition among pregnant women is directly or indirectly responsible for about half of the deaths of children under the age of five [2]. A pooled estimate conducted in 137 developing countries shows that maternal undernutrition caused 14.4% of stunting in 44.1 million children under the age of two[3]. The cycle of undernutrition continues through generations because an undernourished mother is more likely to give birth to a child who is also undernourished [13]-[8]. Preterm birth, intrauterine growth restriction, and stillbirths are all consequences of undernutrition during pregnancy. According to recent studies, eating healthily during pregnancy and lactation may also reduce the child's chance of acquiring chronic illnesses in later life [14]. Stunted growth and development in children, short stature in adults, lower intellectual attainment, and lower economic production are all linked to a vulnerability to undernutrition during pregnancy.

In order to address the dual burden of undernutrition among pregnant and lactating women and its intergenerational effect the Ethiopian government created initiatives such as a revised national nutrition program in 2016 [15], a national nutrition policy in 2019 [16], and a National Nutrition Strategy (NNS) [17]. Maternal nutrition is one of its targets that needs updated data which is essential to develop effective intervention strategies to prevent undernutrition of pregnant women and children. Despite this magnitude of undernutrition remained high among pregnant women.

Previous studies done among pregnant women identified several risk factors for undernutrition, such as the age of the mother, educational status, marital status, family size, food insecurity, iron supplementation during pregnancy, the frequency of daily meals, trimester of pregnancy, dietary diversity, food taboo[8]-[9]. However, various regions of Ethiopia may have multiple risk factors for pregnant women's undernutrition due to variations in socioeconomic, cultural, ethnic, geographic aspects and security related crisis. Although several studies have been conducted among pregnant women in different regions and towns of Ethiopia, the majority are institution-based, which may not accurately reflect the true magnitude of the problem at the community level. Additionally, there is inconsistencies in the MUAC cutoff points to define undernutrition among pregnant women. Determining the prevalence and factors associated with undernutrition among pregnant women is essential for formulating effective strategies to mitigate its impact. So, the current study was conducted to determine the prevalence of undernutrition and associated factors among pregnant women in Nekemte Town, West Ethiopia, 2025.

1.3. Significance of the study

Maternal undernutrition is a critical public health issue, particularly in low and middle income countries. By assessing the prevalence of undernutrition and associated factors among pregnant women in Nekemte town the current study provided a valuable data that reflect the current nutritional status of this population in the area.

The findings will inform both local and regional health and nutrition programs. Understanding the associated factors will guide policy makers in allocating resources and prioritizing interventions that directly address the root cause of undernutrition in pregnant women.

This research will add to the body of scientific Knowledge on maternal nutrition in Ethiopia. It will also provide a baseline for future studies, including intervention-based and longitudinal studies, that aim to further explore and address maternal undernutrition.

2. LITERATURE REVIEW

2.1. Prevalence of Undernutrition Among Pregnant Women

According to the World Health Organization (WHO), approximately 2.1 billion people worldwide are affected by micronutrient deficiencies, and pregnant women are particularly vulnerable [11]. World Health Organization (WHO), estimates that about 15% of pregnant women worldwide are undernourished with regional variation South Asia, 20-30%, Sub-Saharan Africa over 25% of pregnant women [14].

The prevalence of under nutrition among pregnant women is particularly high in Africa, where food insecurity, limited access to healthcare, and cultural practices contribute to the problem [18]. The overall pooled prevalence of malnutrition among pregnant women in Africa is 23.5% [14].

Ethiopia faces a substantial burden of under nutrition, with a significant proportion of pregnant women experiencing nutrient deficiencies. Studies have reported varying prevalence rates (East Borena Zone Liban District 44.9% [19], Gamella Town 28.6% [20], Eastern Ethiopia 43.8% [21], Haramaya District 47.9% [9], Bangladesh (28%) [22], Uganda (6.9%) [23], Kenya (27%) [24], the overall picture shows as one of a significant public health issue.

2.2. Factors Associated with under nutrition among Pregnant Women

2.2.1. Socio-Demographic Factors

Married women generally have better access to healthcare and resources, which can contribute to improved nutritional status. However, factors such as early marriage and forced marriage can increase the risk of under nutrition. A study shows Global Health found that pregnant adolescent girls are more likely to experience low maternal weight gain and inadequate intake of essential nutrients, which increases the risk of under nutrition for both the mother and child [18]. Study Conducted in Gambella, pregnant women who were married before the age of eighteen, 66 (46.8%) were undernourished whereas from those who married at their eighteen [20].

Higher education is often associated with better health knowledge and access to healthcare, which can contribute to improved nutritional outcomes. In Nigeria [25], Kenya [24], and Uganda [23], women with primary or secondary education were significantly less likely to experience malnutrition compared to their uneducated counterparts. In Tanzania, a study found that pregnant women with no formal education were 2-3 times more likely to be undernourished compared to those with secondary or higher education [11]. Systematic review and meta data analysis

conducted in Ethiopia shows those illiterate women were more than three folds undernourished than those have formal education [13].

Women's employment status is a key factor influencing their nutritional well-being. Studies found that unemployed women or those in unpaid work are more likely to be malnourished compared to those in paid employment. Paid work can improve household food security and empower women by giving them greater control over resources [26]. Women engaged in physically demanding or low-paying jobs may have limited access to nutritious food and adequate rest. The occupational conditions of daily laborers, combined with widespread under nutrition, create a precarious situation for pregnant women, especially in sub-Saharan Africa [27].

Larger family sizes were associated with higher rates of maternal under nutrition in low- and middle-income countries. The study concluded that resource allocation within families with more children could hinder the nutritional intake of pregnant women, leading to deficiencies in key nutrients. Women with larger family sizes (more than four children) had a 30% higher risk of being undernourished during pregnancy compared to women with fewer children [11]. Larger family size can increase the burden on household resources, making it more difficult to meet the nutritional needs of all family members. Having large family size has association with Pregnant mother under nutrition [27].

2.2.2. Reproductive related Factors

Women who have had multiple pregnancies (multiparous) are at a greater risk of malnutrition compared to those who have had only one (prim parous). This supports the "maternal depletion syndrome" theory, which suggests that women who have closely spaced pregnancies may not adequately replenish their depleted nutrient reserves. Furthermore, women with a higher number of pregnancies may experience increased fatigue, potentially impacting their appetite and overall food intake [32-33]. A study in Ethiopia revealed that women with unintended pregnancies were significantly more likely to experience undernutrition compared to those with planned pregnancies. This is likely due to several factors. Firstly, mothers who plan their pregnancies can proactively prepare by establishing dietary plans and ensuring access to a variety of nutritious foods. Secondly, women with intended pregnancies often possess greater knowledge about nutrition, stronger decision-making autonomy, and higher levels of education, all of which contribute to better health outcomes [28].

2.2.3. Socio-Cultural Related Factors

According to the World Health Organization (WHO), 20% of women globally suffer from undernutrition and many of these cases are aggravated by cultural practices, including food taboos. Study Conducted in Sub-Saharan African Countries shows a strong association between food restriction and undernutrition among pregnant women in Ethiopia [9], Nigeria [25] and Kenya [24]. A study conducted indicates that undernutrition was nearly 60% among pregnant women who practice food taboos [24].

2.2.4. Nutritional Factor

Dietary characteristics of the study participants such as (Minimum Dietary Diversity of Women, household food insecurity, improved dietary feeding, skipping meals/snacks, and eating additional meals were considered as associated with the nutritional status of pregnant mothers [39] Pregnant women with poor dietary habits are more likely to be undernourished Study Conducted in Borena zone indicates skipping meal], substance use strongly associated with undernutrition among pregnant women. [19]. Studies conducted in Hossana also indicate Frequency of meal consumption of less than three times per day (has an association with undernutrition [8].

Dietary diversity score is associated with undernutrition, the study done in Kenya showed that pregnant women with better Dietary diversity scores had greater macro- and micronutrient intake when compared to pregnant women with low Dietary diversity scores [29]. A study conducted in Gambella Town shows that Pregnant women who had low Dietary diversity scores were two times more likely to be undernourished when they were compared with pregnant women who had better MDDW [20].

2.2.5. Health Care and Environmental Factors

Healthcare access influences the availability of essential services like antenatal care, nutritional counseling, and supplementation, all of which can reduce the risks of maternal and fetal malnutrition. According to a study from Bangladesh, pregnant women who are counseled to alter their eating habits can satisfy the increased nutritional requirements [22]. Prevalence of undernutrition is still high among pregnant women lack of prenatal dietary advice, is significantly associated with undernutrition during pregnancy. A study conducted in Ethiopia, Shows a lack of prenatal dietary advice

Access to sanitation facilities can reduce the risk of infections and improve overall health, indirectly contributing to better nutritional outcomes. Study conducted in different parts of Ethiopia indicates there is strong association between latrine possession and under nutrition in pregnant women, absence of household latrine [19].

Infections during pregnancy (such as gastrointestinal infections, malaria, urinary tract infections, or respiratory infections) can lead to increased nutritional requirements, decreased appetite, malabsorption of nutrients, and loss of nutrients through fever, vomiting, and diarrhea. These effects can exacerbate or cause under nutrition in pregnant women.

Conclusion

Undernutrition among pregnant women remains a pervasive global public health crisis, with a particularly high prevalence in regions like Sub-Saharan Africa and South Asia, including Ethiopia. This literature review underscores that the problem is multifaceted, stemming from a complex interplay of socio-demographic, reproductive, socio-cultural, nutritional, healthcare, and environmental factors.

Key drivers include limited education, early marriage, unemployment, and large family sizes, all of which constrain access to resources and knowledge crucial for adequate nutrition. Reproductive factors, such as high parity and unintended pregnancies, further deplete maternal nutrient reserves and hinder proactive health management. Harmful socio-cultural practices, especially food taboos, significantly exacerbate nutritional deficiencies by restricting access to vital food groups. Furthermore, poor dietary habits, including low dietary diversity and meal skipping, directly contribute to undernutrition. Inadequate access to healthcare services, particularly antenatal care and nutritional counseling, alongside poor sanitation facilities and the burden of infections during pregnancy, create a compounding effect that compromises maternal nutritional status.

Addressing undernutrition in pregnant women necessitates comprehensive, integrated interventions that tackle these interconnected factors. This includes promoting education, empowering women economically, challenging harmful cultural norms, improving dietary practices through education and food security initiatives, and strengthening healthcare systems to provide robust antenatal care and nutritional support.

2.3. Conceptual Framework

This conceptual framework describes factors associated with undernutrition, adapted from UNICEF conceptual framework. It describes that distal factors including socio-demographic and socio economic factors can contribute for the distal intermediate factors including health care and environmental factors and food security and reproductive factors. These factors will in turn leads to the proximal factors which can directly contribute to under nutrition (Figure 1).

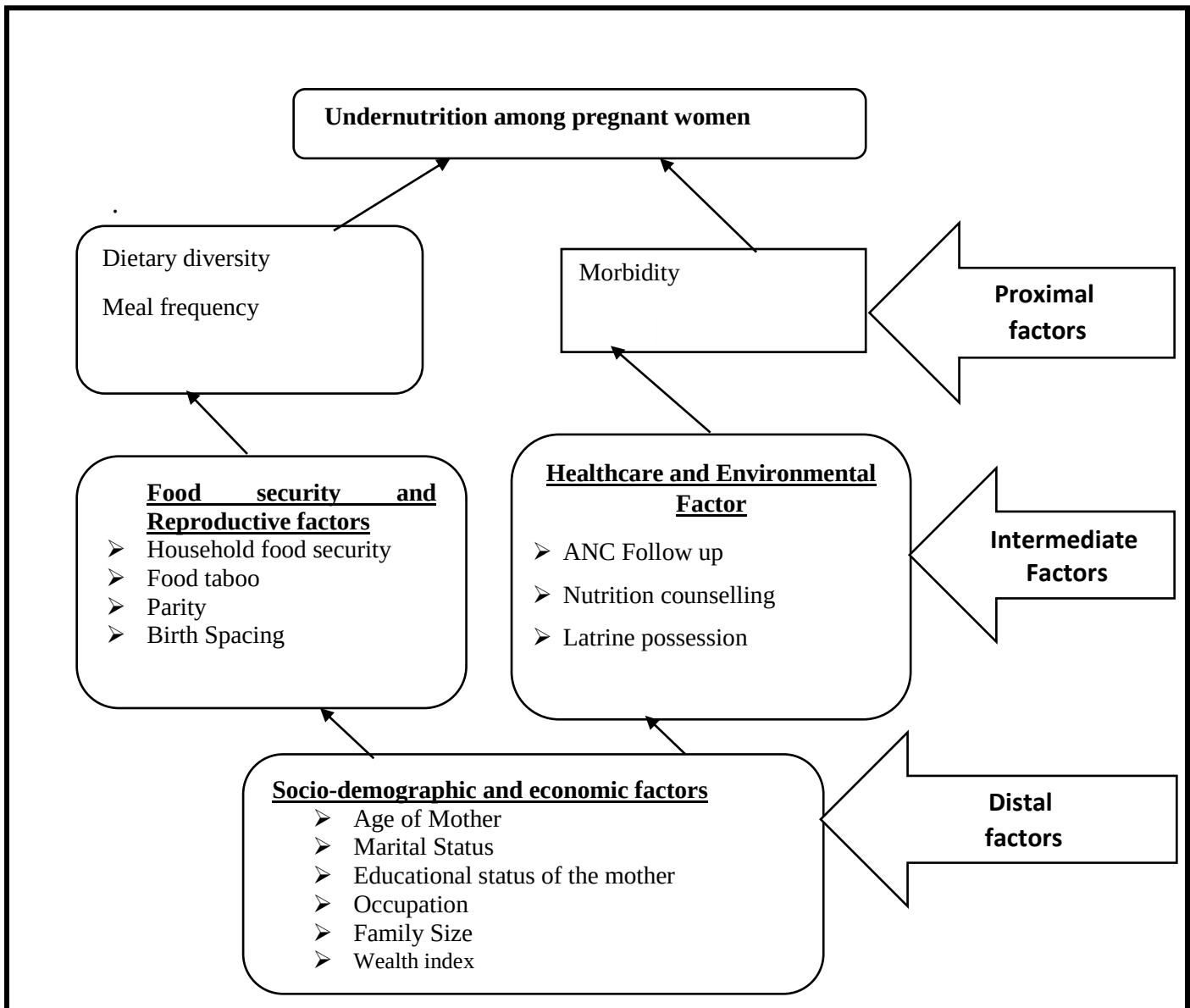


Figure 1: Conceptual Framework of Prevalence of undernutrition and associated factors among pregnant women in Nekemte town, 2025 (24-35)

Source: Adapted from “UNICEF modified conceptual framework of malnutrition (UNICEF, 2020)”[30]

3. OBJECTIVES OF THE STUDY

3.1. General Objective

- This study aimed to assess the Prevalence of under nutrition and associated factors among pregnant women in Nekemte Town, West Ethiopia, 2025.

3.2. Specific Objectives

- To determine the Prevalence of undernutrition among pregnant women, in Nekemte Town, West Ethiopia, 2025
- To identify factors associated with undernutrition among pregnant women, in Nekemte Town, West Ethiopia, 2025

4. METHODS AND MATERIAL

4.1. Study Area and period

This study was conducted in Nekemte town, found in the Eastern Wollega Zone of the Oromia Regional State, Ethiopia. Located at an altitude of 1,960 to 2,170 meters above sea level, Nekemte experiences a temperate climate with temperatures ranging from 14°C to 26°C and annual rainfall between 1500 to 2200 mm. The town's common dietary staples include a variety of fruits such as mango, papaya, orange, avocado, lemon, and lime, alongside vegetables like beans (Abbaa comma) and Dinnicha Oromoo, and a range of spices. As of the 2020 structure plan, the town covered an area of 8,204 hectares and consisted of seven kebeles with a total population of 148,428. Nekemte Town has two Comprehensive Specialized Hospitals (Wallega University Comprehensive Specialized and Nekemte Comprehensive Specialized Hospitals) and Two Health Centers (Nekemte Health Center and Cheleliki Health Center). The study was conducted from Feb 15-March 30/2025.

4.2. Study Design

Community-based Cross-sectional study was conducted.

4.3. Population

4.3.1. Source population

All pregnant women living in Nekemte Town were the source population for this study.

4.3.2. Study Population

All systematically selected pregnant women in selected Kebeles of Nekemte Town during the study period were the study population.

4.4. Eligibility

4.4.1. Inclusion criteria

The pregnant women who lived in Nekemte Town for at least six months before the study were included.

4.4.2. Exclusion criteria

Pregnant women who have body edema or who unable to respond to the interview were excluded.

4.5. Sample Size Determination and Sampling Technique

4.5.1. Sample Size Determination

The sample size was estimated using a single population proportion formula,

1. Considering 28.6% of the prevalence of undernutrition among pregnant women from a study conducted in Gambella Town [20]. Other parameters considered are 5% margin of error, 95% Confidence level, and 10%, non-response rate.

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

Where n = sample size

Z = $z_{\alpha/2}$ a standard normal variable value corresponding to a 95% level of significance = 1.96

P = proportion of undernutrition during pregnancy = 28% = 0.28

Q = (1-p) = (1-0.28) = 0.72

d = Margin of sampling error tolerated (absolute precision) (5%) None response rate = 10%

$$n = \frac{3.84 \times 0.28(1-0.28)}{(0.05 * 0.05)} = 310$$

Therefore, from the above, the sample size is = 310. n = 310*10% none-response rate = 31, n = 310 + 31 = 341. Design effect of multi-stage (stage 2) 341*2 = 682

Hence, total Sample Size needed for this study was 682

2. Sample size for **the second objective**.

The sample size for the second objective was calculated by using the double population proportion formula and Stat-calc of Epi-Info Statistical Software Version 7.2.6.0 under the following presumptions: Power = 80%, confidence level = 95%.

Table 1: Sample size calculation for the study undernutrition among pregnant women in Nekemte town, 2025.

Independent variables	% outcome among exposed	% outcome among non-exposed	AOR	CI level	Pow er	Desig n effect	10% non-response	Samp le size	refer ence
Food insecurity	13 (12.5%)	17 (5.9%)	0.034	95	80	2	10%	358	[19]
Lack of ANC follow-up	26 (9.8%)	4 (3.1%)	0.012	95	80	2	10%	438	
The type of latrine possessed	26 (9.5%)	3 (2.8%)	0.04	95	80	2	10%	484	

Since 682 was the largest sample size that is derived from the first objective was used as a final sample size for this study.

4.5.2. Sampling Procedure

To select study participants, multi-stage sampling technique was employed. First, four out of the seven sub-cities were randomly selected using a lottery method. Subsequently, a complete house-to-house survey was conducted within these four chosen sub-cities to identify all pregnant mothers and marked house with Sequential code. Finally, the study sample were drawn from this list of pregnant mothers using systematic sampling (by Identifying Interval in each selected sub-city by dividing total identified pregnant other /N by desired number of pregnant mother/n). The number of participants selected from each of the four sub-cities were proportionally divided to the total number of pregnant women identified in that specific sub-city. (figure 2)

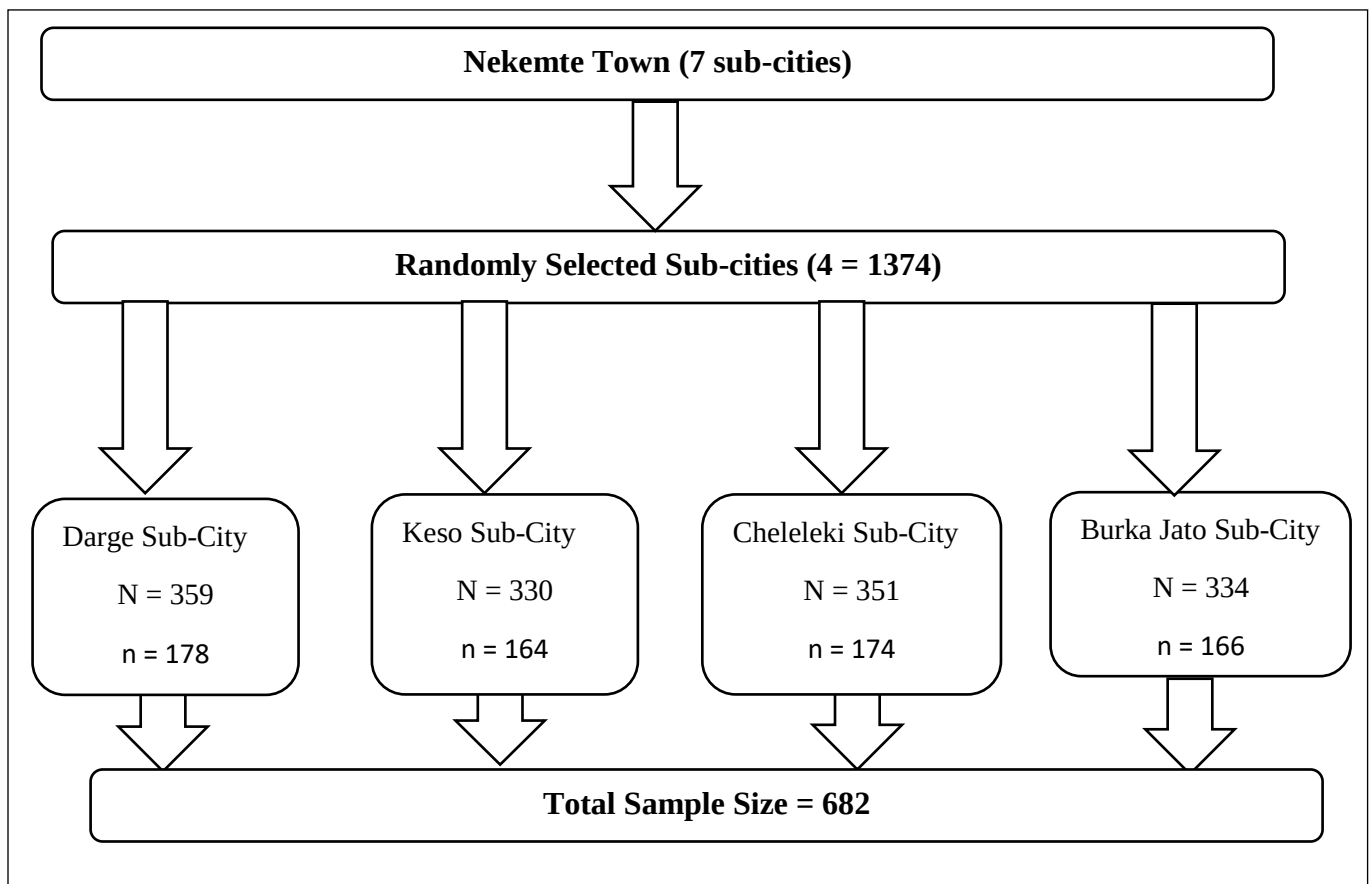


Figure 2: Schematic presentation of Sampling Procedure for undernutrition among pregnant women in Nekemte town, Ethiopia, 2025.

4.6. Study variables

4.6.1. Dependent variable

Undernutrition among pregnant women

4.6.2. Independent variables

Socio-Demographic and Economic variables

- Age of the mother
- Marital status
- Religion
- Educational Level of women
- Occupation
- Wealth index
- Ethnicity
- Family size

Health Care and Environmental Factors

- ANC follow up
- Nutrition counseling
- Latrine Possession
- Morbidity

Obstetric and gynecologic related Factors

- Type of pregnancy
- History of abortion
- Gravidity
- Coffee intake
- Food inaccessibility

Dietary Intake

- Household food security
- Meal frequency
- Food taboo
- Dietary diversification

4.7. Operational definitions

Undernutrition: MUAC less than 23 cm is an indicator of undernutrition and MUAC $\geq$ 23 cm is for normal nutritional status [25].

Dietary diversity Score (DDS): sum of food groups eaten by pregnant women over 24 h preceding data collection [28].

- Inadequate dietary diversity occurs when pregnant women consume fewer than five from 10 different food groups within a given timeframe.
- Adequate dietary diversity is achieved when pregnant women consume five or more from 10 different food groups within the same timeframe.
- **Food Secure:** Households that have none of the food insecurity conditions, or only experience worry (anxiety) about food but rarely.
- **Mildly Food Insecure:** Households that worry about not having enough food sometimes or often, and/or are unable to eat preferred foods, and/or eat a more monotonous diet than desired. But they do not cut back on quantity or reduce meal frequency.
- **Moderately Food Insecure:** Households that sacrifice food quality and quantity: they reduce meal size or number of meals in a day. But they do not experience severe hunger (e.g., going a whole day without eating).
- **Severely Food Insecure:** Households that have run out of food, go to bed hungry, or go a whole day and night without eating, due to lack of resources [29].

Food Taboo: When pregnant women aver at least one food items during pregnancy

4.8. Data collection instruments and procedure

Data were collected using a structured interviewer-administered questionnaire adapted from different literature followed by anthropometric measurement of MUAC.

The questionnaire consisted of socio-demographic and economic characteristics, obstetric and gynecological related factors, reproductive-related questions, socio-cultural related questions, health care and environmental related questions, and household food security assessing questions.

Measurements

Measurement of Dietary Diversity

The Food and Agriculture Organization (FAO) standard questionnaire using the 24-hour dietary recall method, was used in this study to determine the minimal dietary diversity for women (MDD-W). All food and beverages consumed during the previous 24 hours, from waking to sleeping, was recalled and described by the study participants. Those 10 food Groups were

1. Starches staples
2. Dark Green Leaf vegetables
3. Vitamin A rich fruits vegetables and tubers
4. Other fruits and
5. Other vegetables
6. Organ meat
7. Meat and Fish
8. Eggs
9. Legumes nuts and Seeds
10. Milk and Milk Products

Measurement of household Food security

Household food security status was measured by the Food and Nutrition Technical Assistance (FANTA) standard tool, which consists of nine questions with three possible answers each and a 27-score-based Household Food Insecurity Access Scale (HFIAS) scale.[30]

Measurement of undernutrition

Undernutrition was measured using the circumference of the mid-upper arm by non-stretchable MUAC tape with the proper tension (not too loose/tight) [in cm] on the left arm at the halfway between the tip of the elbow (acromion process) and the tip of the shoulder (olecranon process) to the nearest 0.1 cm reading.

4.9. Data quality control

To keep quality of data a two days of training was given for the data collectors and supervisors on methodology, the aim of the research, and data collection procedures. The questionnaire was prepared after a rigorous review of the literature in English language and then translated into the regional language (Afan Oromo). The pre-test was piloted on 5% outside the study area (Arjo Town). Before data collection, the questionnaire was translated into the local language of Afan Oromo. To assess the internal validity and consistency of the tool the questionnaire was translated back from Afan Oromo to English. Data were collected by four BSc Nurses and two master's holder supervisors were assigned. standardization by measuring MUAC of women other than those involved in the study before commencing data collection was done to minimize the technical error of measurement. The data was cleaned and supervised daily.

4.10. Data processing and analysis

Data were checked for completeness and consistencies, coded (Dependent Variable Undernutrition Coded 1 for Yes and 0 for normal nutrition status) and entered in to Epi data 4.7 then exported to SPSS version 26 for cleaning and analysis. Principal component analysis was employed for wealth index after checking of all the assumptions (variables included must be metric level or dichotomous (dummy-coded) nominal level, Large Sample size, the ratio of cases to variables must be 5 to 1 or larger, the correlation matrix for the variables must contain 2 or more, correlations of 0.30 or greater). Minimal Dietary Diversity for woman (MDD_W) was calculated by summing a total of ten food groups eaten by the respondents 24 hr prior to data collection day. Descriptive analysis was conducted to show frequency distribution and to summarize the data. Chi square test was conducted to see an association between categorical variables. Bivariable and Multivariable analysis were conducted using binary logistic regression. All the variables whose p-value < 0.25 were taken to multivariable analysis, Hosmer and Lemeshow's goodness of fit test was employed to check the model fitness and it have p-value of 0.098. Multi collinearity was also checked using variation inflation factor (VIF) at $VIF > 10$ indicating the presence of Multi collinearity. Variables at p-value < 0.05 in the multivariable logistic regression method were declared statistically significant. Results were displayed using texts, tables and figures

4.11. Ethical considerations

This study was adhered to ethical guidelines by obtaining ethical clearance from the Wallaga University Institute of Health Research Ethics Review Committee. Necessary permissions were taken from relevant institutions to facilitate data collection. Participants were fully informed about the study's objectives, procedures, and potential benefits. They were explicitly informed of their right to withdraw from the study at any point without consequence. Participant confidentiality was strictly maintained by anonymizing all collected data. Before participation, all respondents were provided written informed consent. Pregnant women identified as underweight were referred to the nearest healthcare facility for appropriate care and support.

5. Dissemination plan of the study findings

The findings of this study will be shared with the Wallaga University community as part of the MPH thesis requirement. Additionally, the research results will be disseminated to relevant stakeholders, including the Wallaga University Public Health Department (specifically the Reproductive Health and Nutritional Health units), the Oromia Regional Health Bureau, the Nekemte Town Health Offices, targeted health facilities, and relevant NGOs operating in the region. Furthermore, efforts will be made to publish the research findings in both national and international scientific journals to reach a wider audience and contribute to the broader scientific community.

5. RESULT

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

Generally six hundred sixty nine (669) women participated in the current study with response rate of 98%. The mean ($\pm$ SD) age of the participants was 28($\pm$ 4), years with the majority (57.8%) falling with in the age group of 26-34 years. Almost all participants (99.6%) were married, and the majority (83.7%) reported family size of five or fewer members. Regarding ethnicity, 94.5% of the participants were Oromo, and 36.5% of them follow Protestant religion.

In terms of education, 55.3% of the women had attained a diploma or higher, while 6.3 % had no formal education. Regarding Occupation, 29% were housewives. The majority of participants (33.2%) were categorized as being in the low wealth group. (Table 2).

Table 2: Socio- demographic and Economic status of Pregnant women in Nekemte town February-March 2025(n=669)

Variables	Categories	Frequency	Percentage
Ethnicity	Oromo	632	94.5
	Amhara	16	2.4
	Gurage	17	2.5
	Other	4	0.6
Religion	Protestant	244	36.5
	Orthodox	230	34.4
	Muslim	136	20.3
	Other	59	8.8
Age of the women	≤ 25	196	29.3
	26-34	387	57.8
	≥ 35	86	12.9
Educational level of the women	No formal education	42	6.3
	Primary(1-8)	104	15.5
	Secondary(9-12)	153	22.9
	Diploma and above	370	55.3
Occupation of the women	Housewife	193	29
	Gov't employee	170	25.4
	NGO employee	158	23.6
	Self-employee	147	22
Occupation of the Husband	Gov't employee	207	30.9
	NGO	164	24.5
	Self	202	30.2
	Other	96	14.3
Marital Status	Married	666	99.6
	Single	3	0.4
Family size	≤ 5	560	83.7
	> 5	109	16.3
Wealth Index	Low	222	33.2
	Medium	261	39
	High	186	27.8

5.2. Obstetrics and gynecologic Related characteristics of the study participants

The majority of pregnancies (91%) were planned, and 43.2% of the participants were in their third trimester of pregnancy. Most women (61.4%) had experienced two or fewer pregnancies (gravidity $\leq$ 2), and 78.2% reported a birth interval greater than two years. Additionally, 78.7% had initiated antenatal care (ANC) for the current pregnancy, and 83.2% reported no history of abortion. (Table 3).

Table 3: Obstetrics and gynecologic characteristics of the study participants in Nekemte Town from February-March 2025, Nekemte, Oromia, Ethiopia (n=669)

Variables	Categories	Frequency	Percentage
Trimester of pregnancy	First Trimester	167	25
	Second trimester	213	31.8
	Third trimester	289	43.2
Birth interval	$\leq$ 2	136	21.8
	$>$ 2	489	78.2
ANC follow up	Yes	527	78.7
	No	142	21.3
Gravidity	$\leq$ 2	411	61.4
	$>$ 2	258	38.6
History of Abortion	Yes	105	16.8
	No	520	83.2
Planned Pregnancy	Yes	609	91
	No	60	9

5.3 Nutrition, morbidity and environmental related characteristics of the study participants

Most of the participants (90.1%) reported a meal frequency of more than two meals per day. More than half (55.5%) had an adequate dietary diversity score. However, 59.2% of the women were classified as food secure. A notable proportion (22.9%) reported practicing food taboos during the current pregnancy. Furthermore, 71.7% had received nutrition counselling, and 19.6% had experienced illness with in the two weeks prior to data collection. (Table 4).

Table 4: Nutrition, illness and environmental related characteristics of the study participants in Nekemte town, 2025, Nekemte, Oromia, Ethiopia.

Variables	Categories	Frequency	Percentage
Meal frequency	<=2	66	9.9
	>2	603	90.1
Dietary diversity	Inadequate	289	44.5
	Adequate	371	55.5
Household Food security status	Food secure	273	40.8
	Mildly food insecure	209	31.2
	Moderately food insecure	129	19.3
	Severely food insecure	58	8.7
Food Taboo	Yes	156	22.9
	No	516	77.1
Nutrition counselling	Yes	480	71.7
	No	189	28.3
Illness in the last two months	Yes	131	19.6
	No	538	80.4
Presence of Latrine	Yes	620	92.7
	No	49	7.3

5.4 Prevalence of undernutrition among pregnant women

The prevalence of undernutrition among pregnant women in this study was 34.2% ,95% CI:(31%,38%). (Fig 1)

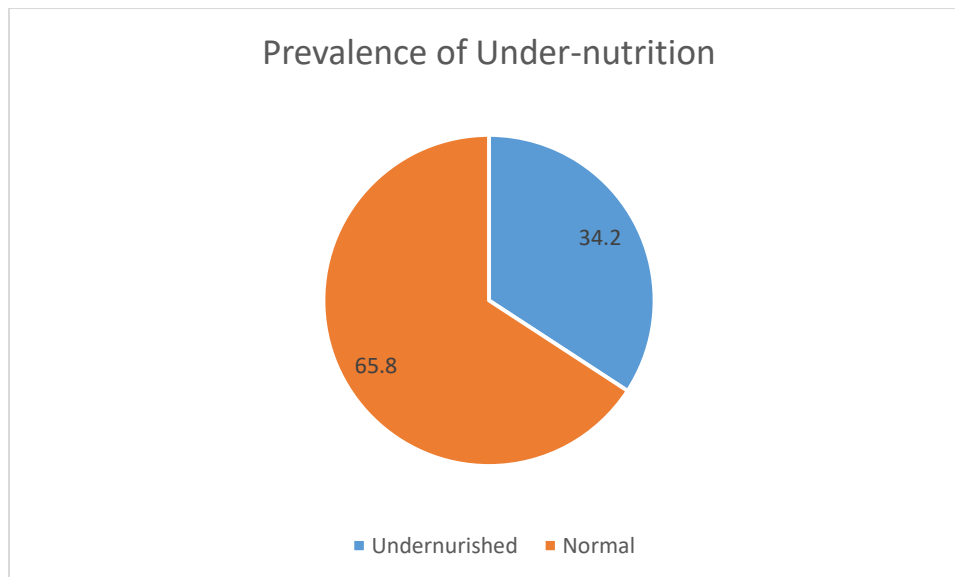


Figure 3: Prevalence of under-nutrition among pregnant women in Nekemte town, Oromia region, Ethiopia, 2025.

5. 5. Results of Binary logistic regression analysis of factors associated with undernutrition among pregnant women.

In the bi-variable binary logistic regression, the following variables were selected as candidates for multivariable logistic regression based on p- value of <0.25: trimester of pregnancy, ANC follow up, maternal age category, presence of latrine, planned pregnancy, food taboo, Wealth index, Food security, dietary diversity, household food insecurity, gravidity, Meal frequency, Birth interval, Nutrition counselling (Table 5).

Table 5: Results of bivariable Binary logistic regression analysis of Factors associated with undernutrition among pregnant women in Nekemte town, Oromia region, Ethiopia, 2025(n=669)

Variables	Categories	Undernutrition		COR (95% CI)			p-Value
		Yes	No				
Age at marriage	<=19	104(15.5%)	218(32.6)	0.84 (0.61, 1.16)			0.31
	>19	125(18.7)	222(33.2)		1		
					Lower	Upper	
Trimester of pregnancy	First Trimester	30(4.5)	137(30.5)	0.279	0.177	0.442	< 0.001
	Second Trimester	72(10.8)	141(21.1)	0.651	0.451	0.940	0.022
	Third Trimester	127 (19)	162 (24.2)	1	1	1	1
Started ANC follow up	Yes	116 (17.3)	411 (61.4)	1	1	1	1
	No	113 (16.9)	29 (4.3)	13.81	8.7	21.8	< 0.001
Maternal age category	<=25	72 (10.8)	124 (18.5)	1	1	1	1
	26-34	119 (17.8)	268 (40.1)	0.76	0.53	1.09	0.146
	>=35	38 (5.7)	48)7.2)	1.36	0.81	2.28	0.238
Latrine presence	Yes	204 (30.5)	416 (62.2)	1	1	1	1
	No	25 (3.7)	24 (3.6)	2.12	1.18	3.81	0.012
Planned Pregnancy	Yes	181 (27.1)	428 (64)	1	1	1	1
	No	48 (7.2)	12 (1.8)	0.11	0.055	0.204	< 0.001
Having illness in the last two weeks	Yes	40 (6)	91 (13.6)	0.81	0.538	1.22	0.32
	No	189 (28.3)	349 (52.2)	1	1	1	1
Avoid food Due to pregnancy	Yes	84 (12.6)	69 (10.3)	3.1	2.1	4.5	< 0.001
	No	145 (21.7)	371 (55.5)	1	1	1	1
Wealth Index	Low	74 (11.1)	112 (16.7)	2.59	1.67	4.03	< 0.001
	Medium	110 (16.4)	151 (22.6)	2.86	1.9	4.3	< 0.001
	High	45 (6.7)	177 (26.5)	1	1	1	1
Food security status	Secure	56 (8.4)	217 (32.4)	1	1	1	1
	Insecure	173 (25.9)	223 (33.3)	3.006	2.10	4.28	< 0.001
Dietary Diversity category	Inadequate	130 (19.4)	168 (25.1)	2.12	1.53	2.94	< 0.001
	Adequate	99 (14.8)	272 (20.7)	1	1	1	1
Family size	<=5	193 (28.8)	367 (54.9)	1	1	1	1
	>5	36 (5.4)	73 (5.9)	1.06	0.69	1.64	0.772

Variables	Categories	Undernutrition		COR (95% CI)			p-Value
		Yes	No				
Gravidity	<=2	155 (23.2)	256 (38.3)	1	1	1	1
	>2	74 (11.1)	184 (27.5)	0.664	0.47	0.92	0.017
Meal Frequency	<=2	17 (2.5)	49 (7.3)	0.64	0.36	1.13	0.129
	>2	212 (31.7)	391 (58.4)	1	1	1	1
Birth Interval	<=2	73 (11.7)	63 (10.1)	2.88	1.95	4.26	<0.001
	>2	140 (22.4)	349 (55.8)	1	1	1	1
Got Nutrition counselling	Yes	107 (16)	373 (55.8)	1	1	1	1
	No	122 (18.2)	67 (10)	6.34	4.39	9.16	<0.001
History of Abortion	Yes	31 (5)	74 (11.8)	0.778	0.49	1.22	0.28
	No	182 (29.1)	338 (54.1)	1	1	1	1

5.6. Results of Multivariable regression logistic regression Analysis of factors associated with undernutrition among pregnant women.

Multivariable regression analysis revealed several significant factors associated with undernutrition among pregnant women. Pregnant women in their **first trimester** had a significantly lower risk of undernutrition, being 81% less likely to be undernourished compared to those in their third trimester [(AOR=0.19 , 95% CI: (0.09-0.39)]. Pregnant women aged over 35 years were more than three times as likely to be undernourished compared to those aged 25 or younger [(AOR=3.60, 95% CI: (2.09-7.48)], low level wealth category [(AOR=4.64, 95% CI: (2.35-9.36)], food-insecure households [(AOR=4.01, 95% CI: (2.37-6.93)], inadequate dietary diversity [(AOR=2.04, 95% CI: (1.66-4.50)].

In addition, Pregnant women who hadn't started Antenatal Care (ANC) follow-up for their current pregnancy were nearly four times more likely to be undernourished compared to those who had. [(AOR=3.93, 95% CI: (2.58-7.55)]. Similarly, women who practiced food taboos during pregnancy were found to be three times more likely to be undernourished compared to those with no such practices [(AOR=3.13, 95% CI: (1.78-5.51)].

A pregnant woman's wealth significantly impacts her risk of undernutrition. Those in the **low wealth** category were four times more likely to be undernourished compared to women in the high wealth category. Similarly, pregnant women in the medium wealth category faced double the risk of undernutrition when contrasted with their counterparts in the high wealth category. [(AOR=4.64, 95% CI: (2.35-9.36)], [(AOR=2.59, 95% CI: (1.31-4.90))] respectively. Furthermore, women living in food-insecure households were four times more likely to become undernourished compared to their counterparts [(AOR=4.01, 95% CI: (2.37-6.93)]. Dietary diversity was also significantly associated with nutritional status. Women who did not receive adequate dietary diversity were two times more likely to be undernourished compared to those who consumed a diverse diet [(AOR=2.04, 95% CI: (1.66-4.50)], Interestingly, Women with gravida of more than two were 52% less likely to be undernourished than those with a lower number of pregnancies [(AOR=0.48, 95% CI: (0.26-0.85)]. Lastly, women who gave birth with a birth interval of two years or less were two times more likely to be undernourished compared to those whose birth interval exceeded two years [(AOR=2.03, 95% CI = (1.55-5.79)]. (Table 6).

Table 6: Results of Multivariable logistic regression analysis of factors associated with undernutrition among pregnant women in Nekemte town, Oromia region, Ethiopia, 2025 (n= 669).

Variables	Categories	Undernutrition		COR(95% CI)	AOR(95% CI)
		Yes	No		
Trimester of pregnancy	1 st Trimester	30(4.5)	137(30.5)	0.28(0.18-0.44)	0.18(0.09-0.39)**
	2 nd Trimester	72(10.8)	141(21.1)	0.65(0.45-0.9)	0.91(0.53-1.55)
	3 rd Trimester	127 (19)	162 (24.2)	1	1
Maternal age category	<=25	72 (10.8)	124 (18.5)	1	1
	26-34	119 (17.8)	268 (40.1)	0.76(0.53-1.09)	0.98(0.54-1.79)
	>=35	38 (5.7)	48)7.2)	1.36(0.81-2.28)	3.60(2.09-7.48)**
Started ANC	Yes	116 (17.3)	411 (61.4)	1	1
	No	113 (16.9)	29 (4.3)	13.8(8.7-21.8)	3.93(2.58-7.55)**
Planned pregnancy	Yes	181 (27.1)	428 (64)	1	1
	No	48 (7.2)	12 (1.8)	0.11(0.05-0.24)	0.22(0.10-1.28)
Avoid food due to pregnancy	Yes	84 (12.6)	69 (10.3)	3.1(2.1-4.5)	3.13(1.78-5.51)*
	No	145 (21.7)	371 (55.5)	1	1
Wealth index	Low	74 (11.1)	112 (16.7)	2.59(1.67-4.03)	4.64(2.35-9.36)*
	Medium	110 (16.4)	151 (22.6)	2.86(1.9-4.3)	2.59(1.31-4.90)*
	High	45 (6.7)	177 (26.5)	1	1
Household Food security status	Secure	56 (8.4)	217 (32.4)	1	1
	Insecure	173 (25.9)	223 (33.3)	3.006(2.10-4.28)	4.01(2.37-6.93)**
Dietary Diversity	Inadequate	130 (19.4)	168 (25.1)	2.12(1.53-2.94)	2.043(1.66-4.50)**
	Adequate	99 (14.8)	272 (20.7)	1	1
Gravidity	<=2	155 (23.2)	256 (38.3)	1	1
	>2	74 (11.1)	184 (27.5)	0.66(0.47-0.92)	0.47(0.26-0.85)*
Meal frequency	<=2	17 (2.5)	49 (7.3)	0.64(0.36-1.13)	.54(.23-1.30)
	>2	212 (31.7)	391 (58.4)	1	1
Birth Interval	<=2	73 (11.7)	63 (10.1)	2.88(1.95-4.26)	2.03(1.55-5.79)*
	>2	140 (22.4)	349 (55.8)	1	1
Nutrition counselling	Yes	107 (16)	373 (55.8)	1	1
	No	122 (18.2)	67 (10)	6.34(4.39-9.16)	1.17(0.56-2.45)
Latrine presence	Yes	204(30.5)	25(3.7)	1	1
	No	416(62.2)	24(3.6)	2.12(1.18-3.81)	1.36(0.51-3.64)

Notes: p- value, ** <0.01 * <0.05

6. DISCUSSION

The current study aimed to determine the prevalence and associated factors of undernutrition among pregnant women in Nekemte town, Oromia region, Ethiopia in 2025. The finding revealed that 34.2% of the pregnant women were undernourished. Several key predictors of undernutrition in these population were trimester of pregnancy, maternal age, antenatal care (ANC) attendance, food taboo practices, household food security status, dietary diversity, wealth status, gravidity and birth interval. These results provide strong evidence that maternal undernutrition remains a significant public health challenge in the study area, and it is influenced by a range of socio-demographic, behavioral, and reproductive health factors.

The observed prevalence of undernutrition in this study is higher than findings from the studies done in Silte zone (21.8%), Addis Abeba (17%), Gambella Town 28.6% [20], and Mettu (17.5%)[31] these contrast might be happen due to the disparity in the study setting, health service availability and level of education of the women. Conversely, the finding from this study is lower than the study conducted in East Borena Zone Liban District (44.9%) [19], Eastern Ethiopia 43.8% [21], Haramaya District 47.9% [9], and Konso ditrict (43.1%)[32]. This difference might be reflected from the disparities in access health services, agricultural productivity, and cultural dietary practices between them. In comparison to the studies conducted outside Ethiopia, the prevalence in this study remains relatively higher than the findings from some middle income countries like Bangladesh (28%) [28], Uganda (6.9%)[23], Kenya (27%)[24]. The observed difference might be attributed to the difference in study setting.

According to the current study women in first trimester of pregnancy were significantly less likely to be undernourished to those in the third this finding is supported by the study done in eastern Ethiopia [21]. This might be attributed to increased energy and nutrient demands as pregnancy progresses, coupled with poor dietary intake. Maternal age was a significant factor, with women aged 35 years old and above being more than three times more likely to be undernourished compared to those aged 25 or lower. This might be explained by the cumulative effect of nutritional depletion, higher parity, or health complications associated with advanced maternal age. Similarly Lack of ANC attendance emerged as a strong predictor of undernutrition. The finding is supported by the study done in Bangladesh [28]. Women who did not begin ANC follow-up were nearly four times more likely to be undernourished, underscoring the critical role of ANC in providing early nutritional

screening, counselling [28]. Cultural practice during pregnancy such as food taboo, contributed significantly to undernutrition, with affected women three times more likely to be malnourished. The study done in Kenya [26] and Silte zone [33] also supports this. The explanation of this cause might be Food taboos can prevent women from consuming nutrient rich foods, especially during critical stages development. Additionally, household's food insecurity and inadequate dietary diversity were both associated with increased risk of undernutrition, again it is supported by the study done in Kenya [27] and Gambella town [20]. This is due to that household's food insecurity directly limits the quantity and quality of food consumed by pregnant women again this factor prevent pregnant women to meet their daily caloric and nutritional need. Additionally, inadequate diversified diet lacks micronutrients such as iron, Vitamin A, Zinc, and folic acid which all are critical during pregnancy.

Wealth status showed an association with undernutrition among this population, with women from lower-income households facing higher risk of undernutrition, the finding is align with study done in Borena zone. This may be explained as low level wealth status may reduce household's ability to purchase a variety of foods especially those rich in essential nutrients, additionally poorer women are more likely to access available health services.

7. LIMITATION OF THE STUDY

This study has several limitations that should be acknowledged. First, Dietary information was collected using a 24 hr recall method, which may be influenced by recall bias and daily Variation in daily intake. Second given the cross -sectional nature of the study, it is difficult to establish temporal relationships between the identified factors and undernutrition, limiting the causal inference. Third, some of the data particularly household wealth, age and dietary practice were based on self-report information, which may be subject to social desirability bias and reporting inaccuracies.

8. CONCLUSION AND RECOMMENDATIONS

8.1. Conclusion

The study revealed a high burden of undernutrition among pregnant women in Nekemte town, with over one-third affected. The results emphasize the multifactorial nature of maternal undernutrition, with significant associations found between undernutrition and variables such as trimester of pregnancy, maternal age, ANC follow-up, food taboo, wealth status, household food insecurity, dietary diversity, and birth spacing.

8.2. Recommendations

Nekemte town Health office:

- To emphasize early ANC registration and integrate targeted nutrition counselling, especially for women in the third trimester pregnancy.
- Community nutrition education to address harmful cultural practices like food taboo and improve awareness about maternal dietary needs.
- Promote family planning and maternal health education to reduce short birth intervals.

Local NGOs

- To implement livelihood programs and food assistance for vulnerable households to improve maternal nutrition.
- Giving special attention to older pregnant women and those in low-income households during nutritional screening and intervention.
- Coordination among health, agriculture, and social sectors to improve maternal nutritional outcomes through integrated interventions.

For Researchers:

- To consider longitudinal or cohort studies to establish temporal and causal relationships between pregnancy-related factors and nutritional status, particularly across the different trimesters.
- To incorporate Qualitative components to gain deeper insights into cultural practices (such as food taboo), perceptions of maternal nutrition, and barriers to accessing ANC and diverse diets.

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Annexes:

Appendix I: Participant Information Sheet and Voluntary Consent Form

Good morning/afternoon I am _____ I am collecting data for a study being carried out in this village by Amelework Biru, who is pursuing a master's degree at the School of Public Health at Wallaga University. I respectfully ask that you give me a moment so that I may explain the study and how you were chosen to participate in it.

The study title: Under nutrition and associated factors among pregnant women in Nekemte town: a community-based cross sectional study

Aim of the study: The study aimed to produce a thesis as a partial requirement for the primary investigator to complete a Master's program in reproductive health.

In addition to this Nekemte town health office, East Wollega, and other health departments may find the results of this study extremely valuable in developing intervention programs to enhance women's nutritional status by focusing on potential determinants identified in this investigation.

Procedure and duration: To gather relevant information that will be useful for the study, I will measure your mid-upper arm circumference and interview you using a questionnaire. I respectfully ask that you give me this time for the interview, which should take about thirty-five minutes.

Benefits and risks: There is no risk associated with taking part in this study, except taking a few minutes from your time. Participants in this study will not receive any direct compensation. Nonetheless, the results of this study can provide crucial information for government planners and the Nekemte municipal health office.

Confidentiality: We will keep the information you provide us private. You won't be specifically identified by any information. The study's conclusions will be generic for the population under investigation and won't be specific to any one individual. To prevent names from being displayed, the questionnaire will be coded. No information that could connect research participants to the study will be mentioned in written or spoken reports

Rights: It is entirely voluntary to participate in this study. You are free to choose whether or not to take part in this study. You are free to leave the study at any moment after you choose to enroll, and doing so will not result in any loss of benefits to which you would otherwise be

eligible. If there is a question you do not wish to answer, you are not required to.
Address for contact: Please get in touch with the principal investigator at any moment if you have any questions or concerns regarding the study or the procedures:

Amelework Biru: Mobile number: +251911099783

Email Address: ameleworkbiru5@gmail.com

Appendix II: Declaration of informed voluntary consent (Informed consent sheet).

I understood the purpose, procedures, risks and benefits, issues of confidentiality, the rights of participating and the contact address for any queries. Therefore, I declare my voluntary consent to participate in the study and assure it with my signature.

Signature if the interviewee _____ Date _____

Name of the interviewer _____ Date _____ Signature _____

Name of the supervisor _____

Appendix III: English version Questionnaire

Part I: Socio-demographic and economic related questions

s.no	Variable	Response	remark
101	Age of the mother	----- years	
102	What is your Ethnicity	1. Oromo 2. Amhara 3. Gurage 4. Other	
103	What religion are you following?	1. Orthodox 2. Muslim 3. Catholic 4. Protestant Others(Specify) -----	
104	Marital status of the mother	1. Single 2. Married 3. Divorced 4. Widowed 5. Separated	
105	Educational status of the mother	1. No formal education 2. Grades 1-8 3. Grades 9-12 4. Diploma and above	
106	Occupation of the mother	1. Housewife 2. Government employee 3. NGO/employee 4. Self-employee	
107	Occupation of the Father	1. Gov't employee 2. NGO/employee 3. Self-employed 4. Other	
108	What is your family size	_____	
109	Monthly Income	_____	

House hold wealth

S. No	Does the household have any of the following properties?	Responses
110	Functioning CD player, Functioning radio/Tape recorder	1. Yes 0. No
111	Functioning Television	1. Yes 0. No
112	Cylinder stove	1. Yes 0. No
113	Refrigerator(fridge)	1. Yes 0. No
114	Electric stove	1. Yes 0. No
115	Bicycle	1. Yes 0. No
116	Motor Cycle	1. Yes 0. No
117	Cart/Gari	1. Yes 0. No
118	Sofa	1. Yes 0. No
119	Spring mattress	1. Yes 0. No
120	Car	1. Yes 0. No
121	Bajaj	1. Yes 0. No
122	Taxi	1. Yes 0. No
123	Own house	1. Yes 0. No
124	Video camera	1. Yes 0. No
125	Digital camera	1. Yes 0. No
126	Washing machine	1. Yes 0. No

Part II: health care, environmental and health related questions			
201	For how many times are you pregnant now	_____	
202	Is your current pregnancy is a planned pregnancy?	1. 1. Yes 2. No	
203	At what age you gave birth for the first time?		
204	How many years is your birth interval?		
205	Have you faced abortion previously?		
206	Have you started ANC follow up for this pregnancy		
207	How many month is your current pregnancy now?		
208	Have you got nutrition counselling	1. Yes 2. No	
209	At what age was your first marriage		
210	What is the source of your drinking water	1. Pipe 2. River 3. Other	
211	How long it takes you to get drinking water	_____minutes	
212	Do you have latrine?		
213	Did you get any illness in the last two weeks		

Part III. Nutrition related questions

24-hour Dietary recall questionnaires

Which Food Groups have you consumed over 24 hours (List all indicated Food Groups)

Please describe the foods (meals and snacks) that you ate or drank yesterday during the day and night, whether at home or outside the home. start with the first food or drink of the morning. Write down all foods and drinks mentioned. When composite dishes are mentioned, ask for the list of ingredients. When the respondent has finished, probe for meals and snacks not mentioned.

Breakfast	Snack	Lunch	Snack	dinner	snack

When the respondent recall is complete, fill in the food groups listed below based on the information recorded above. For any food groups not mentioned, ask the respondent if a food item from this group was consumed.

s.no	Food groups	Examples	Response
301	Starchy staples	corn/maize, teff, millet, sorghum, barrel, wheat, rice, white potatoes, white yam, white cassava, or foods made from these like breads, 'injera', porridge, pasta etc.	1. Yes 0. No
302	Dark green leafy vegetables,	dark green leafy vegetables, including wild forms + locally available vitamin A rich leaves such as amaranth, cassava leaves, kale, spinach, cabbage, Sweet potato leaves	1. Yes 0. No
303	vitamin A rich fruits, vegetables and tubers	Mango, ripe papaya, pumpkin, carrot, or sweet potato that are orange inside, red sweet pepper, and 100% fruit juice made from these,	1. Yes 0. No
304	Other fruits	Other fruits, including wild fruits and 100% fruit juice made from these, other vegetables like tomato, onion, eggplant) +	1. Yes 0. No
305	Other vegetables	Other locally available vegetables, Alfalfa greens, broccoli, cucumber.	2.
306	Organ meat	liver, kidney, heart, blood-based foods	1. Yes 0. No
307	Meat and fish	beef, pork, lamb, goat, chicken, fresh or dried fish	1. Yes 0. No
308	Eggs	Duck egg, hen egg or any other egg	1. Yes 0. No
309	Legumes, nuts and seeds	Beans, peas, lentils, nuts. sesame, chickpea, guaya	1. Yes 0. No
310	Milk and milk products	milk, cheese, yogurt or other milk products	1. Yes 0. No
310	In a typical day how, many meals do you have other than snacks?	_____times	
311	Is there any food that you avoid because of pregnancy?	1. Yes 2. No	

Part IV: Household Food Insecurity Access Scale (HFIAS) scale

How often did this happen?

1. Rarely (once or twice in the past four weeks)
2. Sometimes (three to ten times in the past four weeks)
3. Often (more than ten times in the past four weeks)

S.N	Occurrence Questions	How often did this happen?
401	In the past four weeks, did you worry that your household would not have enough food?	
402	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?	
403	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?	
404	In the past four weeks, did you or any household member have to eat some foods that you did not want to eat because of a lack of resources to obtain other types of food?	
405	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?	
406	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?	
407	In the past four weeks, was there ever no food to eat of any kind in your household because of a lack of resources to get food?	
408	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	
409	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?	

Nutritional status of the mother

501	Mid-upper arm circumference(MUAC) of a woman	----- CM	
-----	--	----------	--

Part VIII: Household Food Insecurity Access Scale (HFIAS) scale		
How often did this happen?		
1. Rarely (once or twice in the past four weeks)		
2. Sometimes (three to ten times in the past four weeks)		
3. Often (more than ten times in the past four weeks)		
S.N	Occurrence Questions	How often did this happen?
1	In the past four weeks, did you worry that your household would not have enough food?	
2	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	
3	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	
4	In the past four weeks, did you or any household member have to eat some foods that you did not want to eat because of a lack of resources to obtain other types of food?	
5	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	
6	In the past four weeks, did you or any household member have to eat fewer meals in a day because there was not enough food?	
7	In the past four weeks, was there ever no food to eat of any kind in your household because of a lack of resources to get food?	
8	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	
9	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	

Appendix IV: Ibsa hirmaattotaa qorannoof kennamuu fi unka walii galtee (Oromiffaa)

Akkam bultan/ooltan?

Ani maqaan koo_____jedhama. Magaalaa Naqamtee keessatti qorannoo Karaa aadde Amalawarq Birruu kan yuunvarsiiiti Wallaggaatti barattuu, digrii lammaaffaa taate gaggeeffamaa jiru irratti odeeffannoo sassaabuuttin jira. Waa’ee qorannoo kanaa fi akkaataa qorannoo kanatti akka hirmaattan ittin filatamtan akkaan isiniif ibsuuf yeroo muraasa akka naaf kennitan isin gaafadha.

Mata duree Qorannichaa: waa’ee hanqina nyaataa dubartoota ulfaa magaalaa Naqamtee keessa jiraatanii irratti kan hundaa’e.

Sababa qorannichaa: Sababni guddaan qorannoon Kun barbaachiseef abbaan qoranichaa Aadde Amalawarq Birruun qorannoo digrii lammaffaa argachuuf waan isaan barbaachisu guutuufi dha. Dabalataanis, bu’aan qorannoo kanaa galtee hoggantoota fayyaa fi deeggartoota fayyaa biroof kan fayyaduudha.

Adeemsaa fi turtii qoranichaa: Qorannichi dubartoota Ulfaa magaalaa Naqamtee keessa jiran irratti kan geggeeffamu taaee, Walumaagalatti qoranichi haadha tokkoof naannoo daqiiqaa 30-45 ni fudhata. Kanaaf qorannoo kana akkaan gegeessuf akka naaf heyyamtan isinan gaafadha.

Faayidaa fi miidhaa qoranichaa: Sababa qorannoo kanatti hirmaattaniif rakkoon guddaa isin irra gahu hin jiru, yeroo keessan muraasa isin irraa fudhachuu keenyaan alatti. Faayidaa kallattiin sababa hirmaannaa keessaniin argattan hin jiru. Garuu odeeffannoon isin kenitan rakkoo sirna nyaataa dubartootan wal-qabate dhufu hambisuuf qorannoo hedduu barbaachisuu dha. Akkasuma bu’aan qorannaa kanaa karoorsitoota fayyaa sadarkaa gaditti jiraniif galtee guddaa taha.

Iccitii eeguu: Ragaan isin nuuf kennitan iccitiin qabama. Kallattiin wanti addatti isin calaqqisu/ibsu asirratti barreeffamu hin jiru.bu’aan qorannoo kanaa ummata naannoo kanaa malee addatti hirmaattota kan calaqqisu miti. Deebiin keessan yommuu galmeeffamu maqaa keessan hin dabalatu, afaaniinis tahe barreeffamaan hirmaattota addatti qorannoo kanaan walitti kan hidhu hin jiru.

Mirga: Hirmaannaan fedhii keessan irratti kan hundaa’e dha. Qorannoo kana irratti hirmaachuuf murteessuu yookiin dhiisuu dandeessu. Hirmaachuuf murteessitan illee yeroo barbaaddan qorannoo kana addaan kuttanii bahuuf mirga guutuu qabdu. Sababa

kanaan faayidaa isin argachuu qabdan kan dhabdan hin jiru. Gaaffii isini deebisuu hin barbaanne yoo jiraate deebisuuf dirqama hin qabdan.

Appendix V: Walquunnamtii kamuu barbaachisuuf: Gaaffii yoo qabaattan ykn ibsa yoo barbaadan yeroo barbaadanitti lakkoofsa bilbilaa qorattuu qorannoo kanaa:

Amalawarq Birruu_____

Walii galtee

Kaayyoo, adeemsa, miidhaa fi bu'aa isaa, dhimmi icciitummaa yaadakoo, mirgaa qorannicha keessatti hirmaachuu fi gaaffii kamiifuu teessoo qoratichaa hubadheera. Kanaafis, fedhakoon qorannicha keessatti hirmaachuu koo mallattoo kootiin nan mirkaneessa.

Mallattoo isa gaafatamuu_____Guyyaa_____

Ganda abbaawarraa_____

Maqaa isa gaafatuu_____Guyyaa_____Mallattoo _____

Maqaa to'ataa_____

Appendix VI: Gaaffii Afaan Oromoo

Kutaa I. Gaaffiiwwan dhimmoota hawaasummaa fi diinagdee

1	Gaaffilee	Deebii	Bira darbi
101	Umuriin kee meeqa?	(waggaa	
102	Qomoon kee maali?	1.Oromoo 2. Amaara 3. Guraagee 4.Kan biraa (adda baasi)	
103	Amantiin kee maali?	1. Musliima 2. Ortodoksii 3. Pirotestaantii 4. Kan biraa (adda baasi)	
104	Haalli gaa'ela kee akkami?	1. Kan heerumte 2. Kan Hin heerumne 3. Kan hiikte/hiike 4. Abbaan mana kan jalaa du'e	
105	Sadarkaa barumsaa kee hagami?	1. Kan hin baranne 2. Sadarkaa jalqabaa (1-8) 3. Sadarkaa lammaffaa (9-12) 4. Sadarkaa ol'aanaa	
106	Hojiin kee maali?	1. Haadha warraa 2. Hojjetaa mootummaa 3. Hojjetaa miti-mootummaa 4. Hojii dhuunfaa 5. kanbiraa(adda baasii)_____	
107	Hojiin abbaa manaa keetii maali?	1. Hojjetaa mootummaa 2. Hojjetaa miti-mootummaa 3. Hojii dhuunfaa 4. kanbiraa(adda baasii)_____	
108	Baay'inni maatii keessanii meeqa?	_____	
109	Galii ji'aa		

Qabeenya mana keessaa abbaa warraa

Lakk	Abbaanwarraakunqabeenyaarmaangadiiqabaa?	
110	Meeshaa CD taphatukanhojiirrajiru	1. Eeyyee0. Lakki
111	Televiziniikanhojjetu	1. Eeyyee0. Lakki
112	Istooviisiliindaraa	1. Eeyyee0. Lakki
113	Meeshaaqorriisiisaa (firiijii)	1. Eeyyee0. Lakki
114	Istooviiielektirikaa	1. Eeyyee0. Lakki
115	Biskileetii	1. Eeyyee0. Lakki
116	Biskileetiimotoraa	1. Eeyyee0. Lakki
117	Konkolaataaharkifamu (gaarii)	1. Eeyyee0. Lakki
118	Soofaa	1. Eeyyee0. Lakki
119	Firaashiiispiriingii	1. Eeyyee0. Lakki
120	Konkolaataamanaa	1. Eeyyee0. Lakki
121	Baajaajii	1. Eeyyee0. Lakki
122	Taaksii	1. Eeyyee0. Lakki
123	Mana dhuunfaa	1. Eeyyee0. Lakki
124	Kaameeraaviidiyoo	1. Eeyyee0. Lakki
125	Kaameeraadigitaalaa	1. Eeyyee0. Lakki
126	Maashinahuccuumiicu	1. Eeyyee0. Lakki

Kutaa 2ffaa_ Gaaffiiwwan haala fayyaa, walhormaataa, tajaajila fayyaa fi haala naannoon wal qabatan

201	Ulfi kee kun meeqaffaadha?	-----	
202	Ulfi kee inni kun fedhakeen kan ta'ee kan itti karoorfamedhaa?		
203	Daa'ima jalqabaa umuriikee meeqatti deesse?	=====	
204	Daa'ima tokko deessee kan biraa da'uuf g/galeessaan waggaa meeqa turta?	=====	
205	Ulfi sirraa ba'ee ni beekaa(turban 28 gaditti)?	1. Eyyee 2 lakki	
206	Ulfa kanaaf hordoffii da'umsa duraa eegalteettaa	2. Eyyee 2. lakki	
207	Ulfi kee kun ji'a meeqa ta'a?	=====	
208	Ulfa kanaaf gorsi haala soorataa irratti siif kennameeraa?	1. Eyyee 2. lakki	
209	Umurii kee waggaa meeqatti heerumte?	=====	
210	Bishaan dhugaatii eessaa argattu	1. Boombaa, 2. Laga 3. Madda eegame 4. Kan biro	
211	Bishaan dhugaatii argachuuf daqiiqaa meeqa deemta?	=====	
212	Mana fincaanii ni qabduu?	1. Eeyyee 2. Lakki	
213	Torban lamaan darbe keessa dhukkubfattee Beektaa?	1. Eeyyee 2. Lakki	

Kutaa III_ Gaaffiiwwan haala sirna soorataa

1. Gaaffilee yaadannoo nyaataa sa'aatii 24

Guyyaa kaleessaa guyyaa fi halkan itti soorata (hebelesoo dabalatee) nyaatte yookiis dhugde ibsi. Nyaata yookiis dhugaatii ganamaa yaadachuu irraa eegali. Nyaataa fi dhugaatii fayyadamte hundumaa barreessi. Maaddiidhaan kan nyaatame yoo ta'e qabiyyee nyaatichaa gaafadhu. Yeroo isaan xumuran, yaada hafe argachuudhaaf gaaffii cinaa itti kaasi. Nyaata alaa nyaattes yoo jiraate nuuf ibsi.

Ciree	Hebelesoo	Laaqana	Hebelesoo	Irbaata	Hebelesoo

Yeroo hirmaattotni yaadannoo isaanii xumuran, odeeffannoo argatte sana gosa nyaataa armaan gaditti qoodame jalatti tarreessi. Gosa nyaataa hintuqamiin yoo jiraate, hirmaattotaan irra deebi'ii gaafadhu.

Lakk	Gosanyaataa	Fakkeenya	Deebii
301	NyaataIstaarchiiyeroohundum aanyaatan	Boqqolloo, Xaafii, Qamadii, garbuu,Ruuzii, Dinnicha, Dinnichasukkaarawaa, nyaatahundeenisanyaatamukanakkaancootee, qoochooyookiisnyaata warren kana irraahojjetamankannenakkabuddeenaa, daabboo, marqaa, paastaa fi kkf	1. Eeyyee 2. 0. Lakki
302	Fuduraaleebaalagurraachaa	Fuduraaleebaalagurraachaakannaannookeettiarga mukanneenVaayitaamin A tiinbadhaadhankanakkaraafuumaraa,goommana fi isafakkaatan	1. Eeyyee 2. 0. Lakki
303	Kuduraalee, muduraaleekanvaayitamin "A" tiinbadhaadhan.	Maangoobilchaataa, paappayyaabilchaataa, Juusii 100% kanneenirraahojjetame, buqqee, kaarotii,dinnichasukkaaraakanneenkeessiisaaniib urtukaanaa fi Kuduraaleevaayitaaminoota"A"nbadhaadhannaa nnootti argaman	1. Eeyyee 2. 0. Lakki
304	Kuduraalee fuduraaleekanneenbiroo fi	Kuduraalee fi juusii 100% isarraahojjetame, fuduraaleekanneenakkatimaatimaa, qullubbiidii fi fuduraaleenaannootti argaman kanneenbiroo	1. Eeyyee 2. 0. Lakki
305	Foonqaamaa	Kalee, Tiruu, nyaatahiddadhiigaa	1. Eeyyee 2. 0. Lakki

306	Foonii fi qurxummii	Foonhorii, foonbooyyee, foonhoolaa, foonre'ee, foonlukkuu, foonkuruphee, fi foonqurxummii	1. Eeyyee 2. 0. Lakki
307	Hanqaaquu/killee	Killeedaakiyyee, lukkuuyookiiskanbiroo	1. Eeyyee 0. Lakki
308	Nyaatabaaqelaa, nuugii fi sanyiilee	Atara, Baaqelaa, missira, nuugii,siisaamii, guwaayaa	1. Eeyyee 0. Lakki
309	Aannanii fi bu'aaleeaannanii	Aannan, itittuu, baaduuyookiisbu'aaleeaannaniikanbiroo	1. Eeyyee 2. 0. Lakki
310	Guyyaa tokkotti yeroo meeqa sooratta?	_____	
311	Erga ulfaan asitti sooratta dabalataa(kan duriin ol) ni soorattaa?	1.Eeyyee 0. Lakki	

IV/Af-gaaffiiwwan haala wabii Nyaataa waliin kan walqabatan

Filannoowwan deebii yeroo hagamiif ta'e jedhuuf ta'an:

1 = Muraasa (torban 4n Durban keessatti taka /yeroo lama)

2 = Dare (torban 4n darban keessatti yeroo 3-10)

3 = Yeroo Baylee (torban 4n darban keessatti yeroo 10 ol)

Lakk.	Gaaffii	deebii	yaada
401	Torban arcane darban keessa martin kee waa'ee nyaata gahaa dhabuu dhiphatteettaa?	0 = Lakki (G2tti dbarfadhu) 1=Eyyee	 _
1a	Yeroo hagamiif ta'e?		 _
402	Torban arfan darban keessa maatiin keessaa kee sababa hanqina qabeenyaa nyaata filatan nyaachuu dadhabaniiruu?	0 = Lakki (G3tti daabarfadhu) 1=Eyyee	 _
2a	Yeroo hagamiif ta'e?		 _
403	Torban arfan darban keessa sababa qabeenya dhabuutiin nyaata gosoota murtaa'ee nyaataniiru?	0 = Lakki (G4tti daabarfadhu) 1=Eyyee	 _
3a	Yeroo hagamiif ta'e?		 _
404	Torban arfan darban keessa sababa qabeenyaan maatii kee keessa nyaata ati hinfeene kan nyaate jiraa?	0 = Lakki (G5tti daabarfadhu) 1=Eyyee	 _
4a	Yeroo hagamiif ta'e?	)	 _
405	Torban arfan darban keessa sababa nyaatni	0 = Lakki (G6tti daabarfadhu)	 _

	gahaa ta'uu dhabuun sis ta'e maatii kee keessa nyaata xiqqaa hanga barbaadamee gad kan nyaate jiraa?	1=Eyyee	
5a	Yeroo hagamiif ta'e?		 _
406	Torban arfan darban keessa sababa nyaatni gahaa ta'uu dhabuun sis ta'e maatii kee keessa nyaata yeroo muraasa hanga barbaadamee gad kan nyaate jiraa?	0 = Lakki (G7tti daabarfadhu) 1=Eyyee	 _
6a	Yeroo hagamiif ta'e?	)	 _
407	Torban arfan darban keessa sababa qabeenyaan si ta'e maatiin kee gosi nyaataa kamiyyuu dhabdaniittuu?	0 = Lakki (G8tti daabarfadhu) 1=Eyyee	 _
7a	Yeroo hagamiif ta'e?		 _
408	Torban arfan darban keessa sis ta'e maatiinkee sababa nyaatni gahaan hin jirreen nyaata malee bultaniittuu?	0 = Lakki (G9tti daabarfadhu) 1=Eyyee	 _
8a	Yeroo hagamiif ta'e?		 _
409	Torban arfan darban keessa sababa nyaatni gahaan hin jirreen guyyaa guutuu nyaata malee turtaniittuu?	0 = Lakki 1=Eyyee	 _
9a	Yeroo hagamiif ta'e?		 _
Safara naannawaa irree haadhaa			
501	Safara Naannawaa irree(MUAC) haadhaa	_____cm	