

ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCES
SCHOOL OF NURSING AND MIDWIFERY
DEPARTMENT OF NURSING

ANEMIA AND ITS ASSOCIATED FACTORS AMONG UNDER-FIVE CHILDREN IN SELECTED HEALTH FACILITIES IN WOLKITE TOWN, CENTRAL ETHIOPIA, 2024 G.C

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A RESEARCH THESIS SUBMITTED TO SCHOOL OF NURSING AND MIDWIFERY, COLLEGE OF HEALTH SCIENCES, ADDIS ABABA UNIVERSITY, GRADUATE STUDIES IN PARTIAL FULFILLMENT OF REQUIREMENTS FOR DEGREE OF MASTER OF SCIENCE IN PEDIATRICS NURSING

MAY, 2024 G.C

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MAY, 2024 G.C

ADDIS ABABA, ETHIOPIA

DEDICATION

This research paper is sincerely dedicated to my supportive family and husband who encouraged and inspired me in conducting this study. They have never left my side throughout the process and gave me strength and hope when I thought of giving up.

STATEMENT OF AUTHOR

By my signature below, I declare and affirm that this thesis is my own work. I have followed all 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 affirm that I have cited and referenced all sources used in this document. Every effort has been made to avoid plagiarism in the preparation of this thesis.

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ACRONYMS AND ABBREVIATIONS

AOR - Adjusted odd ratio

CI - Confidence interval

COR - Crude odd ratio

DD - Dietary diversity

DHS - Demographic and Health Survey

EDHS - Ethiopian Demographic and Health Survey

ETB - Ethiopia Birr

G/dl - Gram per deciliter

HC - Health center

HCT - Hematocrit

Hgb - Hemoglobin

HIV - Human Immunodeficiency Virus

IMNCI ---Integrated management of neonatal and childhood illness

IDA - Iron Deficiency Anemia

MF - Meal frequency

SPSS - Statistical Program for Social Science

SVD – Spontaneous vaginal delivery

WHO – World Health Organization

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ABSTRACT

Background: - Anemia is described as a decrease in hemoglobin concentration, hematocrit, or the number of red blood cells per liter that is less than what is considered normal for healthy people of the same age, sex, and race in the same environment. In 2019, global anemia prevalence was 39.8% in children aged 6-59 months. The prevalence of anemia in children under five was highest in the African Region, 60.2% and in Ethiopia it was 52.1%.

Objectives: -The aim of this study was to assess Anemia and its associated factors among under-five children in Wolkite health center and Wolkite university Referral and specialized Hospital in Wolkite town, Central Ethiopia.

Methods: - Institutional based quantitative cross sectional study was conducted at Wolkite Health Center and Wolkite University Referral and Specialized Hospital in Wolkite town, central Ethiopia on March 2024 G.C. Study participants were selected by using systematic sampling method. Structured Interview questionnaire was administered to collect data from the study participant and the venous blood sample was collected by experienced laboratory technicians. The data was analysed by using Statistical Package for Social Sciences (SPSS) version 25 software. Descriptive statistics (mean, frequency) were carried out to describe the socio-demographic status of the participants presented by table, pie chart and graph. P value ≤ 0.25 in the bivariate analysis was considered candidates for the multivariate analysis. The extant association between the different variables related to anemia was measured using AOR at 95% CI. A P value ≤ 0.05 in Multivariate analysis was considered statistically significant.

Result: - The overall prevalence of anemia was 164(39.0%). Among anemic children under five years of age, 95(22.6%) were mild, 58(13.8%) were moderate and 11(2.6%) were severe. In this study, anemia was significantly associated with being male (AOR= 7.252, 95% CI =4.176–12.592), rural place of residence (AOR=4.295, 95% CI=2.499–7.382), recent history of fever (AOR=2.183, 95% CI=1.203-3.960), recent malaria infection (AOR=4.387, 95% CI=2.097–9.179), Inadequate dietary diversity(AOR=2.218, 95% CI= 1.253-3.925) and underweight(AOR= 2.835, 95% CI= 1.151-6.982).

Conclusion: - Childhood anemia was a moderate public health problem in the study area. Being male, rural residence, history of recent fever, recent malaria infection, inadequate dietary diversity and underweight were significantly associated with childhood anemia.

Key words: - anemia, prevalence, under five children, hemoglobin, hemoglobin level

1. INTRODUCTION

1.1. Background

Anemia is described as a decrease in hemoglobin concentration, hematocrit, or the number of red blood cells per liter that is less than what is considered normal for healthy people of the same age, sex, and race in the same environment. The World Health Organization states that a child under five years old must have a hemoglobin level of less than 110 g/l to be considered anemic(1). Since iron is an essential part of hemoglobin, it is thought that iron deficiency accounts for half of all cases of anemia worldwide(2). Anemia can also be caused by genetic disorders, persistent infections, malaria, hookworm and other helminthes, and other nutritional deficits(3).

A hemoglobin level below the age-adjusted reference range for children in good health is referred to as pediatric anemia(4). Postpartum hemorrhage and low birth weight kids are two long-term repercussions of anemia in female children. Since there is a high demand for iron during this time of rapid growth, young children from low-income families are particularly vulnerable to iron deficiency anemia (IDA)(5). As a result, it is important to maintain a proper nutritional balance during this formative period to support normal brain development. Iron and iodine shortages can also hinder the development of cognitive and motor skills(1). For children, anemia is a major risk since it can hinder their cognitive development, impede their growth, and raise their risk of infections(3).

The causes of anemia are often complex and multifactorial. Stunting, low dietary diversity, food scarcity, prompt supplementary feeding initiation, deworming, wasting, educational attainment, parasite infestations, maternal weight, and prenatal care visits are among the socioeconomic, biological, environmental, and nutritional factors that are associated with anemia(2, 6-8).

Numerous factors can lead to anemia, including inadequate iron intake, poor iron absorption, or excessive iron losses; inadequate hematopoiesis, such as from a vitamin B-12 deficiency; blood loss, or hemorrhagic anemia; premature rupture of the red blood cell plasma membrane, or hemolytic anemia; inadequate or abnormal hemoglobin synthesis, such as thalassemia; and bone marrow destruction, or aplastic anemia(9).

The mean corpuscular volume is used to classify anemia as microcytic, normocytic, or macrocytic. It can also be divided into two categories according to the level of red cell: normochromic, which describes typical red cell staining when hemoglobin is sufficient, and hypochromic, which describes pale red cell staining when hemoglobin is insufficient. An expanded area of central pallor is observed in hypochromic cells(10). Types of anemia includes iron deficiency anemia, sickle cell anemia, Vitamin deficiency anemia, Aplastic anemia, hemolytic anemia, hemorrhagic anemia and anemia of inflammation(6).

Impaired cognitive function, growth, and psychomotor development are potential consequences of anemia, particularly in children. Due to their higher iron requirements resulting from their rapid bodily growth and red blood cell proliferation, newborns, and children under five years old, and pregnant women are more susceptible to anemia(11). A population's incidence of anemia may be the most significant single predictor of its general health status with reference to mal- or under nutrition, helminthic infection, and malaria (2, 12).

According to research conducted in Ethiopia, the following factors increased the risk of anemia: stunting, inadequate dietary diversity, food instability, deworming, wasting, educational status, mother weight, and prenatal care visits(13).

In Ethiopia, diagnosis and treatment of anemia in under-five clinic is based on the WHO guideline of IMNCI by assessing palmar pallor. The treatment plan is based on the severity of the palmar pallor. If the child has severe palmar pallor, they referred to higher-level health facilities for further evaluation and management. When the child has some palmar pallor, the treatment option is to give iron folic acid therapy for 14 days, assess the child`s feeding and counsel the mother on feeding. If the child has no any palmar pallor, option of treatment will be giving prophylactic iron folic acid if child 6 months or older(14). According to this guideline children receiving treatment for anemia are monitored regularly to assess their response to treatment and ensure compliance with medication. Follow-up visits are scheduled to track progress and adjust treatment as necessary(15).

In Hospital, the diagnosis and treatment strategies are different. The diagnosis method is by measuring the hemoglobin level of the child. The treatment options are based on the level of the hemoglobin. The underline causes also assessed and treated in the hospital level.

The current guideline for the diagnosis and treatment of anemia among under-five children in general hospitals of Ethiopia is based on the World Health Organization's recommendations and includes Screening for anemia using a hemoglobin test for all children under five years old during routine health check-ups and Confirmation of anemia through laboratory testing, including complete blood count (CBC) and peripheral blood smear examination to determine the underlying cause of anemia. According to this guideline, Anemia is classified based on hemoglobin levels as mild (Hb 10-10.9 g/dL), moderate (Hb 7-9.9 g/dL), or severe (Hb <7 g/dL). Treatment plans are Iron supplementation, Nutritional counseling and Management of underlying causes. Regular monitoring of hemoglobin levels to assess response to treatment and compliance with iron supplementation also included in this guideline(16).

1.2. Statement of problem

Globally, anemia is a public health issue that has negative effects on social and economic development, human health, and both in countries that are developing and developed. Moreover, it is linked to higher rates of morbidity and mortality. Anemia is a condition that affects people of all ages, although it is more common in children under five from families with low incomes because of iron deficiency brought on by the high demand for iron during an age of rapid growth.

In 2019, global anemia prevalence was 39.8% in children aged 6-59 months, equivalent to 269 million children with anemia. The prevalence of anemia in children under five was highest in the African Region, 60.2%. In Ethiopia the prevalence of anemia among 6-59 months was 52.1%. Since 2000, the global prevalence of anemia in children under five has slowly decreased over the years, from 48.0% to 39.8%. But, the prevalence from 2010, it has been stagnant(4).

The Ethiopia Demographic and health survey reports 57% of children age 6-59 months suffered from some degree of anemia (hemoglobin levels below 11 g/dl). 25% of children are classified with mild anemia, 29% with moderate anemia, and 3% with severe anemia(3). The 2019 Mini-EDHS has no any data about the prevalence of anemia among under-five children.

There is evidence to suggest that the prevalence of anemia in children under five varies across different regions within countries, highlighting the importance of understanding local contextual factors in addressing this public health concern. Additionally, recent research studies have highlighted the persistently high prevalence of anemia among under-five children in specific regions or communities. Several studies have reported a high prevalence of anemia among children under the age of five in both developing and developed countries(17). Many factors contribute to the prevalence of anemia in this vulnerable population. These factors include inadequate iron intake and absorption, poor dietary diversity, infections, such as malaria(18) and hookworm infestations, and socioeconomic factors like poverty and lack of access to healthcare(19). This condition is associated with various negative health outcomes, including impaired cognitive development, decreased physical growth, increased susceptibility to infections, and increased mortality rates(5).

There is a significant gap in the assessment of anemia and associated factors among under five children in the study area of wolkite town, gurage zone. This gap exists due to several reasons, including limited access to healthcare services, lack of awareness about the importance of regular check-ups, and inadequate resources for conducting comprehensive assessments.

One of the main factors contributing to this gap is the limited access to healthcare services in rural areas of Ethiopia. Many families living in remote areas do not have easy access to healthcare facilities, making it difficult for them to seek medical attention for their children. As a result, many cases of anemia among under-five children go undiagnosed and untreated.

Additionally, there is a lack of awareness about the importance of regular check-ups and screenings for anemia among parents and caregivers. Many families may not realize the significance of monitoring their children's hemoglobin levels and may not seek medical help until the child's condition becomes severe.

Furthermore, there are inadequate resources for conducting comprehensive assessments for anemia among under-five children in Ethiopia. This includes a shortage of trained healthcare professionals, limited access to diagnostic tools such as blood tests, and insufficient funding for public health programs aimed at addressing anemia in young children.

To address this gap, it is essential to assess the prevalence of anemia and its associated factors in the rural area of Ethiopia and improve access to healthcare services in rural areas, raise awareness about the importance of regular check-ups for anemia, and allocate more resources towards comprehensive assessments and treatment programs for under-five children.

1.3. Justification of the study

Anemia is a significant public health concern, particularly among children under the age of five. It has been found that a significant proportion of children in developing countries are affected by anemia, with prevalence rates ranging from 24% to as high as 69%(4). The prevalence of anemia among children under five in Ethiopia is alarmingly high, with an estimated 57% of this population affected by the condition(3). This has significant implications for child mortality and morbidity rates in the country. Understanding the factors associated with anemia among this vulnerable population is crucial for developing effective interventions and policies to address this public health issue.

In conclusion, conducting a study on anemia and its associated factors among children under five in wolkite health center and Wolkite University specialized and Referral hospital in Ethiopia was essential for assessing the prevalence and the risk factors for anemia. It also helps in evaluating the effectiveness of current interventions and identifying areas for improvement and to inform evidence-based interventions that can effectively reduce the burden of this condition on child health and well-being by identifying high-risk groups and it helps in tracking changes over time and evaluating the impact of interventions. It provides evidence to support decision-making and resource allocation. Such research has the potential to contribute significantly to improving child survival rates and overall public health outcomes in Ethiopia.

1.4. Significance of the study

Anemia can have serious long-term consequences for children, including impaired cognitive development, decreased physical growth, and increased susceptibility to infections. Even if there are national and regional research regarding the risk factors and prevalence of anemia in Ethiopian children under-five children in particular settings, as far as we are aware, no previous research has been conducted in the wolkite town, central Ethiopia region. Wolkite city is a malaria prevalent city (20, 21).

By identifying the factors associated with anemia in this population, the study can help inform targeted interventions to prevent and treat anemia in young children. Additionally, the findings of the study can contribute to the existing body of knowledge on anemia in Ethiopia and provide valuable insights for policymakers and healthcare providers. This can help guide resource allocation and program planning to address anemia in under five children more effectively.

The study also has important role for pediatrics nurses to identify children at risk early and provide appropriate interventions to prevent further complications and it is essential for promoting the health and well-being of young children and reducing the burden of this preventable condition on the healthcare system.

Overall, the aim of this study was in its potential to improve the health and well-being of young children in Ethiopia by addressing a prevalent and potentially harmful condition.

2. LITERATURE REVIEW

2.1. Prevalence of anemia

Anemia is a significant public health problem, particularly among children under the age of five. Multiple studies have highlighted the high prevalence of anemia in this age group.

A WHO report in 2021 shows that the global anemia prevalence was 39.8% in children aged 6-59 months, equivalent to 269 million children with anemia(4). A systematic review and meta-analysis study showed that the global pooled prevalence of iron deficiency anemia among under-five children was 16.42%(22).

A Demographic and Health Surveys of South and Southeast Asian countries (Bangladesh, Cambodia, India, Maldives, Myanmar, and Nepal) conducted between 2011 and 2016 showed that the overall weighted prevalence of anemia among children in this study was 57.3% ranging from 50.8% in the Maldives to 59% in Myanmar. The higher prevalence of mild anemia was 31.8% in Myanmar and the higher prevalence of moderate anemia was 28.4%, while the prevalence of severe anemia was less than 1% in most of the countries except India with the prevalence of 1.5%(19). A facility based cross sectional study conducted in China found that the total 24.4% children were anemic, of which 18.1% had mild anemia and 6.3% had moderate and severe anemia. Anemia was prevalent among children from rural areas (32.8%) than urban areas (21.3%), but no statistically significant difference was observed between male and female (24.5% vs. 24.2%)(23).

Another study conducted in Indonesia showed a prevalence of anemia among under-five-year-old children was 76.1%. 44.7% and 28.6% had moderate and mild anemia, respectively(17). According to WHO report published in 2021, the prevalence of anemia in children under five was highest in the African Region, 60.2%(4). In the 32 sub-Saharan African countries most recent Demographic and Health Survey (DHS) data showed the overall prevalence of anemia among children aged 6–59 months was 64.1%. Of which, 26.2% were mildly anemic, 34.9% moderately anemic and 3% severely anemic(24). A community-based cross-sectional study conducted in northern Tanzania showed that the prevalence of anemia was 37.9%(25). Another cross-sectional household-based study conducted in Cape Verde, West Africa among under-five showed the prevalence of anemia was 51.8%(26).

The report of WHO showed that the prevalence of anemia among 6-59 months was 52.1% in Ethiopia on 2019(4). The Ethiopia Demographic and health survey also reported 57% of children age 6-59 months suffered from some degree of anemia (hemoglobin levels below 11 g/dl) in Ethiopia. 25% of children are classified with mild anemia, 29% with moderate anemia, and 3% with severe anemia. Between 2005 and 2016, the prevalence of anemia among Ethiopian children shows improvement from 54% to 44% from 2005 to 2011, but increased to 57% in 2016. The Somali Region has the highest level of childhood anemia (83%), followed by Afar (75%) and Dire Dawa (72%); the Amara Region has the lowest anemia prevalence among children (42%)(3). A facility-based cross-sectional study conducted among 6 to 59 months aged children visited health institutions in Kombolcha town showed that the proportion of anemia was 52.2%(11). Hospital-based cross-sectional study conducted at Debre Markos referral hospital Northwest Ethiopia among under-five children showed that the prevalence of anemia was 11.9%(27).

A community-based cross-sectional study done in Debre Berhan Town, North Shewa, Ethiopia, showed the overall prevalence of anemia was 47.5%, of which 18.3% were mildly anemic, 25% were moderately anemic, and 4.1% were severely anemic(28). A cross-sectional health facility based study conducted among 404 children aged 6 to 59 months in attending at Guguftu health center, South Wollo, Northeast Ethiopia showed that the overall prevalence of anemia was 41.1%. Of the anemic under five children, 67.5% had mild anemia, 31.3% had moderate anemia, and 1.2% had severe anemia(2). Another community-based cross-sectional study conducted in southern Ethiopia showed that the prevalence of iron deficiency anemia was 25%, and the total anemia prevalence was 32%(5). Institution based cross sectional study conducted at Shanan Gibe Hospital in Ethiopia showed that current prevalence of anemia was 48.9%. Of this anemia, 25.0% mild, 15.8% moderate and 8.2% were severely anemic(6). Other community-based cross-sectional study conducted in Bale zone showed that the prevalence of anemia was 47.9 % (29).

A hospital-based quantitative cross-sectional study conducted at Bule Hora General Hospital, Southern Ethiopia showed that the overall prevalence of anemia among under-five children was 13.2%. Among anemic children under-five years of age, 12% had mild anemia, 32% had moderate anemia and 56% had severe anemia(7).

2.2. Factors associated with anemia

2.2.1. Socio-demographic factors

A meta-analysis done globally showed that being a male child, age less than 2 years, and living in a large family size has association with Iron deficiency anemia(22).

A study conducted in China found that anemia was prevalent among children from rural areas (32.8%) than urban areas (21.3%). Children in the 6–12 months age group were more anemic than children in other groups. In addition, those children in lower family income group were at higher risk of anemia compared with children in higher family income group. Moreover, the higher the education level of children’s parents, the lower the prevalence of children anemia(23). The study conducted in Indonesia showed that the child aged 12–24 months was significantly associated with anemia(17).

The study done in the 32 sub-Saharan African countries most recent Demographic and Health Survey (DHS) data showed that poor maternal education, lower household wealth status, large family size, being male child and multiple births were significantly associated with increased of higher levels of anemia(24). A study conducted in northern Tanzania showed that Anemia was significantly higher among children aged 6-23 months (48.3%) compared to those aged 24-59 months (28.5%). Children aged 6-23 months had over two times higher prevalence compared to those aged 24-59 months(25). The cross-sectional household-based study conducted in Cape Verde, West Africa among under-five showed that Children who resided within poor household conditions and were below 24 months of age were at high risk of anemia(26).

A facility-based cross-sectional study conducted among 6 to 59 months aged children visited health institutions in Kombolcha town showed that Children in the age group of 6–23 months more likely to have anemia. Children from mothers of at least 30 years old were less likely to be anemic as compared to children from younger mothers. Children from households with a family monthly income of < 1,500 ETB were 17 times more likely to have anemia as compared to those who had a family income of > 4,500 ETB(11). The study conducted in Gugufu health center, South Wollo, Ethiopia showed that children who were in the age group of 6-11 and 12-23 months, living in an urban, with no formal education mothers and primary education mothers,

with a family monthly income of <750 ETB and 750-1500 ETB, with early (<6 months)(2). A study conducted at Shanan Gibe Hospital in Ethiopia showed being rural resident, family low income and family size greater than five were factors significantly associated with anemia among under five children(6).

2.2.2. Feeding related factors

A meta-analysis done globally showed that children who do not drink iron fortified milk were at risk of having iron deficiency anemia in under-5 children(22).

The study conducted in China found that Children with only breastfeeding were more likely to have anemia(23).

Study done in Debre Berhan Town, North Shewa, Ethiopia, showed that household food insecurity, unmet minimum dietary diversity, stunting, and underweight were factors that are significantly related with anemia(28). The study conducted in Gugufu health center, South Wollo, Ethiopia showed that children with early (<6 months) introduction of complementary foods and Underweight were more likely to become anemic(2). A study conducted on children visited health institutions in Kombolcha town showed that Children who exclusively breastfed up to six months were less likely to be anemic compared to children who were not exclusively breastfed. Children having low dietary diversity scores were more likely to have anemia than those having adequate dietary diversity scores(11).

2.2.3. Birth related factors

A study conducted in China found that the prevalence of anemia was higher in cesarean delivered children, premature birth and neonatal asphyxia(23).

2.2.4. Health care and Disease characteristics

A meta-analysis done globally showed that Children born from anemic mother and low birth weight were associated factors of iron deficiency in under-5 children(22).

Based on the Demographic and Health Surveys of South and Southeast Asian countries, mothers with anemia, history of fever in the last two weeks and stunting had significance association with childhood anemia(19). The study conducted in Indonesia showed that the child not

receiving routine immunization and maternal anemia were significantly associated with anemia(17).

A 32 sub-Saharan African countries most recent Demographic and Health Survey (DHS) data showed that having fever in the last two weeks, having diarrhea in the last two weeks, higher-order birth, maternal anemia, underweight, wasted, and stunted were significantly associated with increased of higher levels of anemia(24). The study conducted in Cape Verde, West Africa among under-five showed that Children who recently experienced diarrhea were at high risk of anemia(26).

A study conducted among 6 to 59 months aged children visited health institutions in Kombolcha town showed that Children who have a history of diarrhea in the past 2 months before the data collection were nearly 2 times more likely to be anemic than children who do not have a history of diarrhea(11). A study conducted at Shanan Gibe Hospital in Ethiopia showed that intestinal parasite infections such as *Enteameoba histolytica*, Hookworm, and *Trichuris trichuria* were factors significantly associated with anemia among under -five children(6). A study conducted at west Guji zone, Southern Ethiopia showed that anemia was significantly associated with recent intestinal protozoan infection, malaria infection and soil-transmitted helminths infection(7).

Though, there are national and regional data on the prevalence of anemia and its risk factors among children under five years of age in different settings in Ethiopia, there is no previous study undertaken in the study area of wolkite town. Since the prevalence of malaria and other factors are high in this area there is a need to conduct this study in order to assess the prevalence of anemia and its associated factors among children from 6–59 months of age in Wolkite health center and Wolkite University Referral and specialized Hospital in Wolkite town, Central Ethiopia.

2.3. Conceptual Framework

Conceptual framework for this study was developed from different literature review for assessing anemia and its associated factors among under-five children (2, 6, 17, 19, 23-25). Socio-demographic (age, sex, educational level, monthly income, family size, residence), Health care (Immunization, history of recent blood transfusion reaction, surgical procedure), Disease

characteristics (chronic disease, history of Malaria, history of Diarrhea, underweight, maternal anemia, history of Intestinal parasite), Nutritional related factors (Dietary diversity, breast feeding, complementary feeding) and Birth related factors (Mode of delivery, birth outcome, birth asphyxia) are the independent variables related to the outcome variables. The direction of this relationship between outcome variable (Anemia) and associated variables are illustrated below.

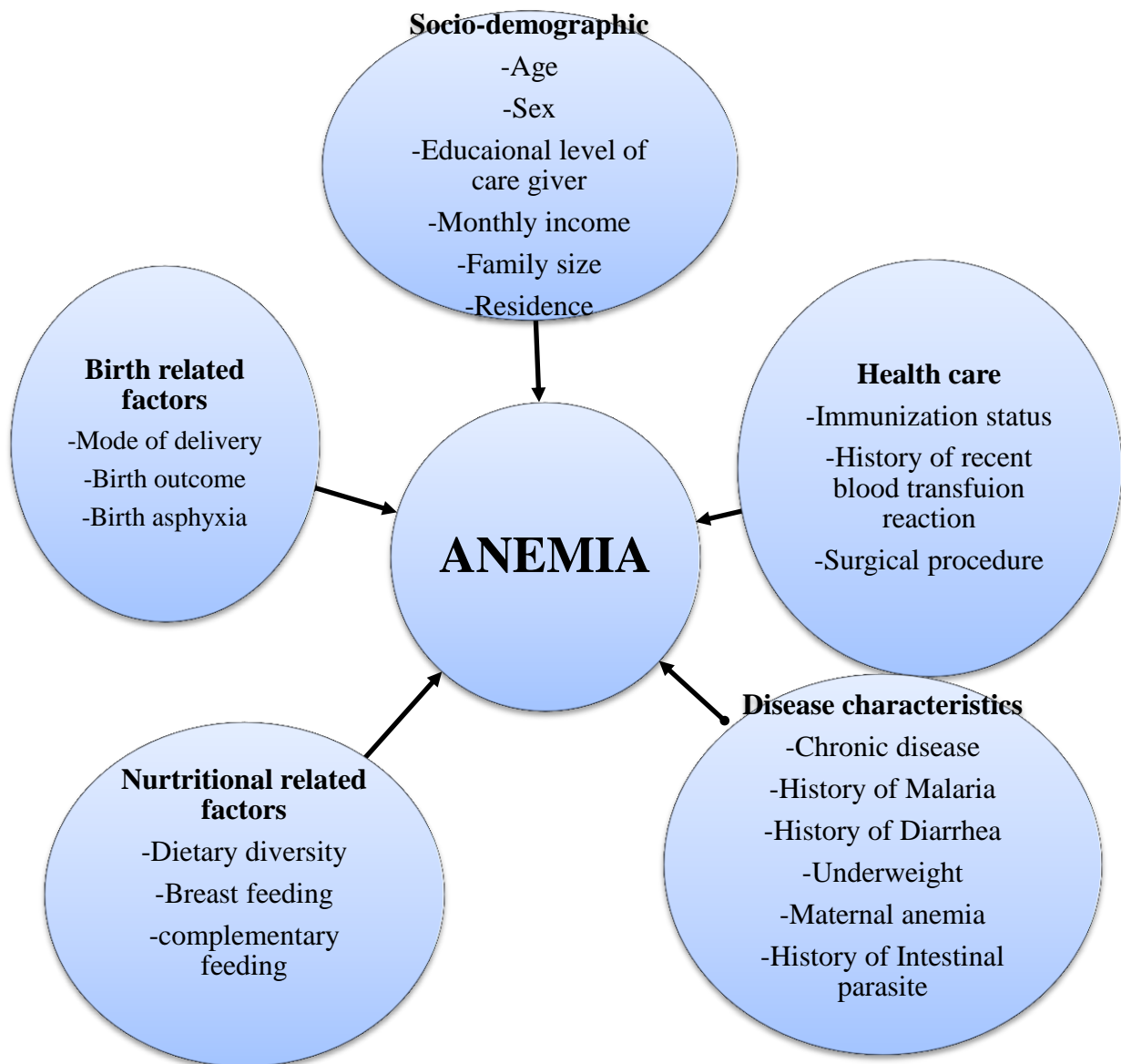


Figure 1: conceptual framework for assessing anemia and its associated factors among under-five children developed from different literature review

3. OBJECTIVES

3.1. General Objective

To assess anemia and its associated factors among under-five children in Wolkite health center and Wolkite University Referral and Specialized Hospital in Wolkite town, Central Ethiopia, 2024 G.C

3.2. Specific objectives

To assess anemia among under-five children in Wolkite health center and Wolkite University Referral and Specialized Hospital in Wolkite town, Central Ethiopia on March 2024 G.C.

To identify significant factors associated with of anemia among under-five children in Wolkite health center and Wolkite University Referral and Specialized Hospital in Wolkite town, Central Ethiopia on March 2024 G.C.

4. METHODS AND MATERIALS

4.1. Study area

The study was conducted in Wolkite town located in Central Ethiopia Regional State, Gurage zone at a distance of 159 km from the capital Addis Ababa to the southwest. Wolkite is the capital city of Gurage Zone that has an average annual temperature of 18.6 °C and an average rainfall of 1244 mm. The town has an elevation between 1910 and 1935 meters above sea level. Based on the 2007 Census conducted by the Central Statistical Agency of Ethiopia, Wolkite town has a total population of 28,856 of whom 15,068 were males and 13,788 females (30). There are three governmental health facilities in the town; which is one specialized hospital and two health centers. Wolkite health center is located in Bekur sub city and offers health care services for the population that reside in Wolkite town and neighboring woredas such as Kebena, Abeshge and others. Wolkite University specialized and Referral Hospital is located in Gubre sub city at the distance of 172 km. The hospital is also a teaching hospital for Wolkite University medical and nursing students. It established on 2019 G.C and it gives different medical, surgical, Maternal and child health and also pediatric health services.

4.2. Study period

The study was conducted from March 1 up to 30/ 2024 GC.

4.3. Study design

Health institution based quantitative cross sectional study design was employed.

4.4. Population

4.4.1. Source Population

All children aged between 6 months and 59 months who attended Wolkite Health center and Wolkite University Specialized and Referral Hospital.

4.4.2. Study population

Selected children aged between 6 months and 59 months who attended Wolkite Health center and Wolkite University Specialized and Referral Hospital during the data collection period.

4.4.3. Study unit

Selected children aged between 6 months and 59 months who attended Wolkite Health center and Wolkite University Specialized and Referral Hospital during the data collection period and fulfilled the selection criteria.

4.5. Study variables

4.5.1. Dependent Variables

Anemia among under-five children

4.5.2. Independent Variables

Socio-demographic variables

- ✓ Age
- ✓ Sex
- ✓ Educational status
- ✓ Number of children in the house
- ✓ Residence
- ✓ Monthly income

Birth related variables

- ✓ Mood of delivery
- ✓ Birth outcome
- ✓ Neonatal asphyxia

Health care related variables

- ✓ Immunization history
- ✓ History of recent blood transfusion reaction
- ✓ Surgical procedure

Nutritional related variables

- ✓ Dietary diversity

- ✓ Breast feeding
- ✓ Complimentary feeding

Disease status

- ✓ Maternal anemia
- ✓ Diarrhea
- ✓ Intestinal parasite
- ✓ Chronic infection
- ✓ Malaria infection
- ✓ Underweight

4.6. Inclusion and exclusion criteria

4.6.1. Inclusion criteria

- All children aged between 6 months and 59 months
- Children who attended Wolkite Health center and Wolkite University specialized and Referral Hospital on the study period.

4.6.2. Exclusion criteria

- who took iron supplements in the past 3 months
- Blood transfusion in the past 3 months

4.7. Sample size determination

The sample size was determined by using single population proportion formula with 95% confidence interval, margin of error is 5% and, prevalence from a research conducted in Kombollcha, 52.2% is taken(11).

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

Where n= the desired sample size

Z= standard normal score (95%)

d= margin of error (degree of accuracy) (5%)

P= prevalence (0.522)

$Z_{\alpha/2} = 1.96$, $1-p = 1 - 0.522 = 0.478$

$$n = (1.96) (1.96) (0.522) (0.478) / (0.05)^2 \approx 383$$

Then, a 10% non-response rate was added considering the response rate of a previous study; thus, the final sample size was 421.

The sample size for each health facilities were determined by proportion allocation formula as follow:-

$$n_j = \frac{n}{N} N_j$$

Where:

n_j = the required sample size from each health facilities

N_j = total number of children aged 6-59 months for each health facilities

N = total number of children aged 6-59 months for both wolkite health center and Wolkite university Referral and specialized Hospital.

n = the total sample size

$$n_{whc} = \frac{421}{5090} 1640 = 135.6 \approx 136, n_{whc} \text{ (Wolkite health center)}$$

$$n_{wrh} = \frac{421}{5090} 3450 = 285.3 \approx 285, n_{wrh} \text{ (Wolkite university Referral and specialized Hospital)}$$

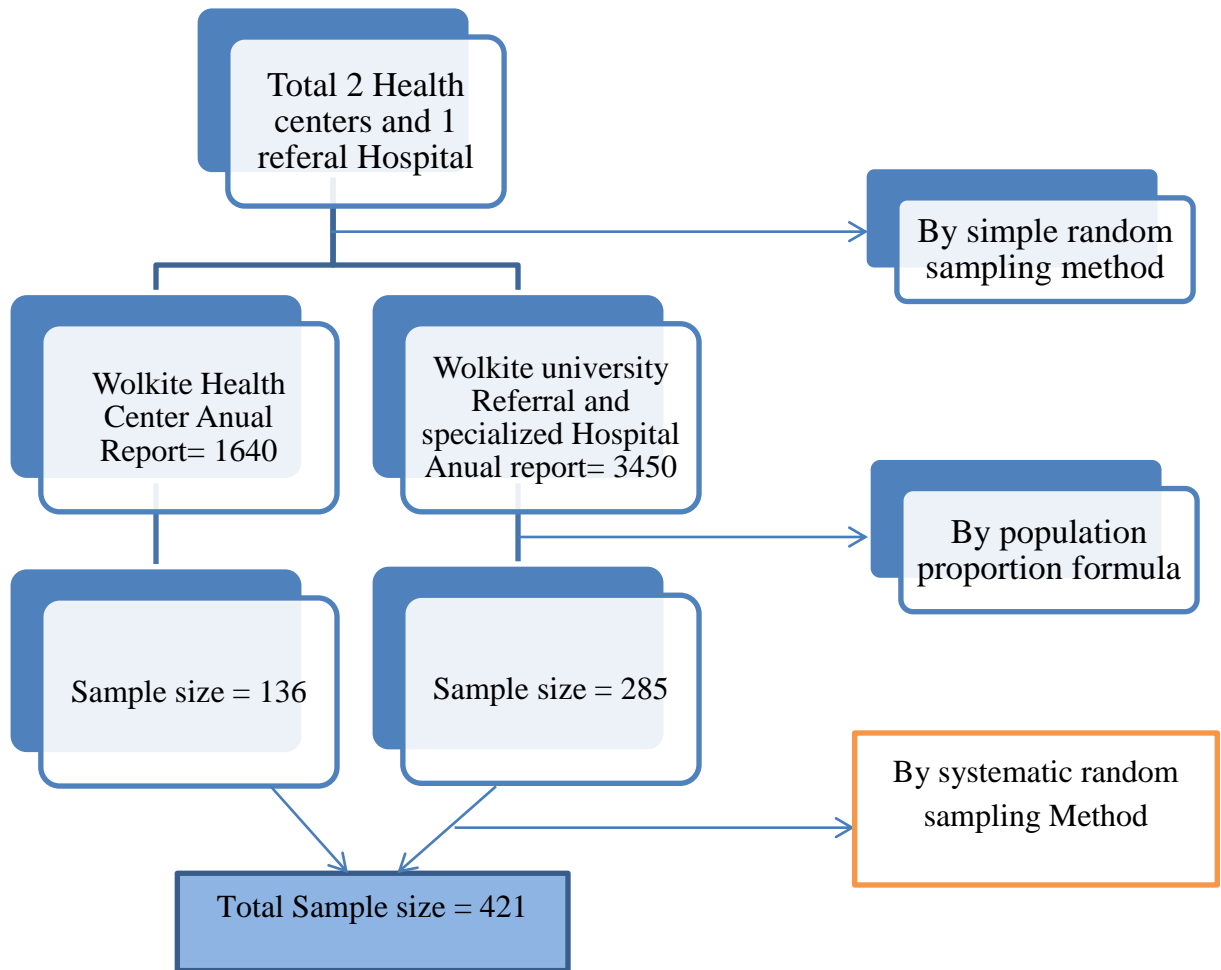


Figure 2: population proportion allocation for assessing anemia and its associated factors among under-five children in Wolkite Health Center and Wolkite University Referral and Specialized Hospital in Wolkite town on March 2024G.C

4.8. Sampling techniques

The study subjects were selected using a systematic sampling method. The first child was selected by simple random sampling (lottery method) and then every 12 children were selected based on the order of their visit.

$$k = \frac{N}{n} = \frac{5090}{421} = 12.09 \approx 12$$

4.9. Data collection tool and procedure

The data was collected using a structured interviewer administered questionnaire adapted from previous literature(7), WHO guideline for measuring of dietary diversity and meal frequency(31) and Food and Nutrition Technical Assistance guideline for assessment of household food insecurity(32). The questionnaire was prepared in English and translated in to Amharic language, and then returned to English to ensure its consistency. The data were collected by a trained nurse and a principal investigator. Thus, Socio demographic and possible associated risk factors of anemia were collected by pre-tested Amharic version questionnaire using face to face interview with parents/ guardians based on an interviewer-administered structured questionnaire. At each data collection spot, sufficient explanation about the aim of the research was given to the parents or study participants before conducting the interview. To prevent double sampling of the participants that referred to Hospital, putting marker on their middle finger was used.

Blood sample collection

Blood Sample was collected strictly following the standard operating procedure (SOPs), a 3 mL venous blood sample was collected. Two Experienced laboratory technicians were collect the samples in tubes containing ethylenediaminetetraacetic acid (EDTA). Materials used to collect the blood samples were syringes with needle and Blood collection tubes containing EDTA. The procedure was strictly follow aseptic techniques.

Anthropometric Measurement

Anthropometric assessment (Height-for-Age, Weight for- Height, and Weight-for-Age) was done using the WHO guideline(33).Each of the three measurements was expressed in standard deviation (SD) units of Z-score from the median of WHO-2006, standard population.

4.10. Operational Definitions

Anemic: - <11 grams/deciliter(3).

Not anemic: - 11 or higher grams/deciliter(3).

Low income: - family monthly income less than 750 birr (ETB)(2).

Moderate income: - family monthly income from 750–1500 ETB(2).

High income: - family monthly income greater than 1500 ETB(2).

Minimum dietary diversity: - children 6–23 months of age who consumed foods and beverages from at least five out of eight defined food groups during the previous day For children 23- 59 months of age who consumed foods and beverages from at least five out of seven defined food groups during the previous day by excluding the breast milk group(31).

The eight food groups used for tabulation of this indicator are one breast milk; two Grains, roots, tubers and plantains; three pulses (beans, peas, lentils), nuts and seeds; four dairy products (milk, infant formula, yogurt, cheese); five flesh foods (meat, fish, poultry, organ meats); six eggs; seven vitamin-A rich fruits and vegetables; and eight other fruits and vegetables(31).

Adequate dietary diversity: - who fulfill the minimum dietary diversity criteria

Inadequate dietary diversity: - less than the minimum dietary diversity criteria

Minimum meal frequency:-children 6–23 months of age who consumed solid, semi-solid or soft foods (but also including milk feeds for non-breastfed children) at least the minimum number of times during the previous day(31).

The minimum number of times is defined as:

- Two feedings of solid, semi-solid or soft foods for breastfed infants aged 6–8 months;
- Three feedings of solid, semi-solid or soft foods for breastfed children aged 9–23 months; and
- Four feedings of solid, semi-solid or soft foods or milk feeds for non-breastfed children aged 6–23 months where by at least one of the four feeds must be a solid, semi-solid or soft feed(31).

Adequate meal frequency: - who fulfill the minimum meal frequency criteria

Inadequate meal frequency: - less than the minimum meal frequency criteria

Household food insecurity assessment: - Food and Nutrition Technical Assistance prepare questionnaire contain nine questions for the assessment of household food insecurity(32) (See table 1).

Table 1:- Household food insecurity assessment tool to assess food insecurity among under five children

Q 1	In the past four weeks, did you worry that your household would not have enough food? (Food insecurity)	0= no 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)
Q 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?	
Q 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?	
Q 4	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of foods?	
Q 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?	
Q 6	In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	
Q 7	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	
Q 8	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	
Q 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?	

Food secure: - If ((Q1=0 or Q1=1) and Q2=0 and Q3=0 and Q4=0 and Q5=0 and Q6=0 and Q7=0 and Q8=0 and Q9=0)

Mildly food insecurity: - If [(Q1=2 or Q1=3 or Q2=1 or Q2=2 or Q2=3 or Q3=1 or Q4=1) and Q5=0 and Q6=0 and Q7=0 and Q8=0 and Q9=0)

Moderately food insecurity: - If [(Q3=2 or Q3=3 or Q4=2 or Q4=3 or Q5=1 or Q5=2 or Q6=1 or Q6=2) and Q7=0 and Q8=0 and Q9=0)

Sever food insecurity: - If [Q5=3 or Q6=3 or Q7=1 or Q7=2 or Q7=3 or Q8=1 or Q8=2 or Q8=3 or Q9a=1 or Q9=2 or Q9=3)

Stunted: - Children whose height-for-age Z-score <-2 SD from the median of the reference population

Wasted: - children whose weight-for-height z-score <-2 SD from the median of the reference population

Underweight: - children whose weight-for-age Z-score <-2 SD from the median of the reference population

Recent Infection: - Children diagnosed with helminthic, intestinal protozoa and malaria with in the last two weeks.

4.11. Data Analysis and Presentation

After collecting data from fieldwork, the data was entered by using Epi-data version 4.6. Data cleaning was performed to check for completeness, accuracy, and missed values, and any errors identified were corrected manually by the investigators. Then, the data was exported to Statistical Package for Social Sciences (SPSS) version 25 software for analysis. Descriptive statistics (mean, frequency) were carried out to describe the sociodemographic status of the participants presented by table, pie chart and graph. A binary logistic regression model was used to identify factors associated with anemia. Variables with a P value ≤ 0.25 in the bivariate analysis was considered candidates for the multivariate analysis. Multivariate logistic regression was performed to control for possible confounding and identify the true effect of the selected predictor variables. The extant association between the different variables related to anemia were measured using AOR at 95% CI. A P value ≤ 0.05 were considered statistically significant.

4.12. Data Quality Assurance

Pretest

Pretest of the questionnaire was carried out five days before the actual study to test the quality and effectiveness of the questionnaire on Gubre health center that available during the data collection. The numbers of participant was 5% of our study participants.

4.12.1. Quality control

All questionnaires were checked daily for completeness, accuracy, clarity and consistency by principal investigators, and necessary corrections and changes were made on the field. Identified irregularities were corrected before the final data collection and training was given for data collectors on data collection method and about the components of the questionnaire.

4.13. Ethical Consideration

Ethical clearance was obtained from the Ethical Committee of Addis Ababa University College of Health science, School of Nursing and Midwifery, Department of Nursing. Participants were informed about the objective of the study and they were assured. The confidentiality of the data were maintained. Informed consent were obtained from all participants prior to data collection. Unique ID number were given for each participant and the data were used for this research only. Children who had anemia were linked to the health center and hospital OPDs for treatment.

4.14. Dissemination of results

The final report of the study will be presented and submitted to Addis Ababa University College of Health science, School of Nursing and Midwifery, Department of Nursing and wolkite health center, Wolkite university Referral and specialized Hospital and health bureau of Gurage zone. Finally the manuscript will be submitted to journals for possible publication.

5. RESULTS

5.1. Socio-demographic characteristics

In this study 421 under five children were participated. The participants' ages ranged from 6 to 59 months, with a mean (SD) age of 30.21(\pm 15.294) months. Among 421 children under the age of five, 213(50.6%) were female, and the majorities 196(46.6%) of children's mothers/caregivers were house wives. 321(76.2%) had male household head, 366(86.9%) were married and 361(85.7%) of caregivers were female. More than half, 238(56.5%) were from urban areas. Approximately, 112(26.6%) of child caregivers were college and above. Out of 421 children under the age of five, approximately 190(45.1%) were Muslims. 175 (41.6%) were living in a household with four family members, and the majority of households, 360(85.5%) had incomes greater than 1500 Ethiopian birr (see Table 2).

Table 2: socio-demographic characteristics of under-five children in assessment of anemia and associated factors among under five children in Wolkite Health Center and Wolkite University Referral and specialized Hospital in Wolkite town (n= 421)

Variables	Category	Frequency	Percent
Age	6-11 months	65	15.4
	12-23 months	84	20.0
	24-35 months	119	28.3
	36-47 months	81	19.2
	48-59 months	72	17.1
Sex of child	Male	208	49.4
	Female	213	50.6
Religion of caregiver	Orthodox	178	42.3
	Muslim	190	45.1
	Protestant	48	11.4
	Catholic	5	1.2
Sex of caregiver	Male	60	14.3
	Female	361	85.7
Marital status of caregiver	Married	366	86.9
	Divorced	33	7.8
	Widowed	7	1.7
	Single	13	3.1
	Other	2	0.5

Variables	Category	Frequency	Percent
Educational level of caregiver	Unable to read and write	50	11.9
	Able to read and write	106	25.2
	Grade 1-8	53	12.6
	Grade 9-12	100	23.8
	College and above	112	26.6
Occupation of caregiver	House wife	196	46.6
	Merchant	79	18.8
	Farmer	14	3.3
	Private Employee	65	15.4
	Government employee	67	15.9
Sex of household head	Male	321	76.2
	Female	100	23.8
Family size	Two	17	4.0
	Three	110	26.1
	Four	175	41.6
	Five and above	119	28.3
Place of Residence	Urban	238	56.5
	Rural	183	43.5
Monthly income	<750 ETB	9	2.1
	750-1500 ETB	52	12.4
	>1500 ETB	360	85.5

5.2. Feeding-Related Factors

Among 421 under five children, 311(73.9%) had Adequate dietary diversity practice, 266(63.2%) introduction of complementary food less than or at 6 months, 243(57.7%) mothers/caregivers have nutritional information, 315(74.6%) had used animal products, 150(35.6%) face mild food insecurity with in four weeks, 392(93.1%) had adequate meal frequency per day of their age, While majority 184(43.7%) breastfeeding practice continued at 6–12 months (see Table 3).

Table 3: Feeding related factors of under-five children in assessment of anemia and associated factors among under five children in Wolkite Health Center and Wolkite University Referral and specialized Hospital in Wolkite town(n=421)

Variables	Category	Frequency	Percent
Introduction of complimentary food	<6 or = 6 months	266	63.2
	>6 months	155	36.8
Duration of Breastfeeding	<6 months	41	9.7
	6-12 months	184	43.7
	1-2 years	97	23.0
	Above 2 years	99	23.5
Nutritional Information	Yes	243	57.7
	No	178	42.3
Animal product use	Yes	315	74.8
	No	106	25.2
Dietary diversity	Inadequate DD	110	26.1
	Adequate DD	311	73.9
Household food insecurity	Food secure	122	29.0
	Mild food insecurity	150	35.6
	Moderate food insecurity	139	33.0
	Severe food insecurity	10	2.4
Meal frequency	Inadequate MF	29	6.9
	Adequate MF	392	93.1

5.3. Birth and health care related factors

Of the 421 under five children, 315(74.8%) were delivered by SVD, 233(55.3%) had no history of maternal anemia, majority of the children, 364(86.5%) had no history of birth asphyxia, and 410(97.4%) were took immunization of their age. Among 421 under five children, 43(10.2%) were underweight, 6(1.4%) were stunted and 5(1.2%) were wasted (see Table 4).

Table 4: Birth and health care related factors of under-five children in assessment of anemia and associated factors among under five children in Wolkite Health Center and Wolkite University Referral and specialized Hospital in Wolkite town(n=421)

Variables	Category	Frequency	Percent
Mood of delivery	SVD	315	74.8
	Instrumental delivery	28	6.7
	CS delivery	78	18.5
History of maternal anemia	Yes	125	29.7
	No	233	55.3
	Unknown	63	15.0
History of birth asphyxia	Yes	57	13.5
	No	364	86.5
Immunization of the age	Yes	410	97.4
	No	11	2.6
Weight for age	Underweight	43	10.2
	Normal weight	378	89.8
Height for age	Stunted	6	1.4
	No stunted	415	98.6
Weight for Height	Wasted	5	1.2
	No wasted	416	98.8

5.4. Disease Characteristics

Out of 421 under five children enrolled in the study, 402(95.5%) had no history of blood loss, 414(98.3%) had no history of surgery, and 417(99.0%) had no history of accident. 187(44.4%) had recent history of fever followed by recent history of diarrhea 164(39.0%), and 88(20.9%) had intestinal protozoa followed by malaria infection 74(17.6%), 401(95.2%) had no chronic disease and 15(3.6%) soil-transmitted helminthic infection (see Table 5).

Table 5: Disease Characteristics of under-five children in assessment of anemia and associated factors among under five children in Wolkite Health Center and Wolkite University Referral and specialized Hospital in Wolkite town(n=421)

Variables	Category	Frequency	Percent
History of recent blood loss	Yes	19	4.5
	No	402	95.5
History of recent blood transfusion reaction	Yes	0	0.0
	No	421	100.0
History of recent surgical procedure	Yes	7	1.7
	No	414	98.3
History of recent accident that cause bleeding	Yes	4	1.0
	No	417	99.0
History of recent fever	Yes	187	44.4
	No	234	55.6
History of recent protozoan infection	Yes	88	20.9
	No	333	79.1
History of recent soil-transmitted helminthic infection	Yes	15	3.6
	No	406	96.4
History of recent malaria infection	yes	74	17.6
	No	347	82.4
History of recent diarrhea	Yes	164	39.0
	No	257	61.0
History of recent epistaxis	Yes	1	0.2
	No	420	99.8
History of chronic disease	Yes	20	4.8
	No	401	95.2

5.5. Prevalence of anemia

Based on the hemoglobin cutoff value, less than 11 g/dL was categorized as anemic, and Hgb values of 10–10.9 g/dl, 7–9.9 g/dl, and less than 7 g/dL were determined to be mild, moderate and severe, respectively(4). The overall prevalence of anemia was 164(39.0%).(see Figure 3).

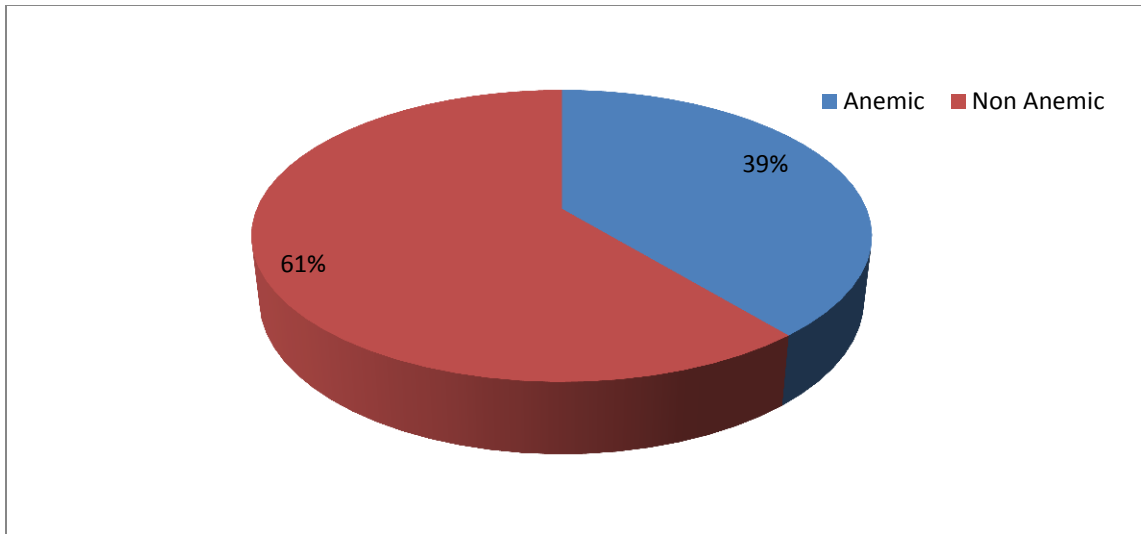


Figure 3: This figure shows the anemia among under five children attended Wolkite Health Center and Wolkite University Referral and specialized Hospital in Wolkite town.

Among anemic children under five years of age, 95(22.6%) were mild, 58(13.8%) were moderate and 11(2.6%) were severe. Anemic children scores hemoglobin values of Mild anemia=10–10.9 g/dl, Moderate anemia= 7–9.9 g/dl and severe anemia= less than 7 g/dL(4).(see Figure 4).

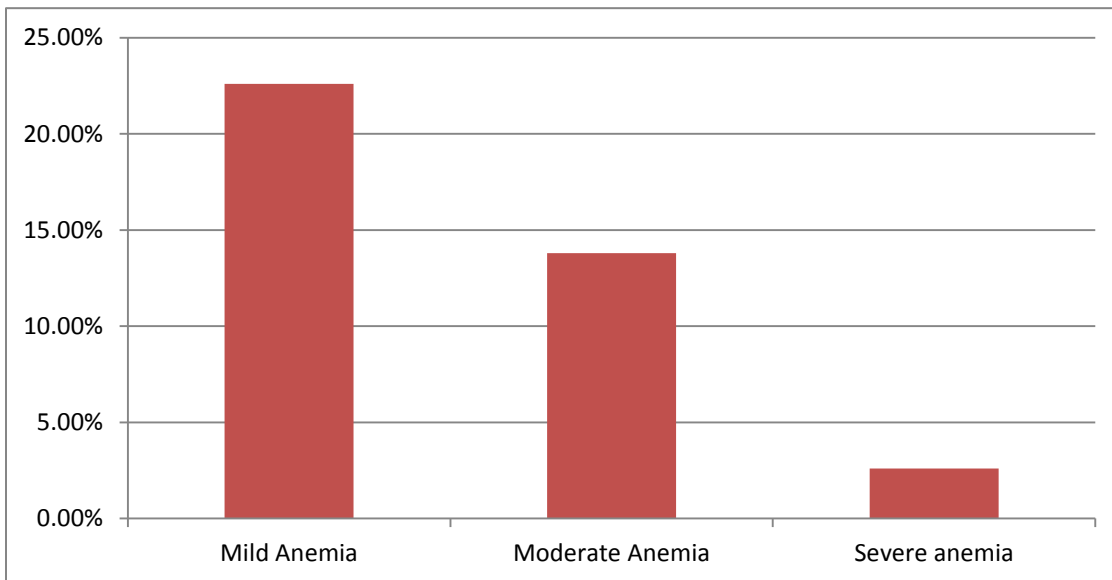


Figure 4: Anemia level among under five children attended Wolkite Health Center and Wolkite University Referral and specialized Hospital in Wolkite town.

5.6. Factor Associated with Prevalence of Anemia

In bivariate analysis, child sex, educational level of care giver, place of residence, monthly income of caregiver, dietary diversity practice, nutritional information, meal frequency, history of maternal anemia, recent history of fever, recent malaria infection, recent history of diarrhea, household food insecurity and underweight had a p value of <0.25 and were considered candidates for multivariate analysis. (see Table 6).

Table 6: Bivariate Analyses of Factors Associated with the Prevalence of Anemia in Among Under five Children Attended Wolkite Health Center and Wolkite University Referral and specialized Hospital in Wolkite town, Ethiopia

Variables	category	Anemic	Non Anemic	COR(95% CI)	P value
Sex	Male	127(61.0%)	81(39.0%)	7.458(4.751-11.707)	0.000
	Female	37(17.3%)	176(82.7%)	1	
Educational level of the caregiver	Unable to read and write	29(58%)	21(42%)	2.689(1.356-5.332)	0.032
	Able to read and write	45(42.4%)	61(57.6%)	1.437(0.830-2.487)	0.071
	Grade 1-8	18(34.0%)	35(66.0%)	1.002(0.502-1.997)	0.015
	Grade 9-12	34(34%)	66(66%)	1.003(0.568-1.773)	0.006
	College and above	38(33.9%)	74(66.1%)	1	
Place of residence	Urban	52(21.8%)	186(78.1%)	1	
	Rural	112(61.2%)	71(38.3%)	5.642(3.679-8.654)	0.003
Monthly income of caregiver	<750 ETB	7(77.7%)	2(22.2%)	6.192(1.268-30.248)	0.24
	750-1500 ETB	27(51.9%)	25(48.1%)	1.911(1.065-3.430)	0.30
	>1500 ETB	130(36.1%)	230(63.9%)	1	

Variables	Category	Anemic	Non Anemic	COR(95% CI)	P value
Nutritional information	Yes	66(27.1%)	17(72.7%)	1	
	No	98(55.0%)	80(45.0%)	3.285(2.183-4.944)	0.000
History of maternal anemia	Yes	65(52%)	60(48%)	1.118(0.610-2.050)	0.000
	No	68(29.1%)	165(70.1%)	0.425(0.241-0.751)	0.718
	Unknown	31(49.2%)	32(50.8%)	1	
History of recent fever	Yes	107(57.2%)	80(42.8%)	4.153(2.740-6.296)	0.000
	No	57(24.3%)	177(75.7%)	1	
History of recent malaria infection	Yes	51(68.9%)	23(31.1%)	4.592(2.673-7.888)	0.000
	No	133(32.5%)	234(67.5%)	1	
History of recent diarrhea	Yes	75(45.7%)	89(54.3%)	1.591(1.066-2.374)	0.23
	No	89(34.6%)	168(65.4%)	1	
Dietary diversity	Inadequate DD	64(58.2%)	46(41.8%)	2.936(1.877-4.592)	0.000
	Adequate DD	100(32.2%)	211(67.8%)	1	
Household food insecurity	Food secure	38(31.1%)	84(68.9%)	1	
	Mild food insecurity	50(33.3%)	100(66.7%)	1.105(0.662-1.844)	0.702
	Moderate food insecurity	67(48.2%)	72(51.8%)	2.057(1.238-3.417)	0.005
	Severe food insecurity	9(90%)	1(10%)	19.895(2.433-162.662)	0.005

Variables	category	Anemic	Non Anemic	COR(95% CI)	P value
Weight for age	underweight	33(76.7%)	10(23.3%)	6.222(2.973-13.022)	0.000
	Normal weight	131(34.7%)	247(65.3%)	1	
Meal frequency	Inadequate MF	19(65.5%)	10(34.5%)	3.237(1.465-7.151)	0.004
	Adequate MF	145(37%)	247(63%)	1	

In multivariate analysis, the chance of having anemia was approximately 7 times higher among children under the age of five who's sex was male (AOR= 7.252, 95% CI =4.176–12.592) than being female. Additionally, children who had lived in rural areas had 4 times more likely to have anemia (AOR=4.295, 95% CI=2.499–7.382) than lived in urban areas. Under five children with history of recent fever had 2 times higher chance to have anemia (AOR=2.183, 95% CI=1.203-3.960) than their counterparts. Similarly, the children who had recent malaria infection were 4 times more likely to have anemia (AOR=4.387, 95% CI=2.097–9.179) than those who did not have recent malaria infection. Additionally, children who had inadequate dietary diversity had 2 times more likely to have anemia (AOR= 2.218, 95% CI= 1.253-3.925) than children with adequate dietary diversity practice. Similarly, under five children with underweight had nearly 3 times higher chance to have anemia (AOR= 2.835, 95% CI= 1.151-6.982) (see Table 7).

Table 7: Multivariate Analyses of Factors Associated with the Prevalence of Anemia in Among Under five Children Attended Wolkite Health Center and Wolkite University Referral and specialized Hospital in Wolkite town, Ethiopia

Variables	Category	Anemic	Non Anemic	COR(95 % CI)	AOR(95 % CI)
Sex	Male	127(61.0%)	81(39.0%)	7.458(4.751-11.707)	7.252(4.176-12.592)***
	Female	37(17.3%)	176(82.7%)	1	1
Place of residence	Urban	52(21.8%)	186(78.1%)	1	1
	Rural	112(61.2%)	71(38.3%)	5.642(3.679-8.654)	4.295(2.499-7.382)***
Recent history of fever	Yes	107(57.2%)	80(42.8%)	4.153(2.740-6.296)	2.183(1.203-3.960)**
	No	57(24.3%)	177(75.7%)	1	1
Recent history of malaria infection	Yes	51(68.9%)	23(31.1%)	4.592(2.673-7.888)	4.387(2.097-9.179)***
	No	133(32.5%)	234(67.5%)	1	1
Dietary diversity	Inadequate DD	64(58.2%)	46(41.8%)	2.936(1.877-4.592)	2.218(1.253-3.925)**
	Adequate DD	100(32.2%)	211(67.8%)	1	1
Weight for age	Underweight	33(76.7%)	10(23.3%)	6.222(2.973-13.022)	2.835(1.151-6.982)*
	Normal weight	131(34.7%)	247(65.3%)	1	1

Note: Statistical significance at $P < 0.001 = ***$, $P < 0.01 = **$ and at $P < 0.05 = *$.

6. DISCUSSION

In this study, the overall prevalence of anemia among under-five children attending Wolkite Health Center and Wolkite University Referral and specialized Hospital in Wolkite town was 164(39.0%). According to the WHO definition, anemia can be defined as a mild, moderate and severe public health problem when the prevalence is 5–19.9%, 20–39.9% and greater than 40%, respectively. Therefore, the prevalence of anemia in this study is considered a moderate public health concern(16).

This study is in line with Global WHO report in 2021(39.8%)(4), northern Tanzania (37.9%)(25),and Gugufu, North east Ethiopia (41.1%)(2). It also less than compared to WHO report of 2021(Africa(60.2%),Ethiopia(52.1%))(4), EDHS report(57%)(3), DHS report of South and Southeast Asian countries (57.3%)(19), Indonesia (76.1%)(17), DHS report of 32 sub-Saharan African countries (64.1%)(24), in Cape Verde (51.8%)(26), Kombolcha town, Ethiopia (52.2%)(11), Shanan Gibe, Ethiopia (48.9%)(6), Debre brhan, Ethiopia(47.5%)(28), and Bale zone, Ethiopia (47.9%)(29). The reason of the difference might be due to the age and the number of participants' variation of the study. In the study done in Debre brhan, Ethiopia, the study participant age was ranging from 6-23 months. This study also greater than when compared to global systematic review and meta-analysis study (16.42%)(22), China (24.4%)(23), Debre Markos, Ethiopia (11.9%)(27), southern Ethiopia (32%)(5), and Bule Hora, Ethiopia (13.2%)(7). The difference in prevalence of anemia conducted globally and china might be due to variations in hemoglobin cutoff points, and cultural, geographical and behavioral characteristics of the community.

Multivariate analysis showed that being male was significantly associated with the prevalence of anemia among under-five children. This finding is in line with DHS report in sub-Saharan African countries (65.3%)(24) and in a Tertiary Health Care Center of Nepal(45.6%)(34). Male children typically experience faster growth rates compared to females during early childhood. This increased growth rate may require higher levels of nutrients such as iron to support the production of red blood cells, making male children more susceptible to developing anemia(35).

Similarly, under-five children lived in rural area had significant association with anemia. This result agrees with study done in china(32.8%)(23), multilevel analysis of EDHS(8), Gugufu, North east Ethiopia(49.5%)(2) and Shanan Gibe, Ethiopia(42.3%)(6). The combination of

limited access to healthcare, poor nutrition, inadequate sanitation practices, and lack of education and awareness about anemia all contribute to the higher prevalence of this condition among under-five children living in rural areas(8).

In addition, under-five children with history of fever in the last two weeks had significant association with anemia. This finding is consistent with DHS report of South and Southeast Asian countries(19), sub-Saharan African countries(24) and analysis of EDHS Of 2016(36). Fever is often a symptom of an underlying infection, such as malaria, pneumonia, or gastrointestinal infections. These infections can lead to anemia through various mechanisms, including the destruction of red blood cells, impaired production of red blood cells, or increased loss of iron(36). The other significantly associated factor for anemia was recent malaria infection. This finding agrees with a study done in bule hora, Ethiopia(40%)(7). Malaria is a leading cause of anemia in children, particularly in regions where the disease is endemic. The Plasmodium parasites that cause malaria infect red blood cells, leading to their destruction and a decrease in the overall number of healthy red blood cells(12).

The other factor which is significantly related to anemia in this study was inadequate dietary diversity practice. This result is in line with study done in Indian(69.2%)(37), Hohoe Municipality, Ghana(52.9%)(38), systematic review and meta-analysis in Ethiopia(13), Kombolcha town, Ethiopia(69.4%)(11) and in Debre brhan, Ethiopia(71%)(28). Certain nutrients are essential for the production of red blood cells and overall health, and these nutrients are often found in a diverse range of foods. Iron is a key nutrient for the production of red blood cells, and it is commonly found in foods such as meat, beans, and leafy green vegetables(39). If a child's diet lacks these iron-rich foods, they may be at risk for developing anemia. Similarly, vitamin B12 and folate are also important for red blood cell production, and deficiencies in these nutrients can contribute to anemia(12). Inadequate dietary diversity can also lead to deficiencies in other essential nutrients such as vitamin A, vitamin C, and zinc, which are important for overall health and immune function. These deficiencies can further exacerbate the risk of anemia among under-five children. When children do not have access to a variety of foods or are not consuming a balanced diet, they may not be getting enough of these essential nutrients(13).

Under-five children with underweight were significantly associated with anemia in this study. This finding is consistent with study in Egypt(6.6%)(40) Guguftu, North east

Ethiopia(50.2%)(2), in Debre brhan, Ethiopia(62.4%)(28), DHS report of South and Southeast Asian countries(19) and sub-Saharan African countries(24). Both anemia and underweight can be caused by a lack of essential nutrients in a child's diet, such as iron, vitamin B12, and folic acid. These nutrients are crucial for the production of red blood cells and overall growth and development (41). Underweight children may have difficulty absorbing nutrients from their food, leading to deficiencies that can contribute to both anemia and underweight and they are susceptible for infection(12).

7. STRENGTH AND LIMITATIONS OF THE STUDY

7.1. Strength of the study

This research tries to address different factors and identify the important part of health related to children, and identified different associated factors that predispose under five children to childhood anemia.

7.2. Limitations of the Study

This study does not differentiate the types of anemia such as Iron deficiency anemia and so on. Additionally, because of shortage of budget we can't do stool examination for the assessment of protozoan and helminthes infections.

8. CONCLUSION AND RECOMMENDATIONS

8.1. Conclusion

Childhood anemia was a moderate public health problem in the study area. Being male, rural residence, history of recent fever, recent malaria infection, inadequate dietary diversity and underweight were significantly associated with childhood anemia.

8.2. Recommendations

Addressing factors through targeted interventions and education on proper nutrition and healthcare practices can help reduce the burden of anemia among all children. Improving healthcare infrastructure, promoting nutrition education, and providing access to clean water and sanitation facilities can help reduce the burden of anemia among children in rural communities. Implementing Effective strategies for prevention such as bed net usage, diagnosis, and treatment for Malaria and other infections are also other way of preventing childhood anemia. Advising dietary diversity among young children is crucial for preventing anemia and ensuring optimal health. By encouraging the consumption of a variety of nutrient-rich foods, caregivers can help reduce the risk of anemia, preventing underweight and support the overall well-being of their children.

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ANNEX

Annex I: Information Sheet

Good morning/afternoon dear participant! My name is _____. I am working as a data collector for the study being conducted in Wolkite Town Gurage Zone to assess the prevalence of anemia and its associated factors among under-five children in Wolkite health center and Wolkite University Referral and Specialized Hospital in Wolkite town, Southern Nation Nationalities and Peoples, Ethiopia, 2024 G.C: by Betelhem Mulugeta. I kindly request you to lend me your attention to explain the study and how being you selected as the study participant.

Title of the Research Project: Anemia and its associated factors among under-five children in Wolkite health center and Wolkite University Referral and Specialized Hospital in Wolkite town, Central Ethiopia, 2024 G.C

Name of the Sponsor: Addis Ababa University

Purpose of the Research Project: To assess the prevalence of anemia and its associated factors among under-five children in Wolkite health center and Wolkite University Referral and Specialized Hospital in Wolkite town, Central Ethiopia, 2024 G.C

Procedure: For this study selected Health facilities in Wolkite Town, Gurage Zone are included. Interviewer-administered questioners are provided to participants and they will answer to questions; then, the data will be collected by the assigned data collectors.

Risk and Benefits: The study has no direct benefit/payments for those study participants but they may be indirectly beneficial if the result utilized by planners. Wolkite health center and Wolkite university Referral and specialized Hospital and also Gurage Zone Health Bureau will get the final result of the study. There is no risk due to participating in this study.

Confidentiality: No need of registering your name; therefore, the information you gave will be kept confidential. All information collected will be kept confidential. No other persons besides the research team will see it.

Right to Refusal or Withdraw: To start data collection, approval of the individual participant is required. If you are not willing to participate you can refuse.

Person to contact: If you have any further questions or would like to receive further information about the project, please contact:

Name: Betelhem Mulugeta: - Email: betelhem.mule@gmail.com (Principal Investigator)

Cell Phone: +251921740931

Thank you for taking the time to give the Information Sheet, and asking any questions that you might have had.

Q 6	What is the educational level of the care giver?	<ol style="list-style-type: none"> 1. Unable to read and write 2. Able to read and write 3. Grade 1-8 4. Grade 9-12 5. College and above 	
Q 7	What is the current occupational status of care giver relation to child?	<ol style="list-style-type: none"> 1. House wife 2. Merchant 3. Farmer 4. Private employee 5. Government employee 6. Other (specify) _____ 	
Q 8	Sex of household head?	<ol style="list-style-type: none"> 1. Male 2. Female 	
Q 9	Number of individuals in the household?	<ol style="list-style-type: none"> 1. Two 2. Three 3. Four 4. Five and above 	
Q 10	Place of residence?	<ol style="list-style-type: none"> 1. Urban 2. Rural 	
Q 11	Monthly income of care giver?	<ol style="list-style-type: none"> 1. < 750 ETB 2. 750-1500 ETB 3. > 1500 ETB 	

Part II Feeding related factor

Q 12	Do you practice dietary diversity during food preparation?	1. Yes 2. No	
Q 13	Which product use in dietary diversity?	1.Breast milk 2.Grains, roots, tubers and plantains 3.Pulses (beans, peas, lentils), nuts and seeds 4.Dairy products (milk, infant formula, yogurt, cheese) 5.Flesh foods (meat, fish, poultry, organ meats) 6.Eggs 7.vitamin-A rich fruits and vegetables 8.Other fruits and vegetables	
Q 14	When start introduction of complementary foods?	1. < or = 6 months 2. > 6 months	
Q 15	Duration of exclusive breast feeding practice?	1. < 6month 2. 6-12month 3. 1-2year 4. Above 2years	
Q 16	Do you have nutritional information?	1. Yes 2. No	
Q 17	In the past four weeks, did you worry that your household would not have enough food? (Food insecurity)	1. Yes 2. No	
Q 18	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)	
Q 19	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	1. Yes 2. No	
Q 20	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)	
Q 21	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	1. Yes 2. No	
Q 22	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)	
Q 23	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of foods?	1. Yes 2. No	
Q 24	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)	
Q 25	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	1. Yes 2. No	
Q 26	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)	
Q 27	In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	1. Yes 2. No	

Q 28	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)	
Q 29	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	1. Yes 2. No	
Q 30	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)	
Q 31	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	1. Yes 2. No	
Q 32	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)	
Q 33	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?	1. Yes 2. No	
Q 34	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)	
Q 35	A child does take animal products (meat, egg milk...?)	1. Yes 2. No	

Q 36	Meal frequency per day?	1. One times 2. Two times 3. Three times 4. Four times and above	
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Part III: Health Care and Diseases Characteristics

Q 37	Was the child took immunization of his age?	1.Yes 2.No	
Q 38	Mood of delivery	1.SVD 2.Instrumental delivery 3.CS delivery	
Q 39	History of birth asphyxia?	1.Yes 2.No	
Q 40	Recent history of acute blood loss in past 4 week?	1. Yes 2. No	
Q 41	History of recent blood transfusion reaction?	1. Yes 2. No	
Q 42	History of recent surgical procedure?	1. Yes 2. No	
Q 43	Recent history of accident that cause bleeding?	1. Yes 2. No	
Q 44	History of maternal anemia	1.Yes 2.No 3.unknown	
Q 45	History of fever for the past 2 weeks	1.Yes 2.No	
Q 46	History of intestinal protozoan infections (Amoebiasis, Giardiasis) in past 2 weeks?	1. Yes 2. No	
Q 47	History of soil-transmitted helminthic infection in past 2 weeks?	1. Yes 2. No	
Q 48	History of malaria infection?	1. Yes 2. No	

Q 49	History of diarrhea in the past 2 weeks?	1.Yes 2.No	
Q 50	Recent history of epistaxis?	1. Yes 2. No	
Q 41	History of Chronic diseases?	1. Yes 2. No	

Annex IV: Laboratory report form

Serial no _____ Date of specimen collection: _____ time: _____

- ✓ Blood examination
 - CBC examination report
- ✓ Anthropometric measurement

THANK YOU!!!

Amharic version Questionnaire

ልዩ ቁጥር	ጥያቄ	ምላሽ	
ጥ 1	የልጅ ዕድሜ?	-----ወር	
ጥ 2	የልጅ ጾታ?	1. ወንድ 2. ሴት	
ጥ 3	ሃይማኖት?	1. ኦርቶዶክስ 2. ሙስሊም 3. ፕሮቴስታንት 4. ካቶሊክ 5. ሌላ (ይግለጹ)	
ጥ 4	የእንክብካቤ ሰጭ ጾታ?	1. ወንድ 2. ሴት	
ጥ 5	የእንክብካቤ ሰጪ የትዳር ሁኔታ?	1. ያገባ 2. የፈታ 3. መበለት (የትዳር አጋሩን በሞት ያጣ) 4. ያላገባ 5. ሌላ (ይግለጹ) _____	
ጥ 6	የእንክብካቤ ሰጪው የትምህርት ደረጃ ምን ያህል ነው?	1. ማንበብ እና መጻፍ አልችልም 2. ማንበብ እና መጻፍ የሚችል 3. ክፍል 1-8 4. 9-12 ክፍል 5. ኮሌጅ እና በላይ	
ጥ 7	የእንክብካቤ ሰጪ ከልጁ ጋር ያለው ግንኙነት አሁን ያለው የሙያ ደረጃ ምን ይመስላል?	1. የቤት እመቤት 2. ነጋዴ 3. ገበሬ 4. የግል ሰራተኛ 5. የመንግስት ሰራተኛ 6. ሌላ (ይግለጹ) _____	
ጥ 8	የቤተሰብ አስተዳዳሪ ጾታ?	1. ወንድ 2. ሴት	
ጥ 9	በቤቱ ውስጥ ያሉ ግለሰቦች ብዛት?	1. ሁለት 2. ሶስት 3. አራት 4. አምስት እና ከዚያ በላይ	
ጥ 10	የመኖሪያ ቦታ?	1. ከተማ 2. ገጠር	
ጥ 11	የእንክብካቤ ሰጪ ወርሃዊ ገቢ?	1. < 750 ኢ.ብ 2. 750-1500 ኢ.ብ 3. > 1500 ኢ.ብ	
ጥ 12	በምግብ ዝግጅት ወቅት የተመጣጠነ ምግብ ያዘጋጃሉ?	1. አዎ 2. አይ	

ጥ 13	በአመጋገብ ልዩነት ውስጥ የትኛውን ምርት ይጠቀማል?	<ol style="list-style-type: none"> 1. የጡት ወተት 2. እህል, ሥሮች, ሀረጎችና እና plantains 3. Pulses (ባቄላ, አተር, ምስር), ለውዝ እና ዘሮች 4. የወተት ተዋጽኦዎች (ወተት፣ የጨቅላ ፎርሙላ፣ እርጎ፣ አይብ) 5. የስጋ ምግቦች (ስጋ, ዓሳ, የዶሮ እርባታ, የሰውነት አካል ሥጋ) 6. እንቁላል 7. ሻይታሚን-የበለጸጉ ፍራፍሬዎችና አትክልቶች 8. ሌሎች ፍራፍሬዎችና አትክልቶች 	
ጥ 14	ተጨማሪ ምግብ መቼ ጀመረ?	<ol style="list-style-type: none"> 1. < ወይም = 6 ወር 2. > 6 ወራት 	
ጥ 15	የጡት ማጥባት ብቻ የቆየበት ጊዜ?	<ol style="list-style-type: none"> 1. <6 ወር 2. 6-12 ወር 3. 1-2 ዓመት 4. ከ 2 ዓመት በላይ 	
ጥ 16	የአመጋገብ እውቀት አለህ ወይም አለሽ?	<ol style="list-style-type: none"> 1. አዎ 2. አይ 	
ጥ 17	ባለፉት አራት ሳምንታት ውስጥ፣ የእርስዎ ቤተሰብ በቂ ምግብ አልኖረውም ብለው ተጨነቁ?	<ol style="list-style-type: none"> 1. አዎ 2. አይ 	
ጥ 18	ይህ ምን ያህል ጊዜ ተከሰተ?	<ol style="list-style-type: none"> 1 = አልፎ አልፎ (ባለፉት አራት ሳምንታት ውስጥ አንድ ወይም ሁለት ጊዜ) 2 = አንዳንድ ጊዜ (ባለፉት አራት ሳምንታት ውስጥ ከሶስት እስከ አስር ጊዜ) 3 = ብዙ ጊዜ (ባለፉት አራት ሳምንታት ውስጥ ከአስር ጊዜ በላይ) 	
ጥ 19	ባለፉት አራት ሳምንታት ውስጥ እርስዎ ወይም ማንኛውም የቤተሰብ አባል በግብአት እጦት ምክንያት የመረጡትን አይነት ምግብ መመገብ አልቻላችሁም?	<ol style="list-style-type: none"> 1. አዎ 2. አይ 	
ጥ 20	ይህ ምን ያህል ጊዜ ተከሰተ?	<ol style="list-style-type: none"> 1 = አልፎ አልፎ (ባለፉት አራት ሳምንታት ውስጥ አንድ ወይም ሁለት ጊዜ) 2 = አንዳንድ ጊዜ (ባለፉት አራት ሳምንታት ውስጥ ከሶስት እስከ አስር ጊዜ) 3 = ብዙ ጊዜ (ባለፉት አራት ሳምንታት ውስጥ ከአስር ጊዜ በላይ) 	
ጥ 21	ባለፉት አራት ሳምንታት ውስጥ እርስዎ ወይም ማንኛውም የቤተሰብ አባል በግብአት እጥረት	<ol style="list-style-type: none"> 1. አዎ 2. አይ 	

	ምክንያት የተወሰነ አይነት ምግቦችን መመገብ ነበረባቸው?	
ጥ 22	ይህ ምን ያህል ጊዜ ተከሰተ?	1= አልፎ አልፎ (ባለፉት አራት ሳምንታት ውስጥ አንድ ወይም ሁለት ጊዜ) 2 = አንዳንድ ጊዜ (ባለፉት አራት ሳምንታት ውስጥ ከሶስት እስከ አስር ጊዜ) 3 = ብዙ ጊዜ (ባለፉት አራት ሳምንታት ውስጥ ከአስር ጊዜ በላይ)
ጥ 23	ባለፉት አራት ሳምንታት ውስጥ እርስዎ ወይም ማንኛውም የቤተሰብ አባል ሌሎች የምግብ ዓይነቶችን ለማግኘት በግብአት እጥረት ምክንያት እርስዎ ለመመገብ ያልፈለጉትን አንዳንድ ምግቦች መብላት ነበረብዎት?	1. አዎ 2. አይ
ጥ 24	ይህ ምን ያህል ጊዜ ተከሰተ?	1= አልፎ አልፎ (ባለፉት አራት ሳምንታት ውስጥ አንድ ወይም ሁለት ጊዜ) 2 = አንዳንድ ጊዜ (ባለፉት አራት ሳምንታት ውስጥ ከሶስት እስከ አስር ጊዜ) 3 = ብዙ ጊዜ (ባለፉት አራት ሳምንታት ውስጥ ከአስር ጊዜ በላይ)
ጥ 25	ባለፉት አራት ሳምንታት ውስጥ እርስዎ ወይም ማንኛውም የቤተሰብ አባል በቂ ምግብ ስላልነበረ ከምትፈልጉት መጠን ያነሰ ምግብ መብላት ነበረባቸው?	1. አዎ 2. አይ
ጥ 26	ይህ ምን ያህል ጊዜ ተከሰተ?	1= አልፎ አልፎ ይህ ምን ያህል ጊዜ ተከሰተ? (ባለፉት አራት ሳምንታት ውስጥ አንድ ወይም ሁለት ጊዜ) 2 = አንዳንድ ጊዜ (ባለፉት አራት ሳምንታት ውስጥ ከሶስት እስከ አስር ጊዜ) 3 = ብዙ ጊዜ (ባለፉት አራት ሳምንታት ውስጥ ከአስር ጊዜ በላይ)
ጥ 27	ባለፉት አራት ሳምንታት እርስዎ ወይም ሌላ የቤተሰብ አባል በቂ ምግብ ስለሌለ በቀን ውስጥ ጥቂት ምግቦችን መመገብ ነበረብዎት?	1. አዎ 2. አይ
ጥ 28	ይህ ምን ያህል ጊዜ ተከሰተ?	1= አልፎ አልፎ (ባለፉት አራት ሳምንታት ውስጥ አንድ ወይም ሁለት ጊዜ)

		2 = አንዳንድ ጊዜ (ባለፉት አራት ሳምንታት ውስጥ ከሶስት እስከ አስር ጊዜ) 3 = ብዙ ጊዜ (ባለፉት አራት ሳምንታት ውስጥ ከአስር ጊዜ በላይ)	
ጥ 29	ባለፉት አራት ሳምንታት፣ ምግብ ለማግኘት በግብአት እጦት ምክንያት በቤተሰባችሁ ውስጥ ምንም አይነት የሚበሉት ምግብ አልነበረም?	1. አዎ 2. አይ	
ጥ 30	ይህ ምን ያህል ጊዜ ተከሰተ?	1= አልፎ አልፎ (ባለፉት አራት ሳምንታት ውስጥ አንድ ወይም ሁለት ጊዜ) 2 = አንዳንድ ጊዜ (ባለፉት አራት ሳምንታት ውስጥ ከሶስት እስከ አስር ጊዜ) 3 = ብዙ ጊዜ (ባለፉት አራት ሳምንታት ውስጥ ከአስር ጊዜ በላይ)	
ጥ 31	ባለፉት አራት ሳምንታት ውስጥ በቂ ምግብ ስለሌለ እርስዎ ወይም ማንኛውም የቤተሰብ አባል ተርበው ተኝተው ነበር?	1. አዎ 2. አይ	
ጥ 32	ይህ ምን ያህል ጊዜ ተከሰተ?	1= አልፎ አልፎ (ባለፉት አራት ሳምንታት ውስጥ አንድ ወይም ሁለት ጊዜ) 2 = አንዳንድ ጊዜ (ባለፉት አራት ሳምንታት ውስጥ ከሶስት እስከ አስር ጊዜ) 3 = ብዙ ጊዜ (ባለፉት አራት ሳምንታት ውስጥ ከአስር ጊዜ በላይ)	
ጥ 33	ባለፉት አራት ሳምንታት ውስጥ፣ እርስዎ ወይም ማንኛውም የቤተሰብ አባል በቂ ምግብ ስለሌለ ምንም ሳይበሉ ሙሉ ቀንና ሌሊት ቆዩ?	1. አዎ 2. አይ	
ጥ 34	ይህ ምን ያህል ጊዜ ተከሰተ?	1= አልፎ አልፎ (ባለፉት አራት ሳምንታት ውስጥ አንድ ወይም ሁለት ጊዜ) 2 = አንዳንድ ጊዜ (ባለፉት አራት ሳምንታት ውስጥ ከሶስት እስከ አስር ጊዜ) 3 = ብዙ ጊዜ (ባለፉት አራት ሳምንታት ውስጥ ከአስር ጊዜ በላይ)	
ጥ 35	አንድ ልጅ የእንስሳት ተዋጽኦዎችን (ሥጋን፣ የእንቁላል ወተት...?) ይወስዳል	1. አዎ 2. አይ	
ጥ 36	የምግብ ድግግሞሽ በቀን?	1. አንድ ጊዜ 2. ሁለት ጊዜ 3. ሶስት ጊዜ 4. አራት ጊዜ እና ከዚያ በላይ	

ጥ 37	ልጅ የእድሜውን ክትባት ወስዷል?	1. አዎ 2. አይ	
ጥ 38	የወሊድ መንገድ	1. በመሃጸን 2. በመሳሪያ 3. በቀዶ ጥገና	
ጥ 39	በወሊድ ጊዜ የልጅ መታፈን?	1. አዎ 2. አይ	
ጥ 40	ባለፈው 4 ሳምንት ውስጥ ከፍተኛ የደም መፍሰስ ታሪክ?	1. አዎ 2. አይ	
ጥ 41	በቅርብ ጊዜ ደም ሲወሰድ ያለመቀበል ታሪክ አለ ?	1. አዎ 2. አይ	
ጥ 42	የቅርብ ጊዜ የቀዶ ጥገና ሂደት ታሪክ?	1. አዎ 2. አይ	
ጥ 43	የደም መፍሰስን የሚያስከትል የቅርብ ጊዜ የአደጋ ታሪክ?	1. አዎ 2. አይ	
ጥ 44	የእናት የደም ማነስ ታሪክ?	1. አዎ 2. አይ 3. ያልታወቀ	
ጥ 45	ላለፉት 2 ሳምንታት የትኩሳት ታሪክ	1. አዎ 2. አይ	
ጥ 46	ባለፉት 2 ሳምንታት ውስጥ የአንጀት ፕሮቶዞሳን ኢንፌክሽኖች (Amoebiasis, Giardiasis) ታሪክ?	1. አዎ 2. አይ	
Q 47	ባለፉት 2 ሳምንታት ውስጥ በአፈር የሚተላለፍ ሄልሚንቲክ ኢንፌክሽን ታሪክ?	1. አዎ 2. አይ	
ጥ 48	የወባ ኢንፌክሽን ታሪክ?	1. አዎ 2. አይ	
ጥ 49	ባለፉት 2 ሳምንታት ውስጥ የተቆማጥ ታሪክ?	1. አዎ 2. አይ	
ጥ 50	የቅርብ ጊዜ የነስር ታሪክ?	1. አዎ 2. አይ	
ጥ 51	ሥር የሰደዱ በሽታዎች ታሪክ?	1. አዎ 2. አይ	

APPROVAL BY THE BOARD OF EXAMINATION

This thesis by Betelhem Mulugeta is accepted in its present form by the board of examiners as satisfying thesis requirement for the degree of masters in Pediatrics and Child Health Nursing.

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