HAWASSA UNIVERSITYCOLLEGE OF MEDICINE AND HEALTH SCIENCE SCHOOL OF NURSING

PREVALENCE AND ASSOCIATED FACTORS OF WASTING, STUNTING AND UNDERWEIGHT AMONG UNDER FIVE CHILDREN IN AMBO TOWN PUBLIC HOSPITALS, OROMIA, ETHIOPIA 2023

PRINCIPAL INVESTIGATOR: HIRPA BERESU

ADVISORS: 1. Mr. THOMAS FAKO (MSc.)

2. Mr. DESALEGN MITKU (MSc.)

A THESIS SUBMITTED TO HAWASSA UNIVERSITY COLLEGE OF MEDICINE AND HEALTH SCIENCE SCHOOL OF NURSING FOR PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN PEDIATRICS AND CHILD HEALTH NURSING

NOVEMBER, 2023

HAWASSA, ETHIOPIA

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HAWASSA, ETHIOPIA

ADVISORS' APPROVAL SHEET

SCHOOL OF GRADUATE STUDIES

HAWASSA UNIVERSITY ADVISORS' APPROVAL SHEET

(Submission Sheet-1)

This is to certify that the thesis entitled "**Prevalence and associated factors of Stunting, Wasting and Under nutrition among under five children in Ambo town, Oromia, Ethiopia 2023**" submitted in partial fulfillment of the requirements for the degree of Master's with specialization in **Pediatrics and Child Health Nursing**, the Graduate Program of the Department/School of Nursing, and has been carried out by **Hirpa Beresu Eka** ID. No.**Gcc/0006/14** under our supervision. Therefore we recommend that the student has fulfilled the requirements and hence hereby can submit the thesis to the department.

_____	_____	_____
Name of major advisor	Signature	Date
_____	_____	_____
Name of co-advisor	Signature	Date

EXAMINER'S APPROVAL SHEET-I

SCHOOL OF GRADUATE STUDIES

HAWASSA UNIVERSITY EXAMINERS' APPROVAL SHEET-1

(Submission Sheet-2)

We, the undersigned, members of the Board of Examiners of the final open defense by Hirpa Beresu Eka have read and evaluated his/her thesis entitled ''Prevalence and associated factors of under-nutrition among under five children in Ambo town, Oromia, Ethiopia 2023'', and examined the candidate. This is, therefore, to certify that the thesis has been accepted in partial fulfillment of the requirements for the degree.

_____	_____	_____
Name of Major Advisor	Signature	Date
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Name of Internal Examiner-II	Signature	Date
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Final approval and acceptance of the thesis/dissertation is contingent upon the submission of the final copy of the dissertation to the School of Graduate Studies (SGS) through the Department/School Graduate Committee (DGC/SGC) of the candidate's department

Date: _____

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List of Abbreviations

AOR ……...Adjusted Odds Ratio

BMI…….....Body Mass Index

DALY ……Disability-adjusted life years

EMDHS ……..Ethiopian Mini Demographic and Health Survey

MUAC ……Mid-Upper Arm Circumference

NGO……....Non-Governmental Organization

SD.……...…Standard Deviations

SDG…….... Sustainable Development Goal

SPSS ……..... Statistical Package for Social Sciences

UNICEF……...United Nations International Children's Emergency Fund

WHO…….....World Health Organization

Abstract

Background: Under nutrition contributes to the deaths of around 3 million children and threatens the futures of hundreds of millions, undermining healthy development and the strength of their societies by preventing children from achieving their full potential. Under - nutrition is a combined consequence of poor dietary consumption and recurrent infectious illnesses, especially in our country, Ethiopia. It is associated with high morbidity and mortality among children.

Objectives: To identify the prevalence and associated factors of under nutrition among under five children in Ambo town, West Shoa Zone, Oromia Region, Ethiopia, in 2023.

Method and Materials: An institutional-based cross-sectional study was conducted among 394 under-five-year-old children from April 20–June 20. A structured questionnaire and anthropometric measurements were used to collect the data. Data were entered into epi-data and exported to the statistical package for social sciences (SPSS), version 26. Descriptive statistics were computed. P-values ≤ 0.25 in bivariable analysis were entered into multivariable regression, and those p-values ≤ 0.05 with a 95% CI were declared as significantly associated factors.

Results: In this study, 394 children and their corresponding mothers participated with a 100% response rate. The prevalence of wasting, stunting, and underweight were 21.3% [95% CI: (19.4–23.2)], 33% [95% CI: (30.8–35.2)], and 20.6% [95% CI: (19.1–22.1)], respectively. Meal frequency and family size were factors in wasting. Mother education, husband occupation and presence of diarrhea in the last 2 weeks were significantly associated with stunting and meal frequency, age at complimentary feeding and exclusive breast feeding, were associated factors of underweight.

Conclusions: The prevalence of under nutrition was high in this study. Maternal education, husband occupation, diarrhea in the last two weeks prior to study, meal frequency, and age at complimentary and exclusive breast feeding were determinant factors of under nutrition. Therefore, improving meal frequency, maternal health awareness, and early childhood illness treatment will reduce under- five under nutrition.

Keywords: Ambo, Ethiopia, prevalence, under five, under nutrition

CHAPTER – 1 INTRODUCTION

1.1.Background

Malnutrition is a general term for a medical condition caused by an improper or insufficient diet (Redi, Egata and Kedir, 2017). The malnutrition of children includes under nutrition, over-nutrition and micronutrient deficiency (Li *et al.*, 2022). In developing countries, however, malnutrition is used to refer to under-nutrition (Kassie and Workie, 2020). Under nutrition denotes the insufficient intake of energy and one or more essential nutrients particularly, protein and calories or impaired metabolism of these nutrients to meet an individual's needs to maintain good health (Tg, Ar andz Ai, 2019; Sewnet *et al.*, 2021). It generates economic losses associated with impaired brain development, poor school performance, and impaired productivity and earnings (Gelu *et al.*, 2022).

Childhood under nutrition is a global health challenge impacting child growth and survival rates, contributing to future increased chronic disease prevalence, and reducing individual and national economic productivity (Kejo *et al.*, 2018). The indicators of childhood under-nutrition involve stunting, wasting and underweight (Kassie and Workie, 2020). Weight-for- height, height-for-age and weight-for-age are three important parameters for assessing nutritional status in children (Emmanuel *et al.*, 2016). Stunting is a growth disorder of children with malnutrition for a long time which leads to more shorter than normal children of his/her age and it can be defined as a height for age less than Z scores below minus two standard deviations (−2SD) of the World Health Organization (WHO) of growth standards median (Kusumawardani *et al.*, 2020). Wasting is nutritional deficiency state of recent onset related to sudden food deprivation or mal-absorption utilization of nutrients which results in weight loss (Habtamu, Id and Id, 2022). It is also defined as weight-for-height/length below minus two standard deviations (<−2SD) from the median of WHO reference population (Wete, Zerfu and Anbese, 2019). Although problems related to poor nutrition affect the entire population, children are more vulnerable because of their unique physiology and socioeconomic characteristics. But, this can be prevented by adequate nutrition. The period from birth to age two is especially important for optimal physical, mental, and cognitive growth, health, and development. Unfortunately, this period is often marked by protein energy and micronutrient deficiencies that interfere with optimal growth (Abeway *et al.*, 2018).

1.2.Statement of the problem

Under nutrition is a major public health problem that increases the global health burden of premature mortality and morbidities during childhood (García Cruz *et al.*, 2017). The burden of under nutrition remains alarmingly high and impacts child growth and survival rate, especially in low- and middle-income countries (IEG, 2018). Globally, it was estimated that under nutrition is responsible for 35% of under-five mortality (Demilew and Abie, 2022). In 2020, globally, 22% or 149.2 million under five children were stunted with more than half (53%) of them from Asia and more than one third (41%) from Africa and 6.7% or 45.4 million children wasted (UNICEF/WHO/WORLD BANK, 2021).

The rate of under nutrition among under-five children in Ethiopia is among the highest in the world and Sub-Saharan Africa, 9% of under-five children were wasted (Wete, Zerfu and Anbese, 2019). Results from the 2019 Ethiopian Mini Demographic and Health Survey (EMDHS) show that 37% of children under 5 years of age were stunted, 21% were underweight and 7% of children were wasted in Ethiopia and the survey also revealed that the proportion of children who are stunted is highest in Tigray (48%), whereas the proportion of wasting is highest in Somali (21%) (Demographic and Survey, 2019). Study done in Adama town, East Shoa Zone, Oromia region revealed that the Prevalence of stunting among children 6 -59 months were 44.4% (Mekonen, Addisu and Mekonnen, 2019), the prevalence of wasting was 14.1% in Kuyu District ,Northern Oromia (Yazew, 2022a) and the prevalence of underweight was 23.63% in Haramaya District (Redi, Egata and Kedir, 2017).

Malnutrition is a treatable condition with prompt identification and prevention. For prompt identification and prevention, it is important to identify factors associated with it. Wasting and stunting, driven by common factors, frequently occur in the same child, either simultaneously or at different moments through their life course (Thurstans *et al.*, 2022). The cause of malnutrition is complex and multifactorial. Inadequate food intake, living standards, water and sanitation, birth weight, birth interval, parity, sex of the child, weaning practices, and mother's education are a few of the important factors that have been identified from research studies carried out on the subject (Demilew and Abie, 2022).

Past studies conducted in Ethiopia reported several factors associated to under nutrition. These includes: age and sex of the child, maternal education, region, source of drinking water, number of under five children, mother's body mass index and wealth index, anemic status of child, multiple births, fever of child before 2 months of the survey, mother's age at first birth, and husband's education (Kassie and Workie, 2020).

Undernourished children are physically, emotionally and intellectually less productive and they will be suffered from chronic illnesses and disabilities. This, can further the cycle of poverty and ill health by raising health care costs, decreasing productivity, and slowing economic growth (Id *et al.*, 2022). The elimination of malnutrition in all its forms is an imperative for health, ethical, political, social and economic reasons, paying particular attention to the special needs of children, and women (Access, 2019).

In Ethiopia, the prevalence of stunting decreased from 47% in 2005 to 38% in 2016 and to 37% in 2019, and that of underweight was decreased from 33% in 2005 to 23% in 2016 and 21 in 2019, but the prevalence of wasting was only reduced by 5% in the last 15 years (Demographic and Survey, 2019). So, still there is a gap to decrease under – nutrition from our country to fulfill SDG targets to end all forms of malnutrition by 2030 and WHO targets to reduce stunting by 40% by 2025. Also there is a gap on magnitude and associated factors of under-nutrition in Ambo town. Thus, to address this gap, this study is needed to determine the prevalence and factors associated with under nutrition among under-five children in Ambo town, Ethiopia.

1.3.Significance of the Study

Under nutrition is the most prevalent form of malnutrition among children in developing countries. There is no recent study done about under nutrition in the study area and little is known about children's health, feeding practices, personal and environmental hygiene practices for their children, and other associated factors of under nutrition. So, this study will include the most important factors, which are demographic and socio-economic, environmental, and health care factors of under nutrition. Therefore, the purpose of this study is to determine the current prevalence of under nutrition and its associated factors among under-five-year-old children in Ambo town. The findings of this study will serve as a baseline for further study, and the findings will also create awareness in the community about the problem and contribute towards formulating locally appropriate interventions to prevent under-nutrition. The findings will be shared among various stakeholders to stimulate focused intervention programs.

CHAPTER – 2 OBJECTIVES

2.1. General Objectives

- To assess the prevalence of Wasting, Stunting, Underweight and their associated factors among under-five age children in Ambo town, west Shoa Zone, Oromia, Ethiopia, 2023.

2.2. Specific Objectives

- To determine the prevalence of Wasting among under- five age children in Ambo town, West Shoa Zone, Oromia, Ethiopia, 2023.
- To determine the prevalence of Stunting among under- five age children in Ambo town, West Shoa Zone, Oromia, Ethiopia, 2023.
- To determine the prevalence of Underweight among under- five age children in Ambo town, West Shoa Zone, Oromia, Ethiopia, 2023.
- To identify factors associated with Wasting among under-five age children in Ambo town, West Shoa Zone, Oromia, Ethiopia, 2023.
- To identify factors associated with Stunting among under-five age children in Ambo town, West Shoa Zone, Oromia, Ethiopia, 2023.
- To identify factors associated with Underweight among under-five age children in Ambo town, West Shoa Zone, Oromia, Ethiopia, 2023.

2.3. Research Question

1. What is the prevalence of Wasting & its associated factors among under- five children in Ambo town?
2. What is the prevalence of Stunting & its associated factors among under- five children in Ambo town?
3. What is the prevalence of Underweight & its associated factors among under- five children in Ambo town?

CHAPTER – 3 LITERATURE REVIEW

3.1. Prevalence of under nutrition

The prevalence of stunting in Asia and Africa accounts 54% and 40%, respectively (UNICEF, WHO and World Bank, 2020). In Indonesia 38% of under five children are stunted (Kusumawardani *et al.*, 2020). The prevalence of stunting in Bangladesh among under five children was 35.4% (Rahman *et al.*, 2021) and 46.5 % in Papua New Guinea (Pham *et al.*, 2021), 29.8% in Uganda (Nsubuga *et al.*, 2022) and 10.5% in North-Central Nigeria (Access, 2018).

According to EDHS mini 2019, in Ethiopia 37% of under five children are stunted (Demographic and Survey, 2019). When we compare this between different regions in Ethiopia, children who are stunted is highest in Tigray (48%), Afar (42%), and Amhara (42%). Based on study done in Pastoral Communities of Afar Regional State , Northeast Ethiopia the prevalence of stunting among Under-Five Children was 43.1% (Gebre *et al.*, 2019). According to study done in west Arsi Zone the prevalence of stunting in under five children was 43.4% (Nigusu, Kemal and Betela, 2019). In Haramaya district, Eastern Ethiopia it was 45.8% (Yisak, Gobena and Mesfin, 2015).

In 2019, Asia accounted for more than two thirds of all wasted children under the age of five, and Africa accounted for more than one-quarter (UNICEF, WHO and World Bank, 2020).The Prevalence of Wasting were 9.1% in Asia, 1.3% in Latin America and Caribbean, 9.5% in Oceania and 6.4% in Africa (UNICEF, WHO and World Bank, 2020). The prevalence of wasting in Bangladesh was 15.4% (Rahman *et al.*, 2021), 13.8% in in Papua New Guinea (Pham *et al.*, 2021), and 16.5% in Tanzania (Kejo *et al.*, 2018). According to EMDHS 2019, the prevalence of wasting in Ethiopia was 7% (Demographic and Survey, 2019). When we compare this, the proportion of wasting is highest in Somali (21%), Afar (14%), and Gambela (13%) (Demographic and Survey, 2019). As study done in Addis Ababa the prevalence of wasting among under five children was 11.1% (Sewnet *et al.*, 2021). The prevalence of wasting among under five children in Arsi Zone was 14.8% (Nigusu, Kemal and Betela, 2019). In Jima Geneti District, the prevalence of wasting was 11.2% (Yazew, 2022b). Similarly, the prevalence of wasting among infant and young child in Kuyu District was 14.1% (Yazew, 2022a).

According to a study done in Bangladesh, the prevalence of underweight among under-fives children was 32.8% (Rahman *et al.*, 2021). As a study done in Eritrea, the prevalence of underweight in under-fives children was 33.4% (Eritrean, Mai-ainiFactors among Children Prevalence of Acute Malnutrition and its Associated Factors among Children aged 6-59 months in Mai-Aini Eritrean Refugees ' Camp and Camp, 2014). Based on a study done in Sudan, the prevalence of underweight was 4.8% (Kiarie *et al.*, 2021). According to EDHS Mini-2019, in Ethiopia, the prevalence of underweight was 21%. Based on a study done in Bahir Dar city, Ethiopia, the prevalence of underweight was 22.1% (Demilew and Abie, 2022). Based on a study done in Gojjam, Ethiopia, the prevalence of underweight among under-five children was 15.3% (Zeray, Kibret and Leshargie, 2019). According to a study done in Northwest Ethiopia, the prevalence of underweight was 22.1% (Girma *et al.*, 2019).

3.2. Factors associated with under nutrition

3.2.1. Socio Demographic factors

Age is one of the variables linked to under nutrition in under five children. A study conducted in Bangladesh indicated that children aged 36 to 47 months had 5.53 times higher odds of being stunted when compared to children aged 6 to 12 months old (Akram *et al.*, 2018). In Nigeria, the odds of stunting increased at 12-35 months of age (Health, 2021). In Ethiopia, Libo kemkem children in the 49–59 month age group were 6.31 times more likely to be stunted compared to children aged 6–12 months (Geberselassie *et al.*, 2018), and in Janamora, it was increased in the 12–24 month age group, or 3.38 times the 95% CI: higher than other age groups (Azmeraw, 2021). In Oromia, Sebeta Hawas district, the risk of being stunting increases as the age of the child increases (Haile and Amboma, 2018).

Likewise, a child's age has an impact on their level of waste. In Nigeria (Akombi *et al.*, 2017),the most commonly affected age groups by wasting and severe wasting are 0–5 months and 6–23 months respectively. In Debre Tabor, Ethiopia (Getu, 2019), 6–11-month-old children had a 4.3-fold higher risk of wasting than 24-59-month-old children.

The child's gender is another factor that contributes to under-nutrition in children under the age of five. Based on studies done in Bangladesh (Akram *et al.*, 2018), in Tanzania (Kejo *et al.*, 2018), Ethiopia, and Sidama (Tafesse, 2021), male children were 1.21times , 1.6 times and 2.37 times more likely to be stunted than female respectively. According to a study done in Northeast Ethiopia, Afar region (Gebre *et al.*, 2019), male children had 1.98 times higher risk of developing stunting as compared to female children. On the contrary, a study done in Ethiopia, Oromia West Guji Zone show that being female becomes 1.74 times shorter than being male for their age (Afework, Mengesha and Wachamo, 2021).

The birth order of the child and being preterm are other factors in under nutrition. According to a study done in Bangladesh (Akram *et al.*, 2018), in urban areas, a second-born child was 1.92 times more likely to be stunted than the first-born child. Conversely, in North West Ethiopia Urban Area (Girma *et al.*, 2019), being the first child in the birth order increases the odds of developing stunting by 8.6 times (AOR= 8.60; 95% CI: 2.40, 30.77) and stunting decreases as birth order increases. Based on study done in Debre Berhan (Town, 2021), Preterm children were 1.8 times more likely to be underweight than term children (AOR=1.8, 95% CI: 1.03–2.5).

Similarly, the educational status of the family and family size are also factors that affect nutritional status of under-fives. According to studies done in different parts of Ethiopia, like Tigray (Tesfaye and Zara, 2021) and West Oromia (Berra, 2020) Children born to mothers with no education were 1.94 and 4.9 times more likely to be stunted compared to children born to mothers with higher education, respectively.

Again, family educational status becomes a factor in wasting and underweight. In Nigeria (Akombi *et al.*, 2017), Children of uneducated parents had significantly higher odds of being wasted compared with those of educated parents. Based on studies done in different parts of Ethiopia, (Habtamu, Id and Id, 2022; Id *et al.*, 2022; Yazew, 2022a), the prevalence of Wasting was associated with uneducated mother. On the other hand, according to an Ethiopian study, children of a husband or partner who did not receive any formal education were (OR=exp (0.270)) 1.309 times more likely to be wasted than children of a husband or partner who had received primary education (Man, 2019).

Finally, based on study done in Debre Berhan (Town, 2021), children born into families who cannot read or write had a 2.5 times higher risk of being under- weight as compared to children born from university or college educated families (AOR=2.5, 95% CI: 1.7–14).

In Ziway Dugda, Ethiopia, children who are from greater or equal to six family size households were 1.57 times more likely to be affected by stunting than children who were from less or equal to 5 family size households [AOR = 1.57, 95% CI (1.13, 2.19)] (Zone *et al.*, 2021). In Northwest Ethiopia (Geberselassie *et al.*, 2018), Children in a family of at least six members were 1.77 times at higher odds of stunting than children in a family of five and less [AOR = 1.77, 95%CI: (1.35, 2.32)]. In Lasta Woreda, North East Ethiopia (C, 2017), stunting was affected by large family size. This means that as the size of a family increases, there is a scarcity of resources for household consumption, especially food, and healthcare which ultimately leads to stunted growth. Similarly, family size is other risk factors for wasting in under-five children. According to a study done in South Ethiopia (Habtamu, Id and Id, 2022) children from family size <3 are 84% less likely to have wasted time compared to those who have family size >5 [AOR = 0.16, 95% CI (0.05, 0.50)]. In Northeast Ethiopia, Afar region (Gebre *et al.*, 2019), children who lived in households with more than or equal to five family members had a 2.72 times greater chance of being wasted than children who did not.

Based on different studies Polygamous marriage and wealth status of the family becomes another factor in under nutrition in under five children. The Study done in Ethiopia, West Guji Zone revealed that under-five children whose fathers had a polygamous marriage were three times more stunted than those whose fathers had a monogamous marriage (Afework, Mengesha and Wachamo, 2021).

Family wealth status becomes other factors of stunting and wasting in under- five children. Based on study done in Bangladesh (Akram *et al.*, 2018), children from the poorest group were 2.34 (95% CI: 1.71-3.2) times more likely to be stunted when compared to the richest households. Similarly, according to studies done in different parts of Ethiopia, like Debre Tabor (Getu, 2019), Jima Geneti (Yazew, 2022b), and Wonago woreda (Habtamu, Id and Id, 2022), families who have poor or low wealth status are more likely to have wasted children than those families who have rich wealth status.

3.2.2. Environmental factors

According to study done in different parts of the country, Source of drinking water and lack of latrine utilization are environmental factors that are associated with under five under nutrition. In Indonesia (Tumilowicz, Beal and Neufeld, 2018), untreated drinking water was associated with stunting. Children from households with unimproved or unprotected drinking water were [AOR = 5.11; 95% CI (1.6, 16.4)] five times more likely to be at risk for stunting than children from homes with improved or protected water in Ethiopia (Mengesha *et al.*, 2021). Lack of latrine utilization was one of the risk factors for stunting and underweight. Based on a study done in the Afar region, children born to a household with no access to latrine were three times more likely to be stunted compared to their counterparts (AOR =3.26, 95% CI (1.54–6.94) (Kahssay *et al.*, 2020). In Bahir Dar (Demilew and Abie, 2022)**,** children who resided in households in which latrines were not used were 3.3 times as prone to developing underweight as their counterparts (AOR =3.3, 95% CI: [1.2, 8.7]).

3.2.3. Health care factors

Poor hand washing practices of mothers, diarrhea in the last two weeks prior to the study, and child vaccination status are some health care factors that are associated with under-five under nutrition. In Northwest Ethiopia (Girma *et al.*, 2019) children whose mothers have poor hand washing practices are 2.5 times more likely to have underweight than children whose mothers have good hand washing practices (AOR= 2.50, 95%CI: 1.3, 4.7). In Debre Berhan (Town, 2021), children born from mothers who did not wash their hands before feeding the child were 2 times more likely to be underweight than children from mothers who always washed their hands before feeding the child (AOR=2, 95% CI: 1.3–8.5).

The study done in Indonesia (Fauziah, 2023) and Northeast Ethiopia (Gebre *et al.*, 2019), declared that a diarrheal episode was shown to be a risk factor for stunting. In central Ethiopia, Adama town (Mekonen, Addisu and Mekonnen, 2019) Children who had diarrhea before 2 weeks of the study period were 1.79 times stunted than children without diarrhea. In Northeast Ethiopia, Afar region(Gebre *et al.*, 2019), Children who had diarrhea in the past two weeks prior to the study were 4.6 times more likely to be wasted than those without diarrheal disease (AOR= 4.57, 95% CI: 2.56–8.16).

In Southern Ethiopia, Wolkite town (Id *et al.*, 2022), Children with a recent history of diarrheal illnesses (two weeks prior to the data collection) had wasting odds that were 1.68 [AOR = 1.68 (95% CI: 1.23, 5.89)] times higher than those without a history.

Immunization status of the child becomes the risk factor of stunting and underweight in under five children. Based on study done in Northeast Ethiopia, Afar region(Gebre *et al.*, 2019),children who were not fully immunized were 3.3 times more likely to be stunted than fully immunized children (AOR= 3.34, 95% CI: 1.31–4.81). In Debre Berhan (Town, 2021), children who were not vaccinated were two times more likely to be underweight than vaccinated children (AOR=2, 95% CI: 1.3– 6.4).

Place of delivery and ANC follow-up are other health care factors that are associated with under-nutrition. The study done in Nigeria revealed that children who were delivered at home were more likely to be wasted than those delivered at a health facility (Akombi *et al.*, 2017). As study done in Northeast Ethiopia, Afar region (Gebre *et al.*, 2019), place of delivery was one risk factor of wasting in children.

In Debre Berhan (Town, 2021), children born from mothers with incomplete maternal ANC follow-up, and those who did not have ANC follow- up at all were 2.5 and 3 times more likely to be under- weight than children born from mothers who had complete ANC follow-up (AOR=3, 95% CI: 1.9–5.3).

3.2.4. Dietary factors

Non-exclusive breast-feeding practices, time of complementary feeding, and meal frequency are the dietary factors that are associated with under nutrition in under five children. Nonexclusive breast-feeding practices were the risk factor for stunting and wasting. According to a study done in the Afar region of North East Ethiopia (Kahssay *et al.*, 2020) non-exclusive breast-fed children were 6.6 times more likely to be stunted compared to their counterparts (AOR = 6.68, 95% (3.1, 14.52). Similarly, as study done in Wonago woreda , south Ethiopia (Habtamu, Id and Id, 2022) nonexclusive breast feeding was associated with wasting. Based on study done in Northeast Ethiopia, Afar region (Gebre *et al.*, 2019), Children who were not exclusively breastfed for 6 months of age were 2.71 times more likely to have wasted compared to those who were exclusively breastfed for 6 months of age [AOR = 2.71, 95% CI (1.05, 6.40)]

The time of complementary feeding initiation was significantly associated with factors of stunting and wasting, based on the following studies: In Janamora, the odds ratio of having stunting was 1.58 times 95%CI: (1.07–2.33) higher among children who started complementary feeding before six months as compared to children who started after six months (Azmeraw, 2021).

Also, as a study conducted in East Gojam, North west Ethiopia, children who start complementary feeding at 6 months were less likely to be wasted compared 6 months and older [AOR = 0.27; 95% CI: 0.08, 0.89] (Zeray, Kibret and Leshargie, 2019). According to a study done in Oromia region West Guji zone, a child who had fewer than four meal frequencies was 2.95 times more likely to be stunted compared to those who ate more than four meals (Afework, Mengesha and Wachamo, 2021)

Conceptual Framework

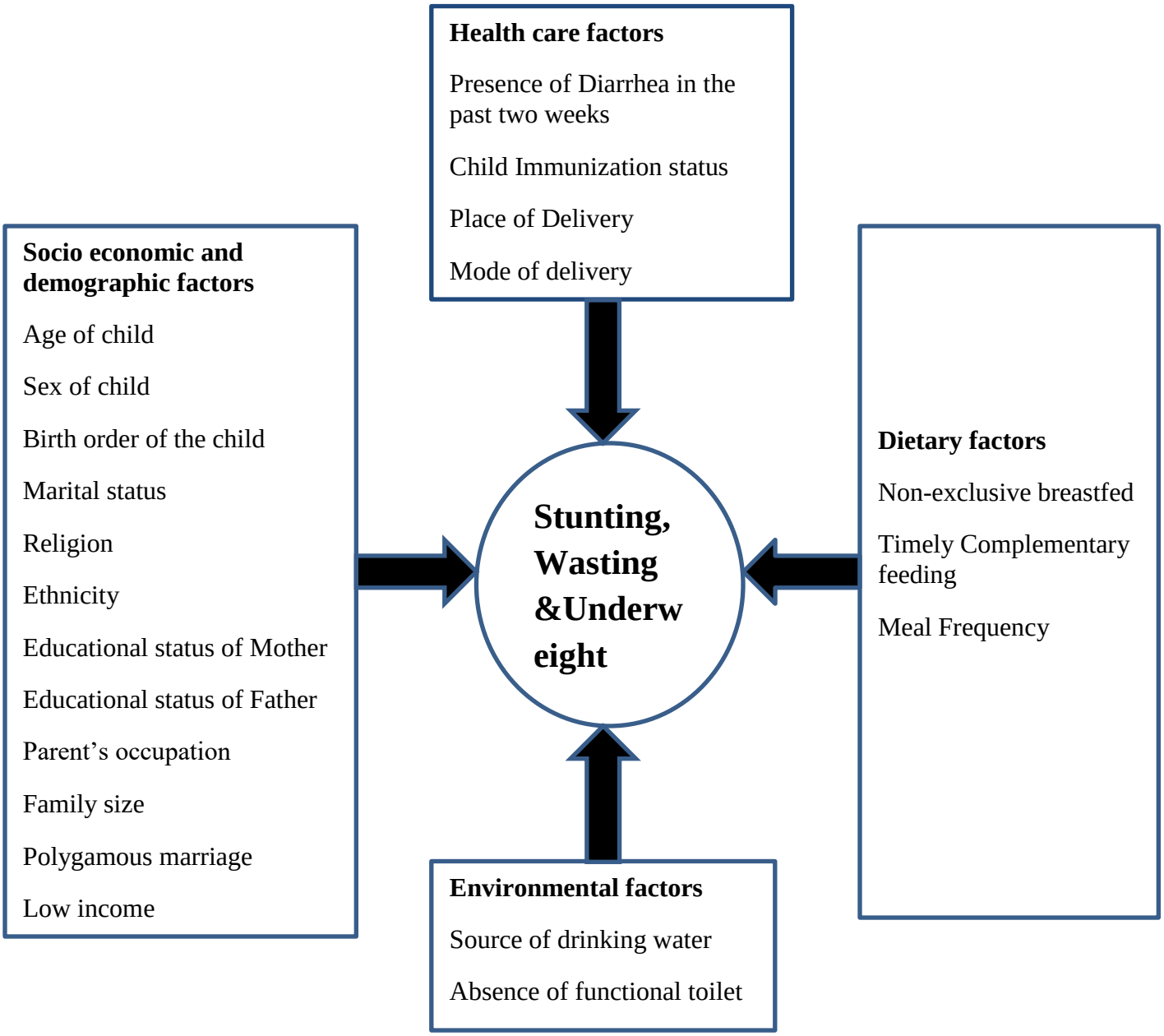

Figure 3.1: Conceptual framework for prevalence of under nutrition and its associated factors among under-fives of age children in Ambo town, west Shoa Zone, Oromia, Ethiopia, 2023, adapted from (Chaudhary, 2017), (Tumilowicz, Beal and Neufeld, 2018), (Jeylan, Mohammed and Girma, 2018)

CHAPTER – 4 METHOD AND MATERIALS

4.1. Study Design

Institutional based cross-sectional study design was conducted to assess under nutrition in Ambo town, Ethiopia, 2023.

4.2. Study Area and Period

This study was carried out in Ambo Public Hospitals from April 20 to June 20, 2023, among under-five children. Ambo town is the capital city of the West Shoa zone of Oromia regional state, which is located 114 km to the west of Addis Ababa. The town has a total population of 133,488 people, of whom 20,023 are children under five years old (Ambo town woreda health bureau). The town has one referral hospital, one general hospital, two health centers, and more than 30 private clinics. The lively life of the residents of the town was heavily dependent on the market, informal sectors, and daily labor.

4.3. Populations

4.3.1. Source Population

All under-five children, with their mothers' or caregivers, who attended public hospitals in Ambo town during the study period.

4.3.2. Study population

All under-five children who met the inclusion criteria and were willing to participate in the study.

4.3.3. Study unit

Individual under-five children

4.4. Inclusion and Exclusion criteria

4.4.1. Inclusion criteria

Under-five-year-old children with their mothers or caregivers who visited health facilities during the study period and who lived in Ambo town for at least 6 months were included in the study.

4.4.2. Exclusion criteria

All children with the following parameters were excluded from the study.

- ✓ Those who are critically ill at the time of the study and require emergency treatment
- ✓ Children with visible deformities
- ✓ Children for whom the mother or caregiver didn't know the exact age of the child
- ✓ Children with known chronic illnesses like TB, HIV, renal disease, cardiac diseases, and congenital abnormalities

4.5. Sample Size

The sample size was determined based on the formula used to estimate a single population proportion, assuming that 37%, 7%, and 21% of under-five children in Ethiopia are stunted, wasted, and underweight, respectively, according to EDHS, 2019 (Demographic and Survey, 2019), a 95% confidence interval (CI) (1.96), 5% margin of error (d), and adding 10% non-response rate.

P_1=0.37= prevalence of stunting

$P_{2=}$ 0.07=prevalence of wasting

P = 0.21 = prevalence of underweight

$$n_1 = \frac{z^2 (p_1) (1 - p_1)}{d^2} = \frac{(1.96)^2 (0.37) (1 - 0.37)}{(0.05)^2} = \frac{0.895477}{0.0025} = \mathbf{358}$$

$$n_2 = \frac{z^2 (p_2) (1 - p_2)}{d^2} = \frac{(1.96)^2 (0.07) (1 - 0.07)}{(0.05)^2} = \frac{0.2501}{0.0025} = \mathbf{100}$$

$$n_3 = \frac{z^2 (p_3) (1 - p_3)}{d^2} = \frac{(1.96)^2 (0.21) (1 - 0.21)}{(0.05)^2} = \frac{0.6373}{0.0025} = \mathbf{255}$$

From the three samples, **358** is the largest number. By adding a 10% non-response rate to it: n = 358 + 35.8 = **394;** is the final sample size

4.6. Sampling procedures

There are two public hospitals in Ambo town. I was selected both hospitals purposefully. All patient flow less than five years of age in the last six consecutive months was taken from the monthly registration book of each health institution, and these six-month patient flow data averages were used as a baseline. A total of 2388 under-five-year-old patients were visited in Ambo University Referral Hospital and 1584 in Ambo General Hospital in the last six months, and the monthly average was 398 and 264, respectively. Since the numbers of patients flow per month in each of the two public health facilities were low, I prolonged my study period for two months. So, the total patient flow for two months in AURH and AGH was 796 and 528, respectively. Then study subjects were selected by systematic random sampling among proportionally allocated 394 children under five years old by using methods of sampling intervals (kth), that is, k = N/n ~ 3. The first study participant was selected by the lottery method from 1–3 numbers, and then the data collectors continued by taking every 3rd unit until the required calculated number of under-5-year-old children were obtained and interviewed.

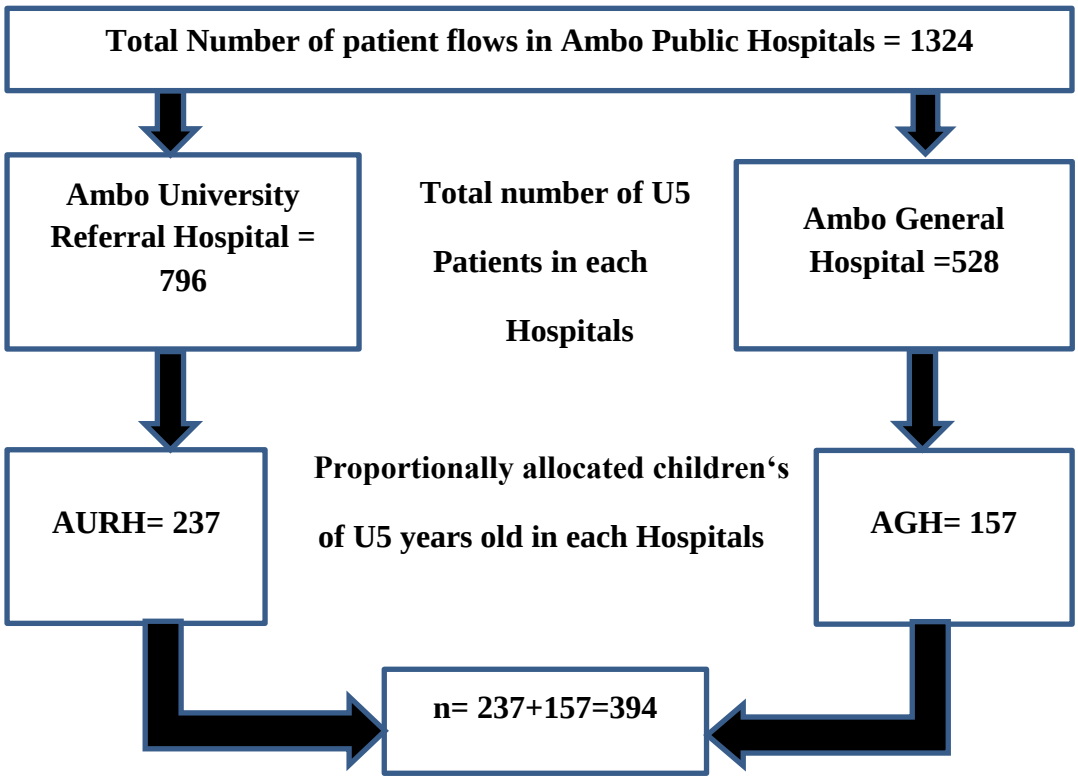

Figure 4.1: Schematic presentation of sampling procedure in the Public Hospital of Ambo Town, Ethiopia, 2023

4.7. Variables of the study

4.7.1. Dependent variable

Wasting

Stunting

Underweight

4.7.2. Independent variables

Socio economic and demographic factors

Age of child

Sex of child

Birth order of the child

Marital status

Religion

Ethnicity

Educational status of mother

Educational status of father

Family size

Polygamous marriage

Low income

Environmental factors

Source of drinking water

Absence of functional toilet

Health care factors

Presence of diarrhea in the past two weeks

Child immunization status

Place of delivery

Mode of delivery

Dietary factors

Non-exclusive breastfed

Time of Complementary feeding

Meal Frequency

4.8. Operational Definitions

Stunting: - Children whose height-for-age Z-score is below minus two standard deviations (-2 SD) from the median of the WHO reference population (Zeray, Kibret and Leshargie, 2019; Toma, Andargie and Alula, 2023).

Wasting: Children whose weight- for- height below −2 SD from the WHO median value (Chekol *et al.*, 2022).

Underweight: an indicator assessing adequacy of weight for age. And the causes which can be short term or long term and are difficult to define (Zone and Region, 2020).

Under five children: in this study under - five children mean those children of 0 – 59 months.

Fully Immunized: - children who received completed primary schedule of vaccine with or without a booster dose (Azmeraw, 2021).

Currently on vaccination:-children who had receiving a vaccination according to the schedule because of their age.

Unvaccinated: -a child who never took any immunization at all (Azmeraw, 2021).

Access to improved/protected drinking water: It is a type of water source that, by nature of its construction or through active intervention, is likely to be protected from outside contamination, in particular from contamination with fecal matter (Zeray, Kibret and Leshargie, 2019).

Polygamy marriage: - in this study Polygamy means father marriage to more than one spouse at a time.

Anthropometry: Measurement of the variation of physical dimensions and the gross composition of the human body at different age levels and degrees of nutrition by weight-for-age, height-for-age, and weight-for-height (Zone *et al.*, 2021).

4.9. Data collection instruments and procedures

Structured interview questionnaires were adapted from different related literatures to collect data on socio-demographic variables and factors affecting under nutrition of under-five children (Sayo and Wollega, 2014; Ayana, Hailemariam and Melke, 2015; Hossain, Abdulla and Rahman, 2023) and data was collected through face-to-face interviews after explaining the purpose of the study to the study participants and getting consent from them. Anthropometric measurements such as weight and height were taken from each child using the standard techniques. A UNICEF-recommended measuring instrument of wooden board inserted with a tape calibrated was used to collect the anthropometric data from all children. Length/height was measured without shoes, socks, hair/head scurf, or ornaments by using a wooden board inserted with a tape calibrated to read the nearest 0.1cm. The length of the children under two years was measured in a recumbent (lying) position using a horizontal wooden length board. Height was measured in children older than two years of age in a standing position to the nearest 0.1 cm using a vertical wooden height board by placing the child on the measuring board and the child standing upright in the middle of the board. The child's five contact points (head, shoulders, buttocks, knees, and heels) were adjusted to touch the board. Child weight was measured to the nearest 0.1 kg by a weighing scale, and it was taken with light clothing and no shoes. Finally, the data from anthropometric measurements was inserted into standardized WHO Anthro software to calculate the Z value of HFA, WFH, and WFA. Four data collectors, from health workers and one supervisor, participated in the data collection process. Before data collection, the data collectors and supervisors were trained for one day on the purpose of the study as well as the technique of data collection, including how to conduct the interview and supervision based on questionnaires, how to interview and take the anthropometric measurement, and the necessary feedback given by the principal investigator.

4.10. Data quality control issues

To ensure the quality of the data, a pretest (5%) of the data collection tool (a questionnaire) was done in a non-selected health facility (Aawaro Health Center) by taking 20 under five age children, and necessary corrections were made after the pretest prior to the actual data collection. The questionnaire was translated from the English version to Afan Oromo by an expert in Afan Oromo and then translated back to English. The recruited data collectors were trained by the principal investigator on the objective, confidentiality of information, relevance of the study and respondent’s rights, informed consent, and techniques of

interviews. We also checked the data for its completeness and missing information at each point. Furthermore, data was checked during entry and compilation before analysis.

4.11. Data processing and analysis

After data collection was completed, the data were checked for completeness, and then recoding and categorization were done. The software program WHO AnthroPlus was used to convert nutritional data from anthropometric measurements into Z-scores of the indices W/H, H/A, and W/A, taking age and sex into consideration using WHO reference and EPI data 4.6 versions was used to enter the data and then the data was exported to SPSS Version 26. Descriptive analysis was computed and presented with frequency tables and percentages.

The model goodness of fitness was assessed using the Hosmer and Lemeshow tests and it was 0.88 (>0.05). After checking the multi-collinearity by computing VIF (1.008, 4.08), between each independent variable, bivariate logistic regression was fitted to screen candidate variables with a p-value < 0.2. All variables that became significant with a p-value of < 0.25 in the binary logistic regression were fitted into the multivariable logistic regression through the utilization of the AOR with their 95% CI was computed to assess the strength of association between dependent variables and independent variables. Variables with a p-value of ≤0.05 with multivariable analysis were considered to be significantly associated with the outcome variable. Then the results were presented in the form of a table and summary statistics.

4.12. Ethical Consideration

The study was approved by the ethical committee at Hawassa University, College of Medicine and Health Science, School of Nursing (Ref.No: IRB/295/15), and permission was also obtained from Ambo University Referral Hospital and Ambo General Hospital management. At the time of data collection, informed verbal consent was obtained from the participants to confirm their willingness to participate. The potential benefits of participating in the study were explained to all the participants. The participants were informed about their rights to withdraw from the study at any time if they decided. A support letter was written from Hawassa University, School of Nursing, and the study was conducted after getting permission from Ambo University Referral Hospital and Ambo General Hospital management.

CHAPTER FIVE: RESULTS AND DISCUSSIONS

5.1. Results

5.1.1. Demographic related characteristics of the study participants

In this study, a total of 394 children and their corresponding mothers were enrolled, with a response rate of 100%. According to sex distribution, almost half of the participants, 205 (52%), were female, and the remaining were male participants. The mean age of the children was 27.10 $\pm$ 17.5 months, and large proportions in the age groups were 12–23 (24.4%) and 48–59 (19%) months, respectively. In terms of mothers marital status, a large proportion (94.2%) of the women reported their marital status as married, while the rest reported being divorced and widowed. Regarding family size, 207 (52.5%) of the children live in a family size of less than five. Three hundred and forty-nine (96.7%) of the caretakers and/or mothers were Oromo, and 10 (2.5%) were Amhara. From the total sample size, two hundred and twenty-eight (57.9%) of the respondents were protestant followers, followed by orthodox (28.2%). **(Table 5.1)**

Table 5.1: Demographic characteristics of respondents in Ambo Town, Oromia Regional State, Ethiopia, 2023 (n = 394)

Variables	Categories	Frequency	Percentage
Child's Sex	Male	189	48
	Female	205	52
Child's Age in month	0-6	45	11.4
	7 – 11	50	12.7
	12- 23	96	24.4
	24 – 35	60	15.2
	36- 47	68	17.3
	48 – 59	75	19
Birth order of the Child's	1	138	35
	2 – 3	209	53
	4 – 5	34	8.6
	6^{+}	13	3.3
Marital status	Married	371	94.2
	Divorced	16	4.1
	Widowed	7	1.8
Does your husband have another wife?	Yes	45	11.4
	No	349	88.6
Total Family Size	<5	207	52.5
	>5	187	47.5
Ethnicity	Oromo	381	96.7
	Amhara	10	2.5
	Gurage	3	0.8
Religion	Orthodox	111	28.2
	Prothestant	228	57.9
	Muslim	20	5.1
	Catholic	10	2.5
	Wakefata	25	6.3
	Self-employee	37	9.4

5.1.2. Socioeconomic related characteristics of the study participants

One hundred and forty-one (35.8%) of the mothers had primary school, followed by above secondary school (35.5%), and sixty-five (16.5%) mothers had no formal education. Concerning father education, 296 (75.1%) of the fathers had above secondary school. Of the 394 participants, 232 (58.9%) were mothers who were unemployed, and 95 (24.1%) were government employees. Out of all the participants, 119 (30.2%), 99 (25.1%), and 87 (22.6%) of the husbands were government employees, merchants, and self-employed, respectively. **Table 5.2)**

Table 5.2: Socioeconomic characteristics of respondents in Ambo Town, Oromia Regional State, Ethiopia, 2023 (n = 394)

Variables	Categories	Frequency	Percentage
Mother's educational Status	No formal education	65	16.5
	Primary education (1-8)	141	35.8
	Secondary education (9 -12)	48	12.2
	Above Secondary	140	35.5
Father's educational Status	No formal education	10	2.5
	Primary education (1-8)	34	8.6
	Secondary education (9 -12)	54	13.7
	Above Secondary	296	75.1
Mother's Occupation	House wife	232	58.9
	Government employee	95	24.1
	Merchant	30	7.7
	Self-employee	37	9.4
Husband Occupation	Government employee	119	30.2
	Non-Government employee	87	22.1
	Merchant	99	25.1
	Self-employee	89	22.6
Family monthly income (ETB)	≤ 4500	161	40.9
	4501 – 6696	102	25.9
	6697+	131	33.2

5.1.3. Health and Environmental related characteristics of the study participants

About 376 (95.4%) of the respondents had functional toilets, and about 267 (67%) of the participants used protected drinking water. Among the total participants, about 366 (92.9%) were delivered at the health facility. Regarding delivery, about 269 (68.3%), 94 (23.8%), and 31 (7.9%) of the respondents were delivered by spontaneous vaginal delivery, cesarean section, and instrument, respectively.

About 59 (16.7%) of children were exclusively breastfed for 6 months, and the remaining 186 (52.7%) and 108 (30.6%) children were exclusively breastfed for 6> months and < 6 months, respectively. Among all the children, 204 (57.1%) started complementary food at 6 months, 60 (17%) of the children started complementary food before 6 months, and 89 (25.2%) started after 6 months. About 224 (63.5%) of the children were fed <3 times per day, and the rest were fed ≥4 times per day. Concerning immunization, 389 (98.7%) of the children received vaccines, and 5 (1.3%) of the children did not receive any form of vaccine. Among those who had received vaccination, 246 (63.2%), 126 (32.4%), and 17 (4.4%) of children were fully vaccinated, currently on vaccination, and not fully vaccinated, respectively. Among all respondents, 61 (15.5%) had diarrhea in the last two weeks (**Table 5.3)**

Table 5.3: Health and environmental characteristics of respondents in Ambo Town, Oromia Regional State, Ethiopia, 2023 (n = 394)

Variables	Categories	Frequency	Percentage
Presence of functional toilet	Yes	376	95.4
	No	18	4.6
Source of drinking water	Protected well	264	67
	Unprotected well	130	33
Place of delivery	Health facility	366	92.9
	Home	28	7.1
Mode of delivery	SVD	269	68.3
	C/S	94	23.8
	Instrumental	31	7.9
Exclusive Breast feeding	For 6 months	59	16.7
	< 6 months	108	30.6
	>6 months	186	52.7
Age at complimentary feeding started	At 6 months	204	57.8
	< 6 months	60	17
	>6 months	89	25.2
Meal Frequency	< 3	224	63.5
	>4	129	36.5
Immunization	Yes	389	98.7
	No	5	1.3
Immunization Status	Fully vaccinated	246	62.4
	Currently on vaccination	126	32
	Not fully vaccinated	17	4.4
Presence of diarrhea in the last two weeks	Yes	61	15.5
	No	333	84.5

5.1.5. Prevalence of Under nutrition in the study area

The analysis of the three anthropometric indices revealed that the prevalence of wasting, stunting, and underweight among under five children was 21.3% [95% CI: 19.4–23.2%], 33% [95% CI: 30.8–35.2%], and 20.6% [95% CI: 19.1-22.1%], respectively. (**Figure 5.1)**

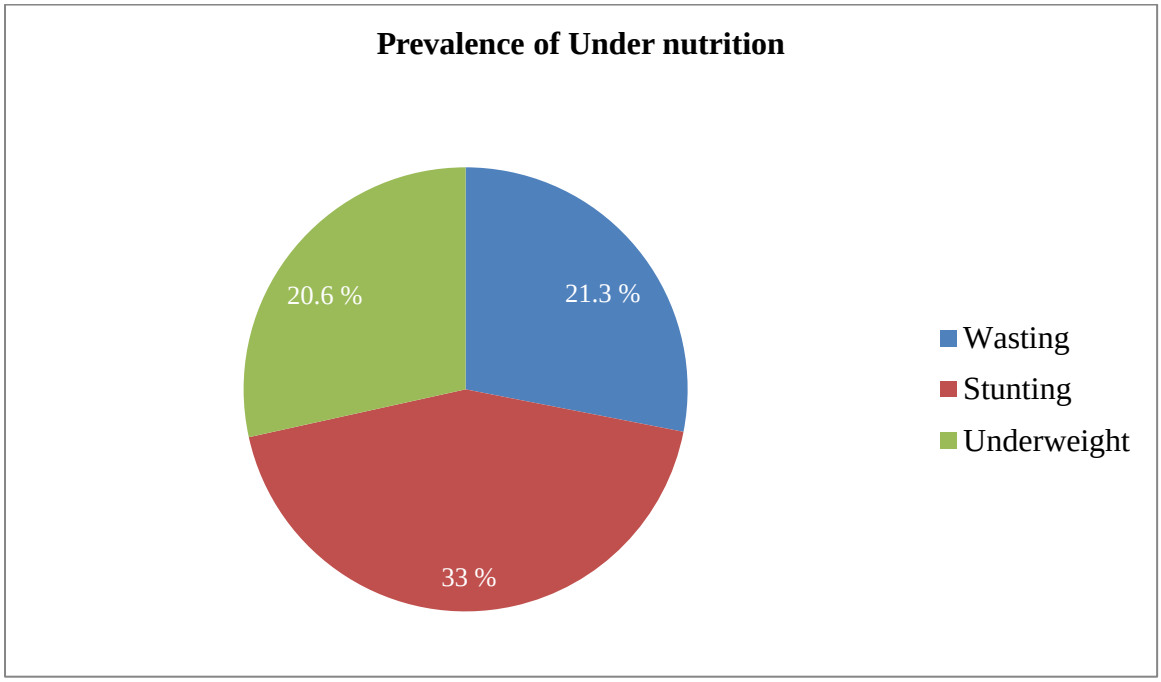

Figure 5.1: Level of under-nutrition among under-five children in Ambo town, Oromia Regional State, Ethiopia, 2023

5.1.2. Factors Associated with under nutrition

5.1.2.1. Factors Associated with Wasting

Meal frequency and family size were found to be significant predictors of wasting in the bivariable analysis. Ultimately, in the multivariable analysis, both variables continued to be independently related to wasting. Odds of wasting were higher among children who ate meals less than three per day (AOR = 2.68; 95% CI: 1.55, 4.63) than those who ate meals more than four times per day. Corresponding to this, children with family sizes greater than five had a three-times higher chance of being wasted (AOR = 2.86, 95% CI: 1.61, 5.08) than children with family sizes less than five. (**Table 5.4**)

Table 5.4: Factors associated with wasting among under-five children in in Ambo Town, Oromia Regional State, Ethiopia, 2023 (n =394)

Variables	Categories	Wasting		COR (95% CI)	AOR (95% CI)
		Yes	No		
Meal frequency	< 3	32 (9%)	193(54.4)	2.49 (1.46 – 4.24)	2.68 (1.55 - 4.63)**
	> 4	38(10.7%)	92(25.9%)	1	1
Family Size	< 5	59 (15%)	148(37.6%)	1	1
	≥5	25 (6.3%)	162 (41.1%)	2.58 (1.54 -4.34)	2.86 (1.6 - 5.1)**

Note: - ** Significant at p <0.05, 1.00= reference group

COR = crude odd ratio; AOR = adjusted odd ratio; CI = confidence interval

5.1.2.2. Factors Associated with Stunting

Bivariate logistic regression showed that mother educational status, father occupation, time of exclusive breast feeding, meal frequency, sources of drinking water, presence of functional toilets, mode of delivery, and presence of diarrhea in the last two weeks revealed some association at p-value < 0.2.

Multivariate logistic regression showed that mother education, father occupation, and the presence of diarrhea in the last two weeks were statistically associated with stunting at a p-value less than 0.05. The odds of being stunted among children whose mothers didn't attend formal education were 10 times higher (AOR=10.08; (95%CI: 4.48, 22.69)) than mothers with above secondary school and those children whose mothers had primary school were six times more likely to be stunted than mothers of children who had above secondary school (AOR= 6.27; (95% CI: 3.46, 11.35).

Similarly, children who have an unemployed father were five (AOR= 5.41, 95%CI: 2.57 – 11.3) times more likely to be stunted compared with children whose fathers were employed. Furthermore, the odds of being stunted among children who had frequent diarrhea in the two weeks prior to the gathering of data were 4.06 times (95% CI: 2.052–8.04) greater than those who had not experienced recurrent diarrhea in the two weeks prior to the gathering of data.**(Table 5.5)**

Table 5.5: Factors associated with Stunting among under-five children in Ambo town, Oromia Regional State, Ethiopia, 2023 (n =394)

Variables	Categories	Stunting		COR (95% CI)	AOR (95% CI)
		Yes	No		
Mother Education	No formal education	10 (2.5%)	55 (14.0%)	6.92(3.26-14.7)	10.1(4.48- 22.7)**
	Primary Education	30 (7.6%)	111(28.2%)	4.66(2.76-7.86)	6.27(3.46 – 11.3)**
	Secondary Education	12(3%)	36 (9.1%)	3.77(1.81-7.86)	5.74(2.57- 12.8)**
	Above Secondary	78 (19.8%)	62 (15.7%)	1	1
Husband occupation	Government emp.	46(11.7%)	73(18.5%)	1	1
	Non-government emp	26(6.6%)	61(15.5%)	1.48(.82-2.66)	1.92 (.985- 3.77)**
	Un employee	15(3.8%)	84(21.3%)	2.38(1.82-6.84)	5.4(2.57 -11.38)**
	Self-employee	43(10.9%)	46(11.7%)	.2(.14 -1.18)	.919(.482 - 1.75)
Diarrhea in last 2 wks	Yes	46	43	2.81 (1.87- 5.7)	3.32(1.90 – 5.79)**
	No	84	221	1	1

**** Significantly associated at p-value < 0.05, 1.00= reference group**

COR-unadjusted odd ratio, AOR-adjusted odd ratio, CI-confidence interval

5.1.2.3. Factors Associated with Underweight

In the bivariable analysis, diarrhea in the last two weeks prior to study, place of delivery, mother education, family size, meal frequency, age at complimentary feeding, and exclusive breast feeding were associated with underweight. From this, meal frequency, age at complimentary feeding, and exclusive breast feeding were independently associated with underweight in the multivariable analysis.

The odds ratio of being underweight was 2.89 times (95% CI: 1.27–6.56) higher among children who started complementary feeding early than those who started complementary feeding at 6 months. Similarly, odds of underweight were three times higher among children who started complementary feeding lately than those who started complementary feeding at 6 months (AOR = 3.10, 95% CI: 1.29–7.46). When compared, children who exclusively breastfed or breastfed only for > 6 months were 3 times more likely to be underweight than those who exclusively breastfed for the first 6 months (AOR = 3.42, 95% CI: 1.54–7.22). The odds of being underweight were 2.94 (95% CI, 1.58–5.47) more likely among children who fed food < 3 times than those who fed ≥ 4 times per day. **(Table 5.6)**

Table 5.6: Factors associated with Underweight among under-five children in Ambo town, Oromia Regional State, Ethiopia, 2023 (n =394)

Variables	Categories	Underweight		COR (95% CI)	AOR (95% CI)
		Yes	No		
Age at	At 6 months	52 (14.7%)	152(42.9%)	1	1
Complimentary	< 6 months	11 (3.1%)	49 (13.8%)	1.52 (0.74 -3.15)	2.88 (1.3 – 6.6)**
Feeding	>6 months	8 (2.3%)	82(23.2%)	2.30 (1.59 – 7.74)	3.10 (1.3 - 7.5)**
Exclusive	6 months	19 (5.3%)	40 (11.2%)	1	1
Breast Feeding	< 6 months	36 (10.1%)	75 (21.1%)	.99 (.50 -1.94)	.44 (.198- .971)
	>6 months	15 (4.2%)	171 (48 %)	5.47(.39 -1.18)	3.42 (1.5 - 7.62)**
Meal frequency	< 3	31(8.7%)	194 (54.6%)	2.68 (1.57 – 4.57)	2.94 (1.6 – 5.5)**
	> 4	39 (11%)	91 (25.6%)	1	1

5.2. Discussion

This study had tried to determine the prevalence and risk factors for under nutrition among under five children in Ambo town. In this study, the prevalence of wasting was 21.3% [95% CI :(19.4, 23.2)],which was similar to studies done in North Sudan 21% (Sulaiman *et al.*, 2018) and India 21% (Arulmohi, Vinayagamoorthy and R., 2017). On the other hand, the result was higher than the national figure of 7% (Demographic and Survey, 2019) and various studies done in Ethiopia like Debre Tabor, 6.2 % (Getu, 2019), Aykel town, 10% (Girma *et al.*, 2019), Arsi Zone, 14.8% (Nigusu, Kemal and Betela, 2019), Kuyu District, 14.1% (Yazew, 2022a), Jima Geneti District,11.2% (Yazew, 2022b) and other countries 9.1% in Asia, 1.3% in Latin America and Caribbean, 9.5% in Oceania and 6.4% in Africa (UNICEF, WHO and World Bank, 2020), 15.4% in Bangladesh (Rahman *et al.*, 2021) and 16.5% in Tanzania (Kejo *et al.*, 2018). This discrepancy might be due to socioeconomic differences, feeding habits of the study population, and differences in study setting.

Furthermore, it was lower than the study done in Debre Berhan town 33%, (Town, 2021) and Hawassa Zuria 28.20%, (Children and Months, 2016). The difference might be due to the time gap between studies; currently, nutrition education is disseminated through the mass media and by professionals. In this study, the prevalence of stunting was 33% [95%CI: (30.8, 35.2)], which was almost comparable with the study done in West Guji Zone 31.8% (Afework, Mengesha and Wachamo, 2021),33.58%, in Karamoja, Uganda (Obeng-amoako *et al.*, 2020) and 35.4%, in Bangladeshi (Rahman *et al.*, 2021).

However, it was much higher than other studies done in Northwest Ethiopia, 28.4% (Girma *et al.*, 2019), Sebeta Hawas district, 22.6% (Haile and Amboma, 2018) and 29.8% in Wakiso District, Uganda (Nsubuga *et al.*, 2022). The discrepancy might be due to differences in the study setting and subjects; in this study, the majority of mothers were less educated and have low income. It was lower than the national figures of the EMDHS report: 37% (Demographic and Survey, 2019), Arsi Zone, 43.4% (Nigusu, Kemal and Betela, 2019), Gondar city, 42.3% (Gelu *et al.*, 2022), and Arusha Tanzania,50% (Kejo *et al.*, 2018). Stunting showed a failure to get adequate food over long period and affected through infections. Despite little improvements from 2019 EMDHS report, the current prevalence of stunting is still a public health problem of the area. The possible explanation for this difference in prevalence might be due to a difference in the socioeconomic, agricultural productivity and food insecurity at household level.

In this study, the prevalence of underweight 20.6% [95%CI :(19.1, 22.1)], was found to be in line with the national figure 21% of EMDHS report (Demographic and Survey, 2019) and other studies done in Ethiopia such as Haramaya, district, Ethiopia, 21 %(Yisak, Gobena and Mesfin, 2015), Bahir Dar city, 22.1% (Demilew and Abie, 2022) and higher than the results in Northwest Ethiopia, 13.5% (Girma *et al.*, 2019) and 16.1 % in Wakiso District, Uganda (Nsubuga *et al.*, 2022). The possible explanation for this variation might be due to different socio-economical compositions of the study participants.

However the results of this study, was lower than study done in Arsi zone, 27.1% (Nigusu, Kemal and Betela, 2019), Bule Hora district, 29.2% (Asfaw *et al.*, 2015), 26% in Debre Berhan town (Town, 2021), Arusha Tanzania, 28.20% (Kejo *et al.*, 2018), Nigeria, 25.6% (Emmanuel *et al.*, 2016) and study done in Bangladeshi, 32.8% (Rahman *et al.*, 2021). This discrepancy might be due to the variation of socio demographic, economic, and lifestyle-related differences across the population.

Over all in this study area the prevalence of under nutrition among under five children had not decreased significantly compared to previous studies done in different parts of Ethiopia. This study shows different associated factors for under nutrition among under five children in the study area. From them, meal frequency was a strong predictor of the high prevalence of wasting. According to the finding, children who had a history of less than three times the frequency of complementary feeding were 2.68 times more likely to be wasted than those with a history of more than four times the frequency of complementary feeding (AOR = 2.68, 95% CI 1.55 to 4.63).

This result was consistent with the study conducted in southern Ethiopia (Chekol *et al.*, 2022). This might be because having frequent complementary feeding practices could lead to optimal growth and development for the child as well as increase their chances of survival. Overall, in this study area, the prevalence of under nutrition among under five children has not decreased significantly compared to previous studies done in different parts of Ethiopia.

Similarly, family size showed a statistically significant association with wasting. The odds of being wasted among children from family sizes ≥5 [AOR = 2.86, 95% CI (1.61, 5.08)] were three times higher than children from family sizes <5. This finding was supported by a study conducted in the Oromia region, west Ethiopia (AOR = 2.59 (95% CI) (1.34, 5.0)). Children from family sizes greater than or equal to 5 were 2.59 times more at risk of being wasted

compared to children from family sizes less than five (Ayana, Hailemariam and Melke, 2015). Other similar studies conducted in the Afar region, Northeast Ethiopia (Seid, Seyoum and Mesfin, 2017) and Gobu Sayo Woreda, East Wollega Ethiopia (Sayo and Wollega, 2014), also showed that children from larger family sizes of the household having five and above were more likely to develop wasting as compared to the family size of the household having less than five. Increased division of available resources in the household results in a nutritional shortfall. This supports the idea that non-nutritional factors should be essential components in the effort to reduce acute malnutrition in Ethiopia. This is due to the fact that mothers who have many children may not have appropriate child-feeding care or nearby maternal intimacy.

Maternal educational status, father's occupation, and diarrhea in the last two weeks prior to the study were predictor factors of children's stunting. Children of uneducated mothers were stunted at a greater likelihood when compared with children of educated mothers. A similar finding was observed in studies done in Ethiopia, Mekelle City (Berhe *et al.,* 2019), South Ethiopia Sidama Region (Tafesse, 2021), Bangladesh,(Akram *et al.,* 2018) and Hunan Province, China (Li *et al.,* 2022) in which mother educational status was found to be associated with child stunting. It is argued that mother's with higher educational status in the society have the ability to make decisions that improve the nutritional status of children, while those with low educational status do not ((Berhe *et al.,* 2019),(Akram *et al.,* 2018) , (Li *et al.,* 2022)). This might be because the ability of the mother to obtain and use information about appropriate caring practices and health services for the child depends on her educational status. On the other hand, more education will improve the mother's knowledge and health practices and have a greater impact on child nutrition.

Similarly, children whose father was unemployed were five times more stunted than those whose father was government-employed. This is supported by a study conducted in Ethiopia (Getu, 2022), Bangladesh (Mukrimaa *et al.,* 2016) and Burkina Faso (Fregonese *et al.,* 2017). The possible reason might be related to the income and educational level of the fathers. If the fathers were employed, they should have formal education, which implies they will have better awareness regarding child feeding practices. On the other hand, if the fathers were employed, they would have a good income as compared to unemployed fathers

The last predictor of stunting for this study was diarrhea in the last two weeks prior to the study. Children with diarrhea exposure are at increased risk of stunting compared to those with no exposure. This finding is consistent with the findings of studies conducted in Sidama Region, Ethiopia (Tafesse, 2021), Wolaita Zone, southern Ethiopia (Batiro *et al.*, 2017), and Haramaya district, Eastern Ethiopia (Yisak, Gobena and Mesfin, 2015). This might be due to the fact that children with diarrhea may have reduced dietary intake, poor absorption of nutrients, and increased nutrient loss.

On the other hand, the prevalence of Underweight was higher among children who started complementary foods after six months, followed by children who received complementary foods before six months of age compared with their counterparts or who started complementary foods at six months of age. This finding is consistent with that of previous studies in Bule Hora, South Ethiopia (Asfaw *et al.*, 2015). Inappropriate timing for introducing complementary foods may affect the child's nutritional status negatively.

This might be due to the fact that early weaning of complementary feeding leads to poor absorption due to an immature and low number of digestive enzymes, as well as low or immature immunity to protect against ARI and other childhood illnesses that will cause children to be underweight. Late weaning of complementary feeding will cause the heightened nutritional needs of the infant to become unsatisfactory secondary to increased nutritional requirements as their age increases.

Regarding exclusively breastfeeding, those children who were exclusively breastfed for more than 6 months were about 3 times more likely to be underweight than those who exclusively breastfed for 6 months. This finding was in agreement with the study conducted in India(Kumar and Singh, 2015). WHO and UNICEF recommend exclusively breastfeeding for the first 6 months, then gradually introducing appropriate foods after 6 months while continuing to breastfeed for 2 years or beyond (Fegert, 2019). Therefore, breast milk alone is not adequate for infants after 6 months for optimal growth and weight gain. This might be due to breast milk no longer providing all the nutrition they need for healthy growth. In this study, the children who fed meals < 3 times per day were 3 times more likely to be underweight than those who fed meals > 4. The results were in agreement with studies conducted in Haramaya District, Oromia, Ethiopia (Redi, Egata and Kedir, 2017).

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

The current study showed that under nutrition is more prevalent in Ambo town. Meal frequency and family size were associated factors in wasting. Mother education, husband occupation, and diarrhea in the last two weeks prior to the study were associated factors in stunting. meal frequency, age at complimentary feeding, and exclusive breast feeding were associated factors with underweight. Therefore, improving the awareness of parents toward meal frequency, complimentary feeding, and use of family planning to reduce family size by health professionals and early treatment during childhood illness is important to reduce under five under nutrition. It is also crucial to give due emphasis to interventions related to infant and young child feeding, with special emphasis on exclusive breast feeding.

6.2. Recommendations

The data from the present study provides valuable information regarding under nutrition among under five age children, and its associated factors. Prevalence of under nutrition to some extent high, therefore, the research has made the following recommendations.

For Administration and Staff of Ambo General and Referral Hospitals

To upscale education on family planning and the importance of having a manageable family size.

Revamp the fight against under nutrition through education on cheap, highly nutritious foods mothers can buy and give their children.

For Ambo town Health office

Need to increase awareness about family planning especially its importance for optimal growth of children in the community.

For HEWs

Need to give nutrition education for the community about maternal and child nutrition to accelerate prevention of under nutrition by focusing the most critical periods of child development.

Need to provide appropriate counseling on good child feeding practice to the mothers and care givers with practical demonstration of how to prepare and give optimal foods for infant and young child.

For researchers

Need to conduct further studies to determine the predictors of under nutrition with qualitative and longitudinal studies.

6.3. Limitations of the Study

The present study has some limitations. It was focused on children characteristics rather than environmental factors, and also the study is cross-sectional it does not show a cause-effect relationship between under nutrition and associated factors. The other limitation might be measurement bias that happened during Anthropometric measurement of the children.

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Annex-I Consent form

Hello, How are you, my name is Hirpa Beresu. I am a final year Post Graduate Pediatrics and Child Health Nursing (PCHN) Student at Hawassa University. The assessment of Under nutrition and its associated factors among Under five children in Ambo Town West Shoa, Ethiopia, 2023 made for the partial fulfillment of my Master's degree in PCHN Nursing. The aim of this study is to assess the prevalence and associated factors regarding Under nutrition. The information you provide is confidential and is used only for the purpose of this study. Your cooperation and participation until the completion of the questionnaire is very necessary for the successful completion of the assessment. You will neither get harmed nor will you get benefit as a result of participating in this study. I therefore ask your genuine willingness. However, you have the right to decline if you don't volunteer to participate at any time. If you have any question and confusion regarding the questions, you have the right to ask me at any point or you can contact me on the following address.

Name: Hirpa Beresu

Tele: + 251-930851798

E-mail: latihirpa2013@gmail.com

Are you willing to participate? Yes ☐ No ☐

Annex-II Data collection tool English Version

Name of the data collector_____ signature_____ Date_____

Questionnaire code_____

S. No	Questions	Response and coding category	Skip
1	**Demographic and socio economic factors**		
	Characteristics of the child		
101	How many months old is your child?	…….months	
102	Sex of child	1. Male 2. Female	
103	What is the birth order of your child?	1. 1 2. 2-3 3. 4-5 4. 6+	
2	**Characteristics of the parent and household**		
201	What is your marital status?	1. Married 2. Divorced 3. Widowed 4. Never married	
202	Does your husband have another wife?	1. Yes 2. No	
203	What is your ethnicity?	1. Oromo 2. Amara 3. Tigire 4. Gurage 5. Other specify?	
204	What is your religion?	1. Orthodox 2. Protestant 3. Muslim 4. Catholic 5. Others (specify)	

205	What is your educational level?	1. No education 2. Primary education (1-8) 3. Secondary (9-12) 4. Above secondary	
206	What is your husband's educational level?	1. No education 2. Primary education (1-8) 3. Secondary (9-12) 4. Above secondary	
207	What is your main occupation?	1. House wife 2. Government employee 3. Non-government employee 4. Merchant 5. Self-employee 6. Others (specify)	
208	What is your husband's main occupation?	1. Government employee 2. Non-Government employee 3. Merchant 4. Self-employee 5. Others (specify)…..	
209	How much is your monthly income in birr?	…….. birr	
210	How many peoples are living in your house?	……..	
3	**Environmental factors**		
301	Do you have functional toilet facility in your house?	1. Yes 2. No	

302	What is the main source of drinking water for members of your household?	1. Piped into dwelling 2. Piped to yard/plot 3. Public tap/stand pipe 4. bottled water know 5. Protected well 6. Unprotected well 7. Other (specify)…	
4	**Health care factors**		
401	Where did you deliver your child?	1. Health facility 3.Home	
402	What is your mode of delivery?	1.SVD 2.C/S 3.Instrumental	
403	Did your child received vaccination?	1. Yes 2. No	If no skip
404	If yes did your child took all vaccination? If card available check	1.Fully Vaccinated 2. Currently on vaccination 3. Not-fully vaccinated	
405	Did your child have recurrent episodes of diarrhea (3 times and more) in the past two weeks?	1. Yes 2. No	
5	**Dietary factors**		
501	For how long your child fed breast only?	…….. months	
502	When did you start giving complementary foods to your child?	…….. months	
503	How many times your child feed meals per day?	……times	
6	**Anthropometric measurement**		
601	Length or height	……cm	
602	Weight	……....kg	

Annex-III Uunkaa Eeyyamaa

Heloo, Akkam jirtu, Hirphaa Barasuun jedhama. Ani barataa Digirii lammaffaa muummee Nursiingii Fayyaa Daa'immanii Yuunivarsiitii Hawaasaa ti. Yeroo ammaa kana mata duree **The assessment of Under nutrition and its associated factors among Under five children in Ambo Town West Shoa, Ethiopia, 2023** jedhurratti eebbaaf qorannoo hojjechaan jira. Kaayyoon qorannoo kootis faffaci'insa Hir'ina nyaataa daa'imman waggaa shanii gadi jiranii fi sababoota isaanii adda baasuufi. Odeeffannoo nuuf kennitaniif icciitiin keessan eegamaa dha. Kaayyoon isaas qorannoo kanaaf qofa gargaaruu dha. Obsaaf hirmaannaan hanga xumura af-gaaffii kanaatti isin gootan baay'ee murteessaa dha. Hirmaannaa keessaniif bu'aan kallattiidhaan isiniif ta'u ykn miidhaan adda ta'ee isinirra gahu hin jiru. Kanaafuu, fedha keessaniin isinirraa barbaada. Af-gaaffii kanarratti hirmaachuu yoo hin feene, adda kutuuf mirga guutuu qabdu. Af gaaffii kanarratti waanti isiniif hin galle ykn bitaa isinitti gale yoo jiraate, yeroo kamillee lakkoofsa ykn email armaan gadiirratti na argachuu dandeessu.

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Af gaaffi kanarratti hirmaachuuf fedha qabduu? Eeyye ☐ Lakki ☐

Annex- IV Data collection tool Afan Oromo Version

Lakk.	Gaaffii	Deebii	darbi
	Rakkoo sababa daa'ima waliin wal qabatan		
101	Umuriin daa'ima keetii meeqa?	Ji'a_____	
102	Saalli daa'ima keetii maalii dha?	**1**.Dhiira **2**.Dubara	
103	Daa'imni kee meeqaffarratti dhalate?	**1**.1, **2**. 2 -3, **3.**4 -5, **4.** 6^{+}	
2	**Rakkoo sababa haala maatii fi jireenya manaa keessaa**		
201	Haalli gaa'ela keeti maalii?	**1**.Heerumera **2**.heerumeen hiike **3**.narraa du'e **4**. hin heerumne	
202	Abbaan manaa kee haadha manaa biraa qabaa?	1.eeyye 2.lakki	
203	Sabummaan kee maali?	**1**.oromoo **2**. Amaaraa **3**.Tigiree **4**. Guraagee **5.** Kan biraa (ibsi____)	
204	Amantiin kee maalii dha?	**1**.Ortodoksii **2.**Proteestaantii **3**.Musiliima **4**.Kaatolikii **5**.kan biraa(ibsi_____)	
205	Sadarkaan barnoota keeti meeqa?	1.hin baranne 2.sadarkaa tokkoffaa 3.sadarkaa lammaffaa 4.sadarkaa lammaffaa ol	
206	Sadarkaan barnoota abbaa manaa keeti meeqa?	1.hin baranne 2.sadarkaa tokkoffaa 3.sadarkaa lammaffaa 4.sadarkaa lammaffaa ol	
207	Hojiin kee maalii dha?	**1**.haadha manaa **2**.hojjettuu mootummaa **3**.hojjettuu miti-mootummaa **4**.daldaaltuu **5**.hojii dhuunfaa **6**. kan biraa (ibsi_____)	
208	Hojiin Abbaa Manaa kee maalii dha?	**1**.hojjetaa mootummaa **2**.hojjetaa miti-mootummaa **3**.daldaalaa **4**. hojii dhuunfaa **5.** kan biraa (ibsi_____)	
209	Galiin keessan ji'aan meeqa?	Qarshii _____	
210	Mana keessanitti nama meeqaan jiraattu?	_____	

3	**Rakkoo sababa naannoon wal qabatan**		
301	Maddi bishaan dhugaati miseensonni maatii kee fayyadaman essarraayi?	1. Tuubboodhan gara mana jireenyaatti 2. Tuubboodhaan gara mooraatti 3. Tuubboo dhaabataa uummata 4.bishaan highland/qaruuraa 5.qulqullinnisaa kan eegame 6.qulqullinni isaa kan hin eegamne 7.kan biraa (ibsi)	
302	Mana fincaanii tajaajila kennu qabduu?	1.eeyyee 2.lakki	
4	**Rakkoo fayya daa'imaan wal qabatu**		
401	Daa'ima kee eessatti deessee?	1.mana yaalaatti 2. manatti	
402	Akkamitti deesse?	1.karaa uumamaa 2.baqaqsuudhaaan 3. Meeshaan	
403	Daa'imni kee taalallii fudhateera/ti?	1.eeyyee 2.lakki	Yoo lakkii ta'e 404tti darbi
404	Yoo eeyyee ta'e taalallii hunda fudhateera/ti? Kaardiin yoo jiraate mirkaneessi	1.taalallii hunda fudhateera/ti 2.amma taalalliirra jira/rti 3.taalallii hunda hin fudhanne	

405	Torbee lamaan darban keessa garaa kaasaa/albaatiin (guyyaatti lamaaf isa ol) daa'ima kee qabateera?	1.eeyyeen 2.lakki	
5	**Rakkoo sababa nyaataan wal qabatan**		
501	Yeroo hangamiif da'imni kee harma qofaa hodhe/ote?	Ji'a_____	
502	Daa'ima kee nyaata dabalataa yoom eegalchiiste?	Ji'a_____	
503	Daa'imni kee guyyaatti marsaa meeqa nyaata?	Si'a_____	
6	**Safaramoota**		
601	Dheerina/hojjaa	_____cm	
602	Ulfaatina	_____kg	

Hirmaannaa keessaniif Galatoomaa !!!

WHO. 2014. *Home/Health topics/Adolescent health* [Online]. WHO. Available: https://www.who.int/health-topics/adolescent-health#tab=tab_1 [Accessed 12/04/2023 2023].