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The Prevalence of Acute Malnutrition and Associated Factors Among Children Aged 6-59 Months In Kamashi District, Benishangul Gumuz Region, Western Ethiopia

Simeneh, Addis

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**BAHIR DAR UNIVERSITY COLLEGE OF MEDICINE AND
HEALTH SCIENCE SCHOOL OF PUBLIC HEALTH
DEPARTMENT OF EPIDEMIOLOGY AND BIostatISTICS**

**THE PREVALENCE OF ACUTE MALNUTRITION AND
ASSOCIATED FACTORS AMONG CHILDREN AGED 6-59
MONTHS IN KAMASHI DISTRICT, BENISHANGUL GUMUZ
REGION, WESTERN ETHIOPIA**

BY: SIMENEH ADDIS (BSC IN PUBLIC HEALTH)

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REGION, FROM OCTOBER 26 TO DECEMBER 15, 2019**

**PRINCIPAL INVESTIGATOR: SIMENEH ADDIS (BSC IN PUBLIC
HEALTH)**

PHONE: +251925972485

Email: simishaddis@gmail.com

ADVISORS: GEDEFAW ABEJE (MPH/RH, ASSISTANT PROFESSOR)

PHONE: +251911550877

Email: abejedefaw@gmail.com

ANIMAW ASRAT (MPH, ASSISTANT PROFESSOR)

Phone: +251911751787

Email: anemawasrat@gmail.com

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Abstract

Background: Childhood acute malnutrition is common in developing countries. The African region and South-East Asia have the highest prevalence of under nutrition. Ethiopia is also one of the countries in Sub-Saharan Africa with the highest rate of under-five malnutrition.

Objective: To assess the prevalence of acute malnutrition and associated factors among children aged 6-59 months in Kamashi district, Benishangul Gumuz Region, Ethiopia, 2019

Methods: A community based cross-sectional study design was conducted from October 26 to December 15, 2019 at Kamashi district. A total of 814 children were included in the study. Sample size was calculated using single population proportion and online EPI INFO version 7. Multistage sampling technique was employed to select children from households. Data was collected using structured questionnaire and anthropometric measurements. Data were entered to EPI INFO version 7 and exported to SPSS version 23 for analysis. Sex, age, height and weight were entered to ENA for SMART 2011 software to convert nutritional data to Z- score of index WFH and Binary logistic regression with backward elimination technique was conducted to identify factors associated with acute malnutrition.

Results: The overall prevalence of acute malnutrition in Kamashi district was 9.8 % (8.7-13.1, 95% CI) with moderate acute malnutrition accounts 5.5 % (4.5-7.9, 95 % CI) and severe acute malnutrition was 4.3 % (3.4-6.4, 95% CI). The prevalence of edema was 0.4%. Factors positively associated with acute malnutrition were children from care givers who had primary and secondary level of education (AOR=0.16 95% CI 0.06-0.41, AOR=0.21 95% CI 0.07-0.68), children who had fever in the past two weeks prior to study (AOR=4.01 95% CI 1.86-8.66), children from families who had < 5 number of children (AOR=3.63 95% CI 1.60-8.31), and children who had vaccinated according to their age (AOR=0.38 95% CI 0.18-0.82), children from mothers who had postnatal care visits (AOR=0.13 95% CI 0.06-0.30), children who had less than 24 months interval from the preceding birth (AOR=3.27 95% CI 1.75-6.12) were negatively associated factors.

Conclusion and recommendation: The prevalence of acute malnutrition in Kamashi district was described as poor according to recommended prevalence by world health organization. So, early screening for malnutrition and nutrition surveillance activities should be strengthened.

Key words: Acute malnutrition, Prevalence, Kamashi district, Ethiopia

List of Acronyms/abbreviations

ANC	Antenatal Care
AOR	Adjusted Odds Ratio
CI	Confidence Interval
COR	Crude Odds Ratio
DALYS	Disability-Adjusted Life Years
EDHS	Ethiopian Demographic and Health Survey
EFY	Ethiopian Fiscal Year
ENA	Emergency Nutrition Assessment
FP	Family Planning
HH	Household
IDPs	Internally Displaced Persons
MAM	Moderate Acute Malnutrition
MUAC	Mid-Upper-Arm-Circumference
NCHS	National Center For Health Statistics
PNC	Post Natal Care
SAM	Severe Acute Malnutrition
SD	Standard Deviation
SPSS	Statistical Product and Service Solution
UNICEF	United Nations Children’s Fund
WB	World Bank
WFH	Weight-For-Height
WHO	World Health Organization
WHZ	Weight for Height Z-score

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1. INTRODUCTION

1.1. Background

Adequate nutrition is essential in early childhood to ensure healthy growth, proper organ formation and function, a strong immune system, and neurological and cognitive development. Undernutrition is the main determinant of mortality and morbidity in young children worldwide(1).

Acute malnutrition results from sudden reductions in food intake or diet quality and is often combined with pathological causes. It is defined using anthropometric cutoffs and clinical signs(2). Causes of acute malnutrition are numerous and multifaceted. It depends on complex interactions of factors like socioeconomic, environmental, reproductive, institutional, cultural, political and regional factors(3, 4).

The weight and height of children aged 6-59 months are used as proxy measures for the general health of the entire population. Weight-for-height (wasting) provides the clearest picture of acute malnutrition in a population at a specific point in time. For children aged 6-59 months, Moderate Acute Malnutrition (MAM) is identified by moderate wasting weight-for-height between <-2 and -3 Z- score and Severe Acute Malnutrition (SAM) is identified by severe wasting weight-for-height <-3 Z-score or the presence of bilateral pitting edema(5).

Nearly 51 million children aged under five were wasted and 16 million were severely wasted worldwide, more than two thirds of all wasted children were lived in Asia and more than one quarter lived in Africa(6). It still affects 50.5 million children under five with more than half of the world's wasted children, 26.9 million living in South Asia(7).

Childhood acute malnutrition is common in developing countries and is found in about 8% of children worldwide. In humanitarian emergencies, such as drought, war, or ethnic violence, childhood malnutrition often escalates; and the separation of the treatment of MAM and SAM can become administratively cumbersome and redundant(8).

Acute malnutrition in childhood is a serious global health concern affecting an estimated 50 million children aged <5 years in low and middle income countries(6, 9). It is the leading causes of mortality, accounting for 11.5% of total deaths and contributes significantly to the overall disease burden(9).

Asia and Africa had the greatest prevalence in all forms of undernutrition. The prevalence of acute malnutrition in under five children in Asia and Africa is 69% and 27% respectively(6). Overall, 10% of children in Ethiopia are wasted, and 3% are severely wasted. In Benishangul Gumuz Region, the prevalence of acute malnutrition in under five children is 11.5% and 3.1% are severely wasted(10).

1.2.Statement of the problem

Globally, it is estimated that 35% of deaths among under-five children is attributed to under nutrition. Over two-thirds of these deaths occur during the first year of life. Undernutrition is a risk factor for infectious disease and deaths(11).

About 52 million children (7.7% of all children under-five years of age worldwide) have wasting, and one-third (17 million) have severe acute malnutrition(1).

Globally, approximately 33 million under five years of age are affected by moderate acute malnutrition and at least 19 million under five age children are affected by severe acute malnutrition(12).

Moderate acute malnutrition affects about 60 million children while around 13 million are severely malnourished worldwide. Globally, undernutrition contributes for more than one third of child deaths which can be prevented through public health interventions(11).

Globally, around 52 million (8%) children under the age of five years were wasted and more than 70% were from Sub-Saharan Africa and Asia(13).

The African region and South-East Asia have highest prevalence of under nutrition, with the former accounting for about 39.4% of the stunted, 24.9% of the underweight and 10.3% of wasted children under-five years of children. Sub-Saharan Africa accounts for one third of all undernourished children globally(14).

In Sub-Saharan Africa, acute malnutrition affects nearly 1 in 10 children aged under-five years. More than 80% of 2 million children treated for acute malnutrition were found in Sub Saharan Africa(15).

In Uganda, the national prevalence of acute malnutrition (wasting) among children 6-59months of age is 4% and it is 10% for West Nile sub- region(16). Acute malnutrition continues to be a serious public health concern especially in conflict and post-conflict recovery situations. Children weakened by all forms of malnutrition often die from diseases which are both preventable and easy-to-treat, such as diarrhea, pneumonia, and malaria (13).

Millions of children in low-income countries suffer from undernutrition, which continues to be a major public health problem in developing countries. It causes about 300,000 deaths per year directly and indirectly responsible for more than half of all deaths in children. It is an underlying cause of the death of 2.6 million children each year, and one-third of the global total of

children's (7.6 million child) deaths each year before their fifth birthday through weakening the body's resistance to illness(17).

Ethiopia is also one of the countries in Sub-Saharan Africa with the highest rate of under-five malnutrition (18). Malnutrition is an underlying factor in over half of under-five child deaths in Ethiopia, and children with severe acute malnutrition face a 30-50% chance of dying unless treated(19).

Ethiopia is one of the countries with very high burden of undernutrition. Undernutrition can best be described in the country as a long term year round phenomenon due to chronic inadequacies in food combined with high levels of illness in under-five children. Undernutrition is currently the most widespread and serious health problem of children(3).

Overall, 10% of children in Ethiopia are wasted, and 3% are severely wasted (below -3 SD). In Benishangul Gumuz region about 11.5% of under-five children are wasted(10).

Causes of acute malnutrition are numerous and multifaceted. It is highly prevalent in developing countries in general and in Ethiopia(3). Children who were from households with more than one under five children, and who practice bottle feeding(11) are highly associated factors with acute malnutrition. Children who had complementary feeding before six months and mothers who had never using family planning methods are highly associated factors for acute malnutrition (wasting). This is a study done in Bule Hora district, Southern Ethiopia(3).

In Kamashi Zone, Benishangul Gumuz region, Ethiopia, there were internally displaced persons (IDPs) in all woredas due to long lasting conflict in 2018 to 2019 and there was a high shortage of food and dietary intake which in turn leads to acute malnutrition in children. The prevalence of acute malnutrition causes significant cost on society's economy. The high mortality due to malnutrition causes loss of economic potential of children and predisposing them for infectious diseases. But the prevalence of acute malnutrition in Kamashi Zone and district is unknown and no study was done on acute malnutrition among children aged 6-59 months. So this study was designed to determine the prevalence and identify factors associated with acute malnutrition among children aged 6-59 months in Kamashi district, Benishangul Gumuz Region, Ethiopia.

1.3. Significance of study

The findings of this study will help the Woreda, Zonal and Regional health workers to take appropriate prevention activities and for caretakers, to improve feeding practices for themselves and their children. This study will also help the non-governmental organizations and other stakeholders to plan and take appropriate measures towards the intervention activities.

The information obtained can be used as a guide for formulating programs related to the prevention and control of acute malnutrition. The gaps identified in the study can be used for further research.

1.4.Literature Review

1.4.1. Magnitude of acute malnutrition

Acute malnutrition is a major global health problem. In 1990, the global estimate of children suffering from MAM or SAM was 58 million according to UNICEF, implying that between 1990 and 2011, the prevalence of acute malnutrition reduced by only 11%. In the year between 2007 and 2011, South Sudan had the highest prevalence of MAM (23%) and SAM (10%) followed by India with MAM (20%) and SAM (6%) and Indonesia had the lowest prevalence with MAM (13%) and SAM (6%) worldwide(20).

Globally, acute malnutrition accounts for 4.7% of all deaths of children aged under-five years. Children with SAM are 11 times more likely to die than healthy individuals. Annually, SAM is responsible for up to 2 million deaths(21).

According to the UNICEF-WHO-The World Bank Joint Child Malnutrition Estimates report in 2012, globally, an estimated 52 million children under-five years of age, or 8%, were wasted. About 70% of the world's wasted children live in Asia, most in South-Central Asia(22).

In 2016, UNICEF-WHO-WB reported the prevalence of wasting in America, Western Pacific and Africa as 0.9%, 2.4%, and 7.4% respectively and prevalence of severe wasting was 0.1%, 0.6% and 2.2% respectively. These children are at substantial increased risk of severe acute malnutrition and death(23).

According to the global nutrition report in 2018, a global total of 50.5 million children under the age of 5 could be classified as having acute malnutrition.

A cross sectional survey conducted in Pakistan revealed that the prevalence of wasting (acute malnutrition) was 16.2%(24). A qualitative exploratory case study done in Bangladesh revealed that the prevalence of acute malnutrition was 13.5%, representing about 2.2 million children, of which 10.1% suffer from MAM and 3.4% suffer from SAM and the prevalence of acute malnutrition in the host communities of Ukhiya and Teknaf was very similar to the national rate with acute malnutrition prevalence of 11.9% and 14.3% respectively and a SAM rate of 2% in both sub-districts(25). A cross sectional survey done in South Asia revealed that the prevalence of wasting in these populations ranged from 9.5% in Afghanistan to 21.0% in India, while the prevalence of severe wasting ranged from 1.9% in Nepal to 7.4% in India(26).

A cross sectional study done in North –Western Uganda revealed that the overall prevalence of acute malnutrition was 5.6% with moderate acute malnutrition 4.5% and severe acute malnutrition was 1.1%(13).

A cross sectional study done in South-East Nigeria revealed that the prevalence of acute malnutrition was 9.7% with prevalence of MAM and SAM was 5.4% and 4.4% respectively(27). According to Morbidity and Mortality Weekly Report in Niger, the prevalence of acute malnutrition ranged from 9.0% in Niamey to 17.9% in Tahoua. The regions with the highest levels of SAM were Maradi and Tillaberi (2.3% and 2.0%) respectively. The prevalence of acute malnutrition was 22.4% among children aged 6--35 months and 6.1% among children aged 36--59 months(28).

A study done in Dabat district, Northwest Ethiopia revealed that the prevalence of acute malnutrition was 18.2%, of which 10.3% and 7.9% were moderately and severely wasted respectively(4). A cross sectional study done among nomadic population in Hadaleala district, Afar region, northeast Ethiopia revealed that the overall prevalence of acute malnutrition was 11.8% and it was above national prevalence(29).

A study done in Shinille Woreda, Ethiopian Somali regional state revealed that the prevalence of acute malnutrition was 20% with 18.8% of them were moderately wasted and 1.2% were severely wasted(30). A study done in Sodo Zuria District, South Ethiopia revealed that the prevalence of acute malnutrition was 11.1%, of which 4.4% were severely wasted and 6.7% were moderately wasted. The highest prevalence of wasting (3.2%) was seen among children aged 48–59 months(31).

1.4.2. Factors associated with acute malnutrition

The causes of acute malnutrition are numerous and multifaceted. These causes are interrelated with each other and hierarchically ordered. The most immediate determinants are poor diet and disease which are themselves caused by a set of underlying factors; household food security, maternal/ child caring practices and access to health services and healthy environment. These underlying factors themselves are influenced by the basic socio-economic and political conditions (3, 32, 33).

Socio demographic factors

A study conducted in Pakistan revealed that children from poorest households were two times more likely to be wasted (20.6%) than children from wealthiest households (10.3%). Proportion of wasting was not prominent between boys and girls. Wasting increased with age, peaking at 20.8% among children aged 24-35 months. This study revealed that family size, mother's education were not significantly associated with acute malnutrition(24).

A study done in Bangladesh revealed that age of child, sex of child, place of residence and wealth index were significantly associated risk factors of acute malnutrition in which wasting decreased as the child goes older and the prevalence of acute malnutrition was slightly higher among males than females. Children from poorer households were at higher risk of acute malnutrition than wealthier households(34).

A survey done in South Asia revealed that child's age was associated with wasting in all countries and child Sex was also significantly associated with wasting in most countries, but not in the Maldives and Nepal. In general, boys were more likely to be wasted than girls, with increased odds of wasting ranging from 16% in India to 36% in Pakistan. At the household level, the prevalence of wasting was higher among children from poorer households. The prevalence of wasting, severe wasting and the co-occurrence of being wasted and stunted, was higher in rural areas than in urban areas in all countries(26).

A study done in Nepal revealed that children with mother's age at birth less than 20 or greater than 35 years, illiterate father, low socioeconomic status were more likely to have acute malnutrition but mother's educational level was not associated with acute malnutrition(35).

A cross sectional study done in North –Western Uganda revealed that boys had higher prevalence of acute malnutrition than girls but there were no statistically significant differences in the prevalence of acute malnutrition by nationality and severe acute malnutrition was more common among the younger age group 6-17 months (1.2%) and decreased with age(13).

A study conducted in Afar revealed that the presence of two and three children in the household was significantly associated with acute malnutrition(29). A study conducted in pastoral communities of Afar region revealed that children living in HHs with greater than or equal to five family members were more likely to be wasted than with those with less family members(36). A study conducted in Gondar revealed that children who had daily laborer fathers were more likely to be wasted than who had Government employee(37). According to a study

done in Shinille Woreda, Ethiopian Somali regional state, family size, maternal education, monthly income were associated factors of acute malnutrition(30). A study conducted among agro-pastorals in Northeastern Ethiopia showed that children with female headed HHs were less acutely malnourished than those with male headed HHs(38). A study conducted in Menz North Shewa revealed that children with age groups 48-59 months were more affected with acute malnutrition and 24-35 month children were less affected and male children in rural and urban area were more likely to be wasted than females(19).

Child caring characteristics

A cross sectional study in Nepal revealed that children who had bottle feeding, and not initiating complementary feeding at the age of 6 months, birth interval less than 24 months were more likely to have acute malnutrition but initiation of breastfeeding, colostrum feeding, exclusive breastfeeding were not significantly associated with SAM (35) and a study in Uganda, low birth weight children were more likely to be wasted than their counterparts(13).

A study done in Pakistan revealed that diarrheal episodes were not associated with acute malnutrition(24) in contrast a cross sectional study done on acute malnutrition among children aged 6–59 months of the nomadic population in Hadaleala district, Northeast Ethiopia revealed that childhood diarrheal diseases and not vaccinated were associated factors of acute malnutrition(29). A study conducted in pastoral communities of Afar region, children who received prelacteal feeding at time of birth were more likely to be wasted than those who don't received and children who had diarrhea in the past 2 weeks prior to study were more likely to be wasted than those who don't had diarrhea(36).

A study conducted among agro-pastorals in Northeastern Ethiopia revealed that diarrhea in the past 2 weeks prior to study and bottle feeding were associated factors of acute malnutrition(38). A study conducted in Gondar revealed that children who weren't exclusively breast-fed for the first six months and who faced eating problem in the last 2 weeks prior to study were more likely to be wasted(37). A comparative cross sectional Study conducted in Gimbi district, Oromia region, Ethiopia showed children who had fever and with no history of vaccination were more likely to be wasted(39).

A study conducted in Bure town revealed that children who had diarrhea and acute respiratory tract infections were more likely to have acute malnutrition(40). A study done in Gambella town revealed that children who had diarrhea and didn't receive vaccination were more likely to be

wasted than their counterparts(41). According to a study in Oromia region, children who had diarrhea and febrile illness in the past 2 weeks prior to study were more likely to be wasted(42).

Maternal health care characteristics

A study done on child wasting in Northwest Ethiopia revealed that children whose mothers initiated breast feeding after one hour of delivery, mothers with no postnatal visit and vitamin A supplementation, poor dietary diversity and mothers who engaged in other work category were associated risk factors for acute malnutrition(4) and parity wasn't associated factor of acute malnutrition according to a study in Pakistan(24). A study conducted in Oromia region revealed that children of mothers who didn't take extra meal during pregnancy and lactation were more likely to be wasted(43).

According to a study done in Ethiopian Somali regional state, extra feeding during pregnancy/lactation, ANC visit, continuation of breast feeding, birth order, how long after birth did you first put the child to breast feed have significant association to acute malnutrition(30).

A study done among rural dwellers in south Ethiopia revealed that children whose mothers don't attended ANC were associated with acute malnutrition(44). A Study conducted in Gimbi district, Oromia region, Ethiopia showed that children born at home were more likely to be wasted than born at health facility(39). According to a study in Bure town, children with preterm and with no ANC follow up mothers were more likely to have acute malnutrition(40).

Environmental health and sanitation

Lack of improved water source was associated with greater likelihood of child wasting in India and Bangladesh(26). A study conducted in Afar revealed that unprotected drinking water source, absence of latrine and hand washing with soap were associated factors of acute malnutrition(29).A study conducted in Oromia region revealed that children who lived in HHs with lack of house quality and insufficient water supply were more likely to be wasted(43). According to a study done at Hidabu Abote district, Oromia, children who were from those family not treat water by any means (boiling) were 2.4 times more likely wasted as compared to children who were from those family treat drinking water obtained from river and unprotected spring water(32). According to a study done in Ethiopian Somali regional state, availability of latrine have significant association to acute malnutrition(30).

According to a study in Oromia region, children with mothers who had habit of less frequent hand washing and who had no latrine were more likely to be wasted(42).

1.5. Conceptual framework

The following conceptual framework was derived from review of literature of this study.

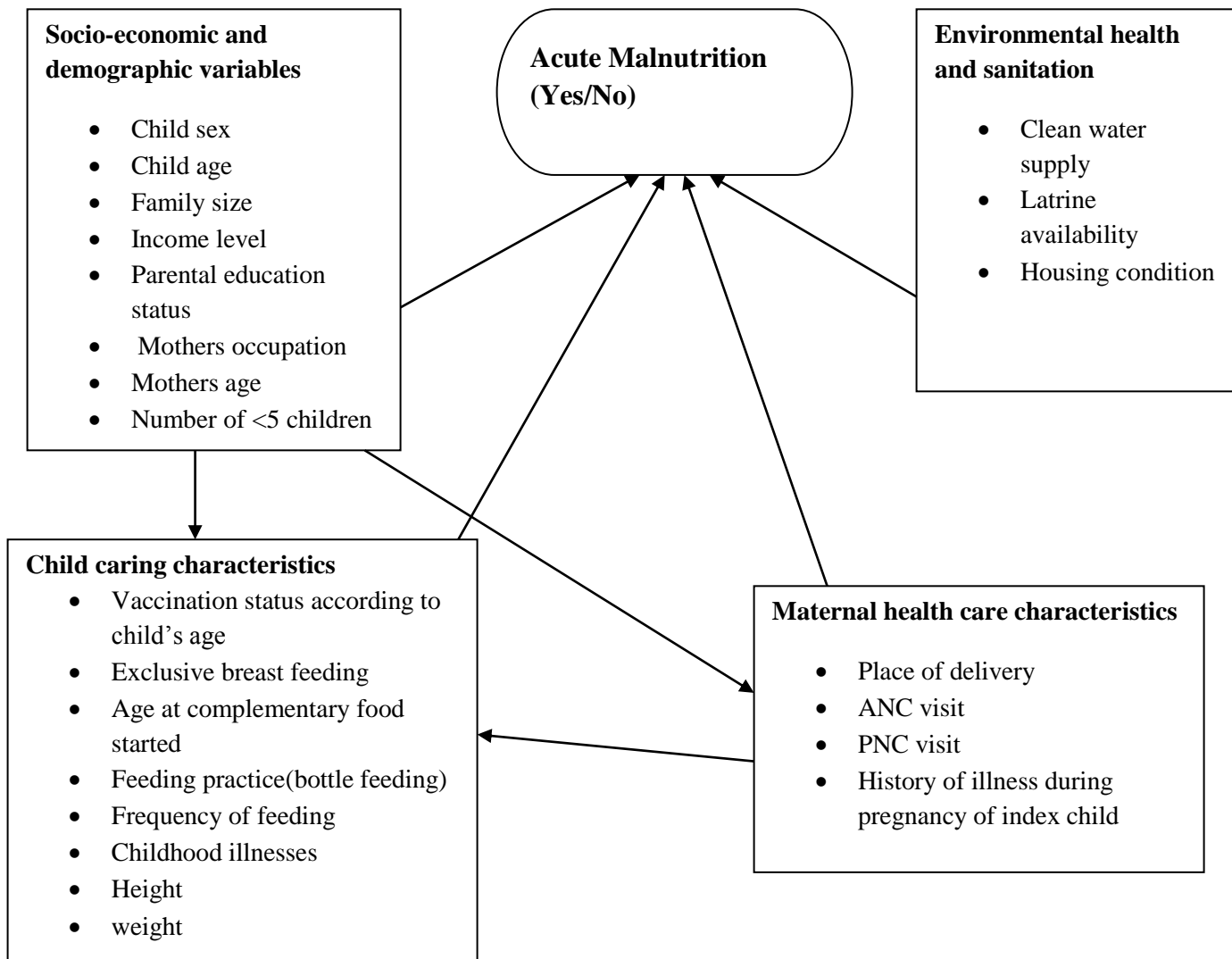


Figure 1 Conceptual framework for the study on the prevalence of acute malnutrition and associated factors at Kamashi district 2019 (2, 32)

2. OBJECTIVE

2.1.General objective

To assess the prevalence of acute malnutrition and associated factors among children aged 6-59 months in Kamashi district, Benishangul Gumuz Region, Ethiopia, 2019

2.2.Specific objectives

- ✓ To determine the prevalence of acute malnutrition among children aged 6-59 months at Kamashi district, Benishangul Gumuz Region, Ethiopia, 2019
- ✓ To identify factors associated with acute malnutrition among children aged 6-59 months at Kamashi district, Benishangul Gumuz Region, Ethiopia, 2019

3. METHODS AND MATERIALS

3.1. Study design

A community based cross sectional study was conducted to assess the prevalence of acute malnutrition and associated factors among children aged 6-59 months.

3.2. Study area and period

The study was conducted from October 26 to December 15, 2019 at Kamashi district. Kamashi district is one of the 20 woredas in the Benishangul Gumuz region, Ethiopia, Part of the Kamashi Zone. It is bordered by the Didessa River on the east which separates it from Yaso and Belo jiganfoy by the Oromia region on the south and west, and by Agalo Meti on the northwest in Benishangul Gumuz Region, Ethiopia. It is located around 225 km from Regional capital, Assosa town. It has an estimated area of 1,622.50 square km. The woreda is divided in to 15 kebeles with a total population of 25,295 with males account about 12,749 and females are 12, 546. The total households in Woreda are 5,621 with under-five children account about 4,092 and children aged 6-59 months account 3,899(45).

3.3. Source and Study population

Source population were all children aged 6-59 months with their care taker living in Kamashi district, study population were children aged 6-59 months in randomly selected kebeles and study unit was all children aged 6-59 months randomly selected from households. The sampling unit was households at which one child was selected.

3.4. Inclusion and exclusion criteria

3.4.1. Inclusion criteria

The inclusion criteria of study participants were children aged 6-59 months who live in Kamashi district.

3.4.2. Exclusion criteria

The exclusion criteria were study participants who didn't have care taker in the household and disabled children which affect anthropometric measurement.

3.5. Sample size determination and sampling techniques

The sample size of the first specific objective prevalence of acute malnutrition in Kamashi district, was determined using single population proportion formula by using 19% prevalence of acute malnutrition (wasting) in Gambella Town(41), 95% confidence interval (CI), marginal error (d) of 4% and 10% non-response rate (contingency) was added to the total sample size.

A Z-value of 1.96 used at 95% CI and d of 4%. (n= sample size, p=prevalence, d= margin of error)

$$n = Z^2 p (1-p) / d^2 = (1.96)^2 0.19(1-0.19) / (0.04)^2 = 370$$

So, with adjustment of 10% non-response rate of computed sample size which means 10% of 370 was added to the sample size $n = (370 + 37) = 407$

Since the sampling technique was multi-stage sampling, design effect was used by multiplying the computed sample size by 2 and the final sample size was $n = 814$ children aged 6-59 months.

The sample size calculation for the second specific objective was calculated by using EPI INFO version 7 with the following assumptions Confidence Interval=95%, Power =80% and respective prevalence of nutritional index. The factors which have significant association with acute malnutrition by having different literatures were diarrhea morbidity, frequency of feeding and exclusive breast feeding practices.

So the sample size was determined by using the above listed significant factors for acute malnutrition by EPI INFO version 7 with the following assumptions.

Confidence interval (CI), 95% and Power, 80%

Table 1 Sample size determination for associated risk factors of acute malnutrition in Kamashi district, Benishangul Gumuz Region, Western Ethiopia, 2019

Reference	Associated factor	% outcome among exposed	% outcome among unexposed	Adjusted odds Ratio (AOR)	Ratio	Sample size
Solomon,2018	Diarrhea morbidity in the past 2 weeks	23.7%	2.7%	0.10	1.2	174
Ma'alın et al. 2016	Immunization status	25% No immunization	5.1% Immunized	7.57	0.3	332
Tufa et al.2017	Age at complementary feeding started (in months)	55.6% started at <6 months	12.8% started at >=6 months	2.2	28	438

Since the sample size for the first objective represents the sample size for second objective, it is taken as the final sample size for this study n=814.

So the required sample size among children aged 6-59 months is n=814 to be included in this study.

3.6.Sampling technique

Multi-stage sampling technique was conducted to select children aged 6-59 months from households. From 15 kebeles in the district, four kebeles were selected by simple random sampling (lottery method). Households with children aged 6-59 months were allocated proportionally to selected kebeles and from selected kebeles, households were selected by simple random sampling (Table of random numbers) technique based on frame listed in health post. The frame consists of households of each kebele counted by Health extension workers.

Formula used to calculate households/sample size from selected kebeles

$n_i = \frac{n}{N} * N_i$, where n_i = sample size of selected kebele, n = total sample size, N_i = number of household of selected kebele, N = total number of household in all selected kebeles

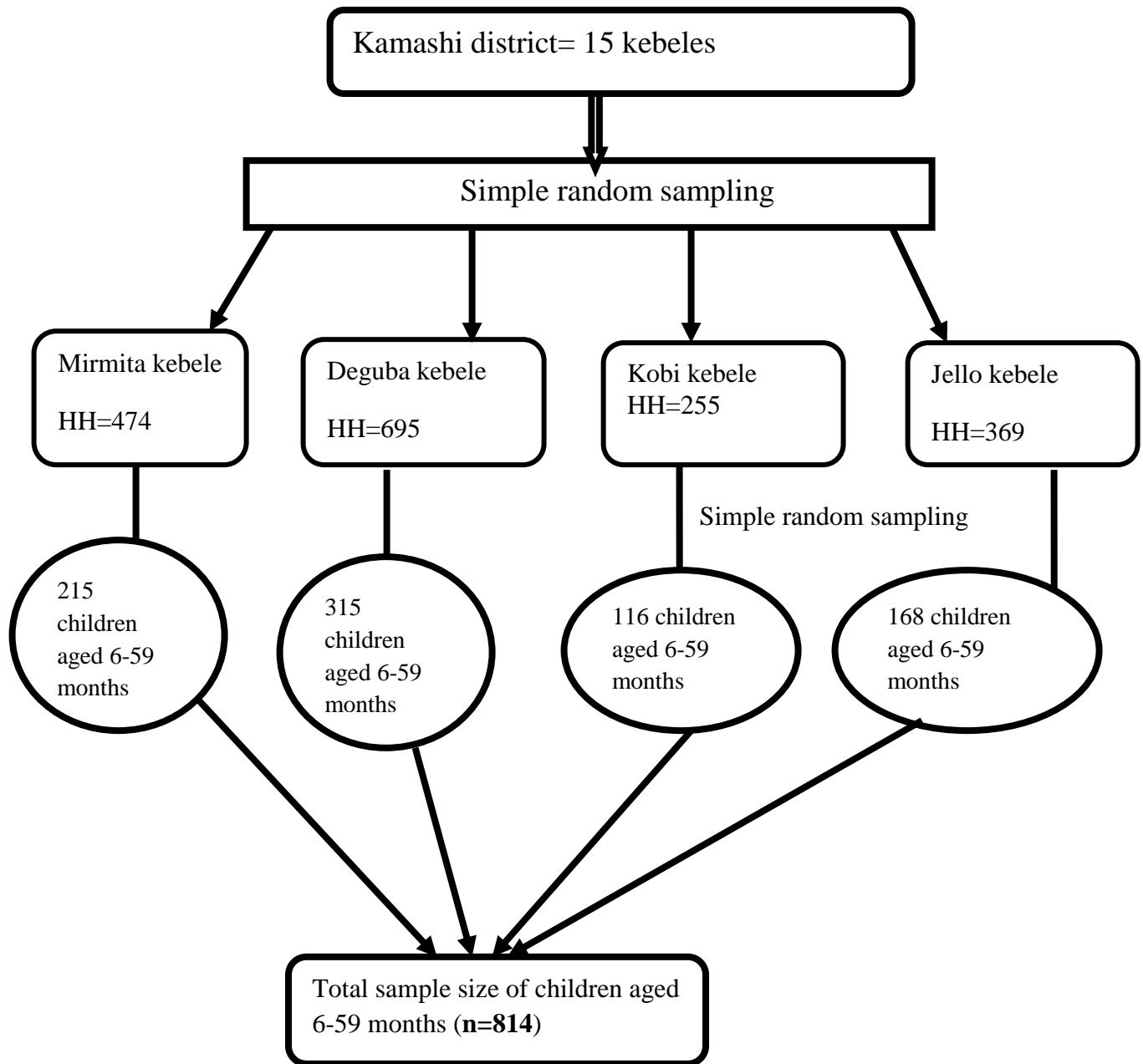


Figure 2 Selection of households to study factors associated with malnutrition among children aged 6-59 months

3.7. Study variables

3.7.1. **Dependent variable:** Acute malnutrition (yes/no).

3.7.2. **Independent variables:** Four categories of risk factor are classified as independent variables.

- **Socio-economic and demographic factors:** Role of mothers on child feeding, marital status, income level, education, occupation, family size and religion of care taker, child age and sex.
- **Child care practices:** Vaccination status, exclusive breast feeding, vitamin A supplementation, age at complementary food started, feeding practice (bottle feeding), frequency of feeding, childhood illnesses or morbidity status (fever, measles, diarrhea) and birth order.
- **Maternal health services use for the index child:** Place of delivery, ANC visit, PNC visit and history of illness during pregnancy of index child.
- **Environmental health conditions:** Clean water supply, latrine availability, housing condition

3.8. Operational definitions

Weight-for-height: an index of current nutrition status also referred to as wasting and is measured by dividing weight of child to weight of reference child of the same height(46). Weight was measured by electronic digital weight scale with minimum/lightly/clothing and no shoes. Calibration was done before weighing every child by setting it to zero. In case of children age below two years, the scale was allowed weighing of very young children through an automatic mother-child adjustment that was eliminated the mother's weight while she standing on the scale with her baby. Height was measured using a vertical wooden height board by placing the child on the measuring board, and child standing upright in the middle of board. The child's head, shoulders, buttocks, knees and heels touching the board.

Acute malnutrition: reflects recent weight loss and is defined as weight-for-height < -2 z-scores or $< 80\%$ weight-for-height median by NCHS standards and/or edema, usually in children aged 6–59 months(5).

Moderate acute malnutrition: a child who has weight-for-height < -2 z-scores and ≥ -3 z-scores, or weight-for-height median < 80 per cent and ≥ 70 percent, and/or edema is moderately acutely malnourished(5, 46)

Severe acute malnutrition: a child who has weight-for-height <-3 z-scores or <70 percent weight-for-height median and/or edema is acutely malnourished(5, 46).

Edema: the presence of excessive amounts of fluid in the intercellular tissue; the key clinical sign of kwashiorkor, a severe form of protein-energy malnutrition, carrying a very high mortality risk in young children(46). In order to determine the presence of edema, normal thumb pressure was applied to the two feet for three seconds whether a shallow print or pint remains on both feet when the thumb is lifted.

Family size: Total number of people living in the house during study period.

Income: It is monthly earning from one's business, lands, work, investment (if <1500 ETB, poor and ≥ 1500 ETB good income status). It was measured by number of assets the households had(47).

Complementary foods: foods given to young children in addition to breast milk or formula milk. Complementary food should usually be introduced into the child's diet at the age of about six months(46). It was measured by the age of index child at which additional food was started (at less than 6 months or at 6 or more months).

Diarrhea: Passing of three or more loose stool or watery stool per day

Fever: The elevation of body temperature above 37.5 degree centigrade. Axillary temperature was taken from each participant (children are said to have fever if temperature was greater than or equal to 37.5 degree centigrade and if less than 37.5, declared to be no fever.

Vaccination status: Vaccination status of index child according to his/her age (at 6, 10, 14 weeks and 9 months)

Housing condition: The presence or absence of household's own living house (Yes/No).

3.9.Data collection procedures

Data were collected by using structured questionnaire and anthropometric measurements. The questionnaire was developed by reviewing different literatures and it was adapted. It consists of socio-demographic, child care practices, maternal health care services and environmental factors, assets in the household and anthropometric measurements. Two clinical nurses and five health extension workers who can communicate easily with community were recruited from health facility and training about data collection and anthropometric measurement was given for about two days.

Interview was carried out with mothers/caregivers of children to fill the questionnaire which was prepared in Amharic and data collection took about 25 days. In HHs with more than one children of age 6-59 months, one child was selected by using lottery method to interview. The anthropometric data were collected according to procedures stated by Emergency Nutrition Assessment (2004) for taking anthropometric measurements.

Height/length: Body length of children age up to 23 months was measured without shoes and the height was read to the nearest 0.1cm by using a horizontal wooden length board with the infant in recumbent position. However, height of children 24 months and above was measured using a vertical wooden height board by placing the child on the measuring board, and child standing upright in the middle of board. The child's head, shoulders, buttocks, knees and heels touching the board.

Weight: weight was measured by electronic digital weight scale with minimum/lightly/clothing and no shoes. Calibration was done before weighing every child by setting it to zero. In case of children age below two years, the scale was allowed weighing of very young children through an automatic mother-child adjustment that was eliminated the mother's weight while she standing on the scale with her baby.

Edema was checked because children with bilateral pitting edema reflect severe acute malnutrition regardless of WFH measurement. To determine the presence of edema, normal thumb pressure to the bilateral feet of children for three seconds was applied and dent remains on both feet when the thumb is lifted. To identify morbidity of children, past illnesses were asked that occurred in the past 2 weeks and measles history in the past one year.

3.10. Data quality control

Structured questionnaire was prepared in English and translated to Amharic and then back to English to ensure its accuracy. Pre test was conducted on 5% of sample size before the actual time of data collection to see the accuracy of responses and to estimate time needed.

Data were collected under supervision of principal investigator and incomplete questionnaires were completed by making second visits to the homes. Weighing scales were calibrated with known weight object by setting to zero. The scales indicator was checked against zero reading after weighing every child and data were collected.

3.11. Data analysis

Data were entered using EPI INFO version 7 software and then sex, age, height and weight were entered to ENA for SMART 2011 software to convert nutritional data to Z- score of index WFH (wasting level) using NCHS reference population standard of WHO and data were exported to SPSS version 23 software for analysis.

Firstly, bivariable logistic regression analysis was conducted to determine the association between acute malnutrition and associated factors and statistical association was checked by 95% confidence interval and crude odds ratio (COR). Secondly, multivariable logistic regression analysis was performed using backward elimination technique to identify risk factors of wasting by considering significant variables (P- value <0.25) observed in bivariable analysis and significant variables were taken as associated risk factors of acute malnutrition by 95% confidence interval and adjusted odds ratio (AOR). P-value less than 0.05, 95% CI and odd ratio were considered as statistically significant.

3.12. Ethical Consideration

Ethical clearance was obtained from Ethical Review Board of Bahir Dar University, College of Medicine and Health Science and consent was obtained from Benishangul Gumuz Regional Health Bureau, Kamashi Zonal Health Department and kebele administrative offices. Verbal consent was obtained from each respondent and the objective of this study was explained to care takers.

Participants were guaranteed to collected information and completed questionnaires were stored securely and they were also told that their nonparticipation would not have negative effect on their health facility care.

3.13. Dissemination of Results

The result of this study will be shared to the Benishangul Gumuz Regional Health Bureau, Kamashi Zonal Health Department with respective Woreda Health offices, Kebele administrative office and all stakeholders so as to perform appropriate nutritional programs and intervention strategies.

4. RESULTS

4.1.Socio-demographic characteristics

Among 814 children aged 6-59 months planned to be studied, 804 were participated in the study with a response rate of 98%. Ten of them were not found at home for interview after two repeated visits. Children aged 36-47 months and 48-59 months accounted 208 (25.6%) each followed by children aged 24-35 months who accounted 202 (24.8%) and children aged 12-23 and 6-11 months accounted 135(16.6%) and 61(7.5%) respectively with mean (\pm SD) age was 3.5 (\pm 1.2) months. The numbers of under- five children below two years accounted 734 (90.2%) and two years and above were 80 (9.8%). Regarding sex, 340 (41.8%) study participants were females and 474 (58.2%) were males. Majority of care givers were married 718 (88.2%) and protestant was the dominant religion of care givers and accounted 560 (68.8%). Concerning educational status of care givers, primary education accounted 341 (41.9%). About three-fourth of care givers were farmers 590 (72.5%) and 745 (91.5%) households were headed by female care givers.

Table 2 Socio demographic characteristics of care givers and children aged 6-59 months in Kamashi district, Benishangul Gumuz Region, Western Ethiopia, 2019 (n=814)

Variable	Category	Frequency (%)
Age of care givers(in years)	15-34	757 (93%)
	35-50	57 (7%)
Age of children (in months)	6-11	61 (7.5)
	12-23	135 (16.6)
	24-35	202 (24.8)
	36-47	208 (25.6)
	48-59	208 (25.6)
Child sex	Male	474 (58.2%)
	Female	340 (41.8%)
Family size	<5	477 (58.6%)
	>=5	337 (41.4%)
Number of under five children	<2	734 (90.2%)

	>=2	80 (9.8%)
Care giver's level of education	No formal education	300(36.9%)
	Primary education	341(41.9%)
	Secondary and above	173(21.3%)
Care giver's occupation	Farmer	590(72.5%)
	Merchant	10(1.2%)
	Daily laborer	6(0.7%)
	Private employee	3(0.4%)
	Government employee	181(22.2%)
	Student	24(2.9%)
Care giver's marital status	Single	70(8.6%)
	Married	718(88.2%)
	Divorced	18(2.2%)
	Widowed	8(1.0%)
Role of mothers on child feeding	Mother involved	745(91.5%)
	Mother not involved	69(8.5%)
Care giver's religion	Muslim	7(0.9%)
	Orthodox	230(28.3%)
	Protestant	560(68.8%)
	Catholic	17(2.1%)
Monthly household income	Less than 1500 ETB	563(69.2%)
	Greater than or equal to 1500 ETB	251(30.8%)

4.2. Child care practices

From the total children, breast feeding practice was initiated within one hour for 741 (91%) children after delivery and about 115 (14.1%) children practiced bottle feeding. About 807 (99.1%) children started complementary foods at 6 or more months with 347 (42.6%) children fed one times per day.

Table 3 Child care practices in Kamashi district, Benishangul Gumuz Region, Western Ethiopia, 2019 (n=814)

Variables	Category	Frequency (%)
Vaccination status according to child's age	Yes	609(74.8%)
	No	205(25.2%)
Age at complementary food started	Less than 6 months	7(0.9%)
	At 6 or more months	807(99.1%)
Initiation of breast feeding after delivery	Within one hour	741(91%)
	After one hour	73(9%)
Bottle feeding	Yes	115(14.1%)
	No	699(85.9%)
Frequency of feeding for the baby	One times	347(42.6%)
	Two times	84(10.3%)
	Three times	85(10.4%)
	Four times and above	298(36.6%)
Diarrhea in the past 2 weeks prior to study	Yes	90(11.1%)
	No	724(88.9%)
Fever in the past 2 weeks prior to study	Yes	98(12%)
	No	716(88%)
Preceding birth interval	First birth	243(29.9%)
	< 24 months	65(8%)
	36-47 months	51(6.3%)
	>=48 months	455(55.9%)

4.3. Maternal health care services use

About 208 (25.6%) interviewed mothers have history of illness during pregnancy of the index child and 389 (47.8%) had four and above ANC visit while 192 (23.6%) mothers had no ANC visit during pregnancy of the child. About 623 (76.5%) mothers delivered at health facility and 191 (23.5%) delivered at home. Regarding PNC, 214 (26.3%) mothers had no PNC visit and 324 (39.8%) had three and above visits of the child.

Table 4 Maternal health care characteristics of children in Kamashi district, Benishangul Gumuz Region, Western Ethiopia, 2019 (n=814)

Variables	Categories	Frequency (%)
History of illness during pregnancy	Yes	208(25.6%)
	No	606(74.4%)
Place of delivery	Home	191(23.5%)
	Health facility	623(76.5%)
ANC visit	No visit	192(23.6%)
	One to three visit	233(28.6%)
	Four and above visit	389(47.8%)
PNC visit	No visit	214(26.3%)
	One visit	119(14.6%)
	Two visit	157(19.3%)
	Three and above visit	324(39.8%)

4.4. Environmental health conditions

From the total households participated in the study, 541 (66.5%) reported owning some land for agriculture and 273 (33.5%) didn't. About 728 (89.4%) households had their own living house and 681 (83.7%) of the households in the study area had latrine. About 463 (56.9%) of the households used hand pump as main source of drinking water and only 98 (12.0%) of households used piped water as source of drinking water.

Table 5 Environmental and housing conditions of care givers in Kamashi district, Benishangul Gumuz Region, Western Ethiopia, 2019 (n=814)

Variables	Categories	Frequency (%)
Availability of latrine	Yes	681(83.7%)
	No	133(16.3%)
Drinking water source	Pipe water	98(12.0%)
	Protected well	173(21.3%)
	River/pond	80(9.8%)
	Hand pump	463(56.9%)
Own living house	Yes	728(89.4%)
	No	86(10.6%)
Own agricultural land	Yes	541(66.5%)
	No	273(33.5%)

4.5.Proportion of children who consumed food items within 24 hours

Cereal is more consumed (81.6 %) and egg is less consumed (36.9%) by children in the past 24 hours prior to data collection reported by care givers.

Table 6 Children who consumed specific food items in the past 24 hours prior to data collection reported by care givers in selected kebeles, Kamashi district, Benishangul Gumuz Region, Western Ethiopia, 2019 (n=814)

Food items	Response	Frequency (%)
Cereals	Yes	664 (81.6%)
	No	150 (18.4%)
Roots and tubers	Yes	479 (58.8%)
	No	335 (41.2%)
Vegetables	Yes	441 (54.2%)
	No	373 (45.8%)
Dark green leaves	Yes	590 (72.5%)
	No	224 (27.5%)
Meat	Yes	360 (44.2%)
	No	454 (55.8%)
Egg	Yes	300 (36.9%)
	No	514 (63.1%)
Pulses and nuts	Yes	400 (49.1%)
	No	414 (50.9%)
Milk and milk products	Yes	331 (40.7%)
	No	483 (59.3%)

4.6. Household's food security status

Distribution of responses to household food security reported that 208 (25.6%) of care givers not had enough food in the past four weeks prior to data collection.

Table 7 Distribution of responses to household food security status in selected kebeles, Kamashi district, Benishangul Gumuz Region, Western Ethiopia, 2019 (n=814)

Indicators	Responses	Frequency
In the past four weeks, did you worry that your household would not have enough food?	Yes	208 (25.6%)
	No	606 (74.4%)
How often did this happen?	1 or 2 times	83 (10.2%)
	3 to 10 times	124(15.2%)
	> 10 times	1 (0.1%)
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?	Yes	215 (26.4%)
	No	599 (73.6%)
How often did this happen?	1 or 2 times	73 (9.0%)
	3 to 10 times	141 (17.3%)
	> 10 times	1 (0.1%)
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?	Yes	201 (24.7%)
	No	613 (75.3%)
How often did this happen?	1 or 2 times	63 (7.7%)
	3 to 10 times	137 (16.8%)
	> 10 times	1 (0.1%)
In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	Yes	196 (24.1%)
	No	618 (75.9%)
How often did this happen?	1 or 2 times	64 (7.9%)
	3 to 10 times	131 (16.1%)
	> 10 times	1 (0.1%)
Did any household member have to eat a smaller meal than you needed because there was not enough food?	Yes	191 (23.5%)
	No	623 (76.5%)
How often did this happen?	1 or 2 times	63 (7.7%)

	3 to 10 times	128 (15.7%)
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?	Yes	186 (22.9%)
	No	628 (77.1%)
How often did this happen?	1 or 2 times	57 (7.0%)
	3 to 10 times	129 (15.8%)
In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	Yes	181(22.2%)
	No	633(77.8%)
How often did this happen?	1 or 2 times	56 (6.9%)
	3 to 10 times	125 (15.4%)
Did you or any household member go a whole day and night without eating anything because there was not enough food	Yes	177 (21.7%)
	No	637 (78.3%)
How often did this happen?	1 or 2 times	54 (6.6%)
	3 to 10 times	123 (15.1%)

4.7.Prevalence of acute malnutrition

The overall prevalence of acute malnutrition (WHZ <-2 Z-score and/or edema) was 9.8 % (8.7-13.1, 95% CI), moderate acute malnutrition (WHZ <-2 Z-score and \geq -3 Z-score and no edema) was 5.5 % (4.5-7.9, 95 % CI) and severe acute malnutrition (WHZ <-3 Z-score and/or edema) was 4.3 % (3.4-6.4, 95% CI). Generally, the prevalence of all forms of acute malnutrition was higher among girls than boys (10.8% and 9.07%). The prevalence of edema was 0.4%.

Table 8 Prevalence of acute malnutrition based on WHZ and/or edema and by sex in Kamashi district, Benishangul Gumuz Region, Western Ethiopia, 2019 (n=814)

Variables	All (n=814)	Males (n=474)	Females (n=340)
Prevalence of acute malnutrition and/or edema	80(9.8%) (8.7-13.1, 95% CI)	43 (9.07%) (7.4-13.0, 95% CI)	37 (10.8%) (8.7-15.9, 95% CI)
Prevalence of MAM, no edema	45(5.5%) (4.5-7.9, 95% CI)	26(5.4%) (4.1-8.6, 95% CI)	19(5.6%) (3.7-9.3, 95% CI)
Prevalence of SAM and /or edema	35(4.3%) (3.4-6.4, 95% CI)	17(3.6%) (2.4-6.5,95% CI)	18(5.3%) (3.7-8.9,95% CI)

The highest prevalence of acute malnutrition was seen among children aged 48-59 months with 3.7% (2.4-4.9, 95% CI) prevalence and the lowest prevalence was seen among 6-11 months children with prevalence of 0.1% (0.09-0.50, 95% CI) in Kamashi district.

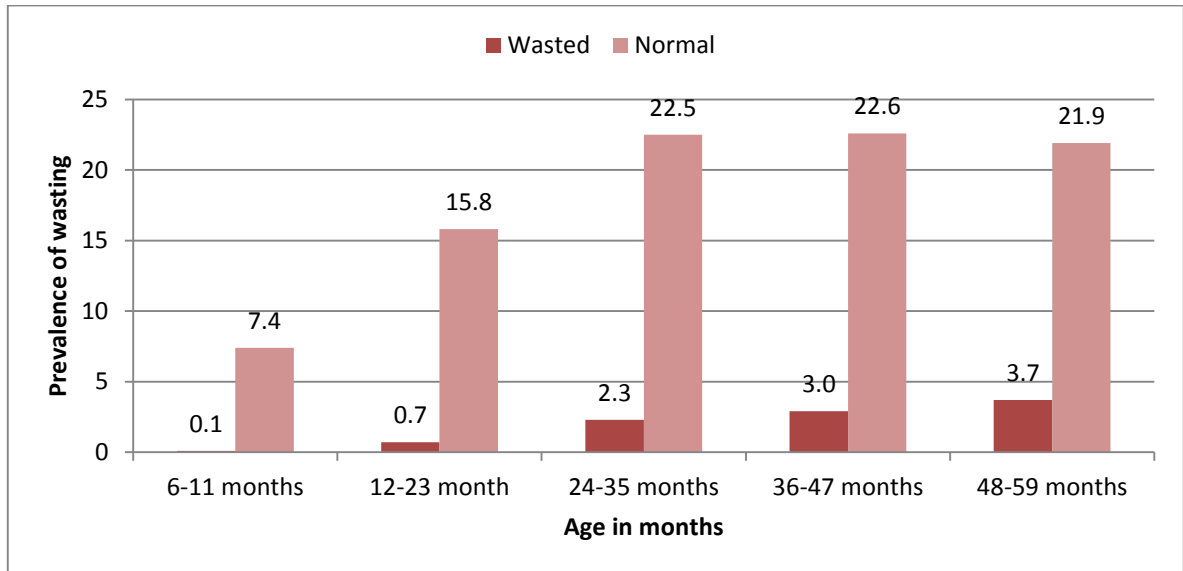


Figure 3 Prevalence of wasting by age category among children aged 6-59 months in Kamashi district, Benishangul Gumuz Region, Western Ethiopia, 2019 (n=814)

4.8. Factors associated with acute malnutrition

In bivariable analysis the covariates include: care givers level of education, preceding birth interval, source of drinking water, diarrhea and fever in the past two weeks prior to data collection, bottle feeding, initiation of breast feeding, latrine availability for the family, role of mothers on child feeding, ANC and PNC follow up, vaccination status of child according to age, number of under five children, monthly income status, own living house, mother's history of illness and place of delivery were associated factors of acute malnutrition/wasting.

In multi-variable logistic regression :Care givers level of education, fever in the past 2 weeks prior to study, vaccination status of children, PNC follow up of mothers, number of under five children in the household and preceding birth interval had statistically significant association with acute malnutrition at p-value <0.05.

The odds of acute malnutrition was reduced by 84% and 79% among children aged 6-59 months who had primary and secondary level of education of their care taker (AOR=0.16, 95% CI, 0.06-0.41 and AOR=0.21 95% CI 0.07-0.68) respectively compared to children whose mothers attended no formal education.

The odds of acute malnutrition was 4.01 times more among children aged 6-59 months who had fever in the past two weeks prior to the study than their counterpart(AOR=4.01, 95% CI (1.86-8.66).

The odds of acute malnutrition was 3.63 times more among children aged 6-59 months from household which had ≥ 2 under five children than children from households of < 2 under five children (AOR=3.63, 95% CI (1.60-8.31). The odds of acute malnutrition was reduced by 62% among children who had received vaccination according to their age than who didn't receive (AOR=0.38, 95% CI 0.18-0.82) and the odds of acute malnutrition was reduced by 87% among children whose mother had PNC follow up than who didn't have PNC visit (AOR=0.13, 95% CI (0.06-0.30). The odds of acute malnutrition was 3.27 times higher among children who had birth interval of less than 24 months than those who had greater than or equal to 24 months birth interval (AOR=3.27 95% CI (1.75-6.12).

In multivariable logistic regression, care givers level of education, fever in the past 2 weeks, vaccination status of child, number of under-five children in HH, PNC follow up of mothers and preceding birth interval had statistically significant association with acute malnutrition as shown in the table below.

Table 9 Bivariable and multivariable analysis of acute malnutrition among children aged 6-59 months in Kamashi district, Benishangul Gumuz Region, Western Ethiopia 2019(n=814)

Explanatory variable	Categories	Wasting		COR 95% CI	AOR 95% CI
		Yes (%)	No (%)		
Care givers level of education	No formal education	64 (80)	236(32.2)	1	1
	Primary education	9(11.3)	332(45.2)	0.10(0.05-0.21)	0.16(0.06-0.41)
	Secondary and above	7(8.7)	166(22.6)	0.16(0.07-0.35)	0.21(0.07-0.68)
Initiation of breast feeding	Within one hour	56(70)	685(93.3)	1	1
	Within more than one hour	24(30)	49(6.7)	5.99 (3.43 -10.48)	2.38 (0.98-5.76)
Fever	Yes	31(38.7)	67(9.1)	6.29 (3.76-10.54)	4.01 (1.86-8.66)
	No	49(61.3)	667(90.9)	1	1
Vaccination status of children	Yes	19(23.8)	590(80.4)	0.76 (0.04-0.13)	0.38 (0.18-0.82)
	No	61(76.2)	144(19.6)	1	1
No of under five children	<2	55(68.7)	679(92.5)	1	1
	≥2	25(31.3)	55(7.5)	5.61 (3.25-9.69)	3.63 (1.60-8.31)
PNC follow up	Yes	18(22.5)	582(79.3)	0.08 (0.04-0.13)	0.13 (0.06-0.30)
	No	62(77.5)	152(20.7)	1	1
Preceding birth interval	< 24 months	53(66.3)	255(34.7)	3.68 (2.26-6.01)	3.27 (1.75-6.122)
	≥ 24 months	27(33.7)	479(65.3)	1	1

NB: COR= Crude odds ratio, AOR=Adjusted odds ratio, 1= Reference

5. DISCUSSION

The prevalence of acute malnutrition among children aged 6-59 months in this study was 9.8% and 4.3% had severe acute malnutrition. According to WHO threshold for acute malnutrition, the prevalence is described as poor which ranges 5%-9.9%(5). This study is found to be consistent with a study done in Nigeria 9.7%(27), Afghanistan 9.5%(26), Ethiopia and Benishangul Gumuz Region prevalence 10% and 11.5% respectively (10). This prevalence is also consistent with studies done in Gambella town 12.4%(41), Hadaleala district in Afar 11.8%(29)and Damot gale district, South Ethiopia 9%(44) but in contrast it was slightly lower than study done in Shinille district, Ethiopian Somali region 20%(30), Dabat district, Northwest Ethiopia18.2%(4)and Hidabu Abote district, Oromia regional state 16.8%(32). This may be due to a difference in study subjects, study area, sample size and socio-demographic characteristics. In this study, the prevalence of acute malnutrition among females and males 10.8% and 9.07% respectively in contrast with a study done in North-Western Uganda; the prevalence of acute malnutrition was higher among males than females 7.7% and 3.9% respectively and in under five children of pastoral communities of Afar Regional state, prevalence of wasting was slightly higher among males 9.9% than females 6.3%(13, 36). This may be due to care taker's decision on feeding practices for females as males in the study area.

In this study, the prevalence of acute malnutrition was highest among children aged 48-59 months (3.7% (2.4-4.9, 95% CI) compared to children aged 6-11 months with prevalence of 0.1% (0.09-0.50%, 95% CI, children aged 12-23 months with prevalence of 0.7% (0.2-1.4 95% CI, children aged 24-35 months with prevalence of 2.3% (1.5-3.4, 95% CI and children aged 36-47 months with prevalence of 3.0% (1.8-4.3, 95% CI) which is consistent with study in Sodo Zuria district, South Ethiopia with prevalence of acute malnutrition 3.2% of similar age groups(31) but the prevalence is slightly lower in study conducted in Hidabu Abote district with prevalence of 5% of the same age group but study conducted in North-Western Uganda showed that the prevalence of acute malnutrition was higher among children aged 6-17 months(13, 32). A study conducted among under -five children of pastoral communities of Afar Regional state, the highest prevalence of wasting was seen among children aged 12-23 months with prevalence of 4.9% and lowest prevalence was seen among 48-59 months children with prevalence of 1.3%(36). But in our study, the lowest prevalence of acute malnutrition was seen among children

aged 6-11 months. This might be due to the protective mechanism of breast feeding against acute malnutrition(11).

Regarding associated risk factors for acute malnutrition, care givers level of education, initiation of breast feeding, fever in the past 2 weeks prior to study, vaccination status according to child's age, number of under five children in household, PNC visit of mothers and preceding birth interval were found to be statistically significant.

In our study, the odds of acute malnutrition was reduced by 84% and 79% among children aged 6-59 months who had primary and secondary level of education of their care taker which is consistent with a study on prevalence of acute malnutrition in Afghanistan at which the odds of acute malnutrition of children with illiterate mothers were 2.21 times (AOR=2.21 95% CI 1.00-4.88) more likely to be wasted than their counterparts(48) but in contrast study done in Pakistan(24)and Nepal(35), Hidabu Abote district, Oromia regional state(32), mother's level of education wasn't associated with acute malnutrition. The lower prevalence of acute malnutrition among children from mothers who were educated may be due to knowledge of balanced dietary intake for the family and awareness to improve nutritional status of under-five children and their health(48). The odds of acute malnutrition was 4.01 times more among children aged 6-59 months who had fever in the past two weeks prior to the study than their counterpart with similar study done in Gimbi district, Oromia region in which children having fever were wasted 3.5 times (AOR=3.5 95% CI 1.3-11.6) higher than those who didn't have it and study on determinants of acute malnutrition in Oromia region, children with febrile illness in past 2 weeks were 1.89 times (AOR=1.89 95% CI 1.0-3.59) more likely to be wasted than their counterparts(39, 42). This might be due to febrile illnesses affect dietary intake, utilization and increased losses of fluid which in turn impairs childhood nutritional status(39).

The odds of acute malnutrition were reduced by 62% among children who had received vaccination according to their age than who didn't receive. This is consistent with studies done in Hadaleala district, Afar region in which acute malnutrition was reduced by 85% by receiving vaccination and study done in Gambella town, children who didn't receive vaccine were 3.38 times (AOR=3.38 95% CI 1.07-10.59) more likely to be wasted. Similarly, in Shinille district, Ethiopian Somali region, children who didn't receive vaccine were 7.57 times (AOR=7.57 95% CI 3.65-15.70) more likely to be wasted than their counterparts. This can be justified as

vaccinated children are less likely to be infected with vaccine preventable diseases which in turn deplete nutrients from the body (29, 30, 41).

In this study, initiation of breast feeding was not significantly associated with acute malnutrition which is consistent with a study done in Nepal among under five children founded that initiation of breast feeding wasn't associated with acute malnutrition(35), but study done in Dabat district, Northwest Ethiopia on child wasting that children who started late initiation of breast feeding were 1.43 times (AOR=1.43 95% CI 1.04-1.95) more wasted than children who started early initiation of breast feeding(4). This may be due to a difference in study subjects, in Dabat, Northwest Ethiopia, the study was conducted among children aged under-five years(4).

In this study, the odds of acute malnutrition was 3.63 times more among children aged 6-59 months from households which had ≥ 2 under five children than children from households of < 2 under five children. This is consistent with a study done on magnitude of wasting among under five orphans in Dilla town, Southern Ethiopia in which children from households which had ≥ 2 under five children were 1.22 times (AOR=1.22 95% CI 1.35-3.29) more wasted than children from households of < 2 under five children(49) but a study done on magnitude of undernutrition in Hawassa town founded that children from households which had more than one under five children were 1.48 times (AOR=1.48 95% CI 1.16-4.82) more wasted than households which had one under five child(11). This could be because children could not be able to get enough and balanced food required for their growth and development as the number of under-five children increases in household(41).

In this study, children aged 6-59 months who had < 24 months preceding birth interval were 3.27 times (AOR=3.27 95% CI 1.75-6.12) more likely to be wasted than those who had ≥ 24 months preceding birth interval in line with a study done in Nepal in which children who had < 24 months birth interval were 4.09 times (AOR=4.09 95% CI 1.87-8.97) more likely to be acutely malnourished(35). This may be due to lack of awareness of using family planning methods with a study done in Nepal. This study is also consistent with study done in Hawassa town on magnitude of undernutrition with the finding of children born within 24 months from the preceding child were 1.21 times more likely to be wasted than children born after 24 months from the preceding child. This might be because families with more children experience more economic burden for food consumption and more likely to suffer from acute malnutrition(11).

6. LIMITATIONS

- Certain level of recall bias was expected with regard to some variables like, history of illness of mothers, breast feeding pattern after delivery
- Some independent variables weren't included such as vitamin A supplementation for children and family planning method usage.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1. Conclusion

This study revealed that the prevalence of acute malnutrition in Kamashi district was described as poor according to the recommended prevalence by world health organization. The prevalence in the study area was similar with the prevalence of regional and national statistics found from Ethiopian Demographic and Health Survey 2016 national reports. The prevalence of acute malnutrition was highest among children aged 48-59 months compared to children aged 6-11 months, 12-23 months, 24-35 months and 36-47 months. In this study, care givers level of education, time of initiation of breast feeding after birth, fever in the past 2 weeks prior to study, vaccination status of children, PNC follow up of mothers, and number of under-five children in the household and preceding birth interval had statistically significant association with acute malnutrition.

7.2. Recommendations

- Nutrition education for the community as a whole should be encouraged by health extension workers and professionals to improve feeding pattern practices
- Care takers should be encouraged for the prevention of febrile illnesses
- Kamashi district should conduct continuous screening program for malnutrition
- Further study should be done to see unexplored risk factors like vitamin A supplementation, family planning methods usage that weren't included in this study
- Nutrition surveillance should be strengthened especially to vulnerable groups
- Awareness should be created on how to lengthen birth interval for care takers

8. REFERENCES

1. Goday PS, Motil KJ, Li B, Hoppin AG. Malnutrition in children in resource-limited countries: Clinical assessment. UpToDate. 2017.
2. Lenters L, Wazny K, Bhutta ZA. Management of severe and moderate acute malnutrition in children. *Reproductive, Maternal, Newborn, and Child Health*. 2016;205.
3. Asfaw M, Wondaferash M, Taha M, Dube L. Prevalence of undernutrition and associated factors among children aged between six to fifty nine months in Bule Hora district, South Ethiopia. *BMC Public health*. 2015;15(1):41.
4. Tariku A, Bikis GA, Woldie H, Wassie MM, Worku AG. Child wasting is a severe public health problem in the predominantly rural population of Ethiopia: A community based cross-sectional study. *Archives of Public Health*. 2017;75(1):26.
5. Organization WH. The management of nutrition in major emergencies: World Health Organization; 2000.
6. Unicef. Levels and trends in child malnutrition. eSocialSciences, 2018.
7. Fanzo J, Hawkes C, Udomkesmalee E, Afshin A, Allemandi L, Assery O, et al. 2018 Global Nutrition Report: Shining a light to spur action on nutrition. 2018.
8. Maust A, Koroma AS, Abla C, Molokwu N, Ryan KN, Singh L, et al. Severe and moderate acute malnutrition can be successfully managed with an integrated protocol in Sierra Leone. *The Journal of nutrition*. 2015;145(11):2604-9.
9. Jelle M, Grijalva-Eternod CS, Haghparast-Bidgoli H, King S, Cox CL, Skordis-Worrall J, et al. The REFANI-S study protocol: a non-randomised cluster controlled trial to assess the role of an unconditional cash transfer, a non-food item kit, and free piped water in reducing the risk of acute malnutrition among children aged 6–59 months living in camps for internally displaced persons in the Afgooye corridor, Somalia. *BMC public health*. 2017;17(1):632.
10. EDHS E. demographic and health survey 2016: key indicators report. The DHS Program ICF. 2016.
11. Darsene H, Geleto A, Gebeyehu A, Meseret S. Magnitude and predictors of undernutrition among children aged six to fifty nine months in Ethiopia: a cross sectional study. *Archives of Public Health*. 2017;75(1):29.

12. Isanaka S, Boundy EO, Grais RF, Myatt M, Briend A. Improving Estimates of Numbers of Children With Severe Acute Malnutrition Using Cohort and Survey Data. *Am J Epidemiol.* 2016;184(12):861-9.
13. Legason I, Dricile R. Prevalence of acute malnutrition among children ages 6-59 months: Results from a baseline nutrition survey in North-Western Uganda. *J Nutr Hum Health* 2018; 2 (1): 7-12 *J Nutr Hum Health* 2018 Volume 2 Issue. 2018;1:6-59.
14. Akombi BJ, Agho KE, Merom D, Renzaho AM, Hall JJ. Child malnutrition in sub-Saharan Africa: A meta-analysis of demographic and health surveys (2006-2016). *PloS one.* 2017;12(5):e0177338.
15. Seid A, Seyoum B, Mesfin F. Determinants of Acute Malnutrition among Children Aged 6–59 Months in Public Health Facilities of Pastoralist Community, Afar Region, Northeast Ethiopia: A Case Control Study. *Journal of nutrition and metabolism.* 2017;2017.
16. UBOS I. Uganda demographic and health survey 2016. Key indicators report. Kampala, Uganda: UBOS, and Rockvile, Meryland, USA: UBOS and ICF. 2017.
17. Tsegaye. B. Assessment of Acute Malnutrition Using Transthyretin Levels in Blood of Children Under Five Years of Age in Tikur Anbessa Specialized Hospital and Yekatit 12 Hospital, Addis Ababa. *March, 2015:2-3.*
18. Desyibelew HD, Fekadu A, Woldie H. Recovery rate and associated factors of children age 6 to 59 months admitted with severe acute malnutrition at inpatient unit of Bahir Dar Felege Hiwot Referral hospital therapeutic feeding unite, northwest Ethiopia. *PLoS One.* 2017;12(2):e0171020.
19. Endazenaw G. Assessment of Gender Differential in Magnitude and the Risk Factors of Childhood Malnutrition in Menz Keya District, North Shewa Zone, Amhara Regional State, Ethiopia: Addis Ababa University; 2009.
20. Annan RA, Webb P, Brown R, editors. Management of moderate acute malnutrition (MAM): Current Knowledge and Practice. *CMAM Forum Technical Brief; 2014.*
21. Organization WH. Global nutrition targets 2025: wasting policy brief. *World Health Organization, 2014.*
22. De Onis M, Brown D, Blossner M, Borghi E. Levels and trends in child malnutrition. *UNICEF-WHO-The World Bank joint child malnutrition estimates. 2012.*
23. UNICEF W. World Bank Group, Levels and trends in child malnutrition, 2016. 2018.

24. Khan GN, Turab A, Khan MI, Rizvi A, Shaheen F, Ullah A, et al. Prevalence and associated factors of malnutrition among children under-five years in Sindh, Pakistan: a cross-sectional study. *BMC nutrition*. 2016;2(1):69.
25. Kouam CE, Delisle H, Ebbing HJ, Israël AD, Salpéteur C, Aïssa MA, et al. Perspectives for integration into the local health system of community-based management of acute malnutrition in children under 5 years: a qualitative study in Bangladesh. *Nutrition journal*. 2014;13(1):22.
26. Harding KL, Aguayo VM, Webb P. Factors associated with wasting among children under five years old in South Asia: Implications for action. *PloS one*. 2018;13(7):e0198749.
27. Manyike PC, Chinawa JM, Ubesie A, Obu HA, Odetunde OI, Chinawa AT. Prevalence of malnutrition among pre-school children in, South-east Nigeria. *Italian journal of pediatrics*. 2014;40(1):75.
28. Control CfD, Prevention. Nutritional and health status of children during a food crisis--Niger, September 17-October 14, 2005. *MMWR Morbidity and mortality weekly report*. 2006;55(43):1172.
29. Gizaw Z, Woldu W, Bitew BD. Acute malnutrition among children aged 6–59 months of the nomadic population in Hadaleala district, Afar region, northeast Ethiopia. *Italian journal of pediatrics*. 2018;44(1):21.
30. Ma'alin A, Birhanu D, Melaku S, Tolossa D, Mohammed Y, Gebremicheal K. Magnitude and factors associated with malnutrition in children 6–59 months of age in Shinille Woreda, Ethiopian Somali regional state: a cross-sectional study. *BMC Nutrition*. 2016;2(1):44.
31. Tufa EG, Dake SK, Bekru ET, Tekle HA, Bobe TM, Angore BN, et al. Magnitude of wasting and underweight among children 6–59 months of age in Sodo Zuria District, South Ethiopia: a community based cross-sectional study. *BMC research notes*. 2018;11(1):790.
32. Mengistu K, Alemu K, Destaw B. Prevalence of malnutrition and associated factors among children aged 6-59 months at Hidabu Abote District, North Shewa, Oromia Regional State. *J nutr disorders ther*. 2013;1:1-15.
33. Tsedeke W, Tefera B, Debebe M. Prevalence of acute malnutrition (wasting) and associated factors among preschool children aged 36–60 months at Hawassa Zuria, South Ethiopia: a community based cross sectional study. *Journal of Nutrition & Food Sciences*. 2016;6(2):466.

34. Das S, Gulshan J. Different forms of malnutrition among under five children in Bangladesh: a cross sectional study on prevalence and determinants. *BMC Nutrition*. 2017;3(1):1.
35. Pravana NK, Piryani S, Chaurasiya SP, Kawan R, Thapa RK, Shrestha S. Determinants of severe acute malnutrition among children under 5 years of age in Nepal: a community-based case–control study. *BMJ open*. 2017;7(8):e017084.
36. Gebre A, Reddy PS, Mulugeta A, Sedik Y, Kahssay M. Prevalence of Malnutrition and Associated Factors among Under-Five Children in Pastoral Communities of Afar Regional State, Northeast Ethiopia: A Community-Based Cross-Sectional Study. *Journal of Nutrition and Metabolism*. 2019;2019.
37. Abebe Z, Zelalem Anlay D, Biadgo B, Kebede A, Melku T, Enawgaw B, et al. High prevalence of undernutrition among children in Gondar town, Northwest Ethiopia: a community-based cross-sectional study. *International Journal of Pediatrics*. 2017;2017.
38. Liben ML, Abuhay T, Haile Y. Determinants of child malnutrition among agro pastorals in northeastern Ethiopia: a cross-sectional study. *Health Science Journal*. 2016;10(4):1.
39. Eticha K. Prevalence and Determinants of Child Malnutrition In Gimbi district, Oromia region, Ethiopia Comparative Cross-Sectional study: Addis Ababa University; 2007.
40. Amare D, Negesse A, Tsegaye B, Assefa B, Ayenie B. Prevalence of undernutrition and its associated factors among children below five years of age in Bure Town, West Gojjam Zone, Amhara National Regional State, Northwest Ethiopia. *Advances in Public Health*. 2016;2016.
41. Egata G, Mesfin F, Feleke S. The Prevalence of Undernutrition and Associated Factors among Orphan Children aged 6-59 Months in Gambella Town, Southwest, Ethiopia: Haramaya University; 2018.
42. Ayana AB, Hailemariam TW, Melke AS. Determinants of acute malnutrition among children aged 6–59 months in Public Hospitals, Oromia region, West Ethiopia: a case–control study. *BMC Nutrition*. 2015;1(1):34.
43. Fekadu H AA, Garoma S, Garoma W (2014). Prevalence's of Wasting and its Associated Factors of Children among Months Age in Guto Gida District, Oromia Regional State, Ethiopia. 2013.

44. Abera L, Dejene T, Laelago T. Prevalence of malnutrition and associated factors in children aged 6-59 months among rural dwellers of damot gale district, south Ethiopia: community based cross sectional study. *Int J Equity Health*. 2017;16(1):111-.
45. Kamashi woreda health office annual plan. 2018.
46. children: St. Emergency Nutrition Assessment: Guideline for field workers. 2004.
47. Motbainor A, Taye A. Wasting in under five children is significantly varied between rice producing and non-producing households of Libokemkem district, Amhara region, Ethiopia. *BMC pediatrics*. 2019;19(1):300.
48. Frozanfar MK, Yoshida Y, Yamamoto E, Reyer JA, Dalil S, Rahimzad AD, et al. Acute malnutrition among under-five children in Faryab, Afghanistan: prevalence and causes. *Nagoya journal of medical science*. 2016;78(1):41.
49. Wete AT, Zerfu TA, Anbese AT. Magnitude and associated factors of wasting among under five orphans in Dilla town, southern Ethiopia: 2018: a cross-sectional study. *BMC Nutrition*. 2019;5(1):33.

Annex I: English version of information sheet and consent form

Good morning/Good afternoon

My name is _____ I will be the member of the team for the study conducted in this area under Bahir Dar University College of Medicine and Health Sciences and School of Public Health, Department of Epidemiology & Biostatistics. This study focuses on prevalence of acute malnutrition and associated risk factors among children aged 6-59 months. You are selected to participate in this study which is designed by investigator, because you fulfill the requirements to be a sample.

The data that we will obtain in this interview will use only for research purpose and your response will be kept confidentially. For this purpose your name will not be written here & there is no way of linking to your responses to the final result of the study findings. The study has no risk to you and your child except spending a maximum of 30 minutes of your time & if you will face any difficulties in relation to the research you can contact responsible person based on the address below. You have the right not to respond at all or to stop in the meantime, but your participation is highly valuable for the success of this research objectives. Therefore, we politely request your cooperation to participate in this interview.

Do you agree to participate in this study? Yes _____ continue No _____

Thank you for being volunteer to participate in the study.

Name of data collector _____ Signature _____

Name of supervisor----- Signature-----

Annex II: Amharic version of information sheet and consent form

ጤና ይስጥልኝ !

ስሜ-----ይባላል።

ወደ እርስዎ የመጣሁት የፊልድ ኢ.ፒ.ዲ.ሚዮሎጅ ሁለተኛ ዲግሪ በባህርዳር ዩኒቨርሲቲ ህክምና እና ጤና ሳይንስ ኮሌጅ ስር በሚካሄደው ጥናት የመረጃ ስብሰባ አባል በመሆን ነው። የዚህ ጥናት መጠይቅ የሚያተኩረው የምግብ እጥረት መጠንና አጋላጭ ሁኔታዎችን ለመለየት የተዘጋጀ ሲሆን እርስዎ ለጥናቱ የሚያስፈልጉ መስፈርቶችን አሟልተው በመገኘትዎ የጥናቱ አባል አድርገንዎታል።

በመሆኑም ይህ መጠይቅ ሲዘጋጅ ተገቢ የሆኑ መረጃዎችን ለማግኘት ሲሆን ከእርስዎ የሚገኘው መረጃ ለጥናትና ምርምር ተግባር ብቻ የሚውል ነው። ከእርስዎ የሚገኙት ምላሾች ሚስጥራዊነታቸው የተጠበቁ መሆናቸውን እየገለጹኩ ለዚህም ዓላማ ሲባል የእርስዎ ሆነ የልጅዎ ስም በመጠይቁ ላይ የማይጻፍና የጥናቱ የመጨረሻ ውጤት የግል ማንነት ጋር የማይገናኝ መሆኑን ከወዲሁ አረጋግጣለሁ። ከዚህ በተጨማሪ ይህ መጠይቅ ከ30 ደቂቃ ያልበለጠ ጊዜ ከመሻማት ውጭ ምንም ዓይነት ጉዳት የማያደርስ ሲሆን ከጥናቱ ጋር በተያያዘ ለሚከሰቱ ማንኛውም ጉዳዮች ከዚህ በታች በተቀመጠው አድራሻ ሊያገኙን የሚችሉ መሆኑን እያስገነዘብኩ በጥናቱ ላይ ያለ መሳተፍና የማቋረጥ መብትዎ የተጠበቀ ነው።

የእርስዎ መሳተፍ ግን ከምንም በላይ ለጥናቱ ዓላማ መሳካት ወሳኝ በመሆኑ በመጠይቁ እንዲተባበሩኝ ስል በታላቅ አክብሮትና ትህትና እጠይቃለሁ።

በጥናቱ ለመሳተፍ ፈቃደኛ ነዎት? አዎ/አይደለሁም

የመረጃ ሰብሳቢው ስም----- ፊርማ-----

የተቆጣጣሪው ስም----- ፊርማ-----

Annex III: English version Questionnaire for acute malnutrition

Name of supervisor _____ signature _____

Name of investigator _____ signature _____

Name of the data collector _____ signature _____ Date _____

Participant code _____

Part I: Socio-Demographic characteristics

S. No	Variable	Response	Skip to
1	Age of mothers /caregivers? (in completed years)	_____years	
2	Mothers/caregiver's current level of education?	1. Unable to read and write 2. Able to read and write 3. Grade 1-8 4. Grade 9-12 5. College and above	
3	Mothers /caregiver's marital status?	1. Single 2. Married/partner 3. Divorced 4. Widowed 5. Others (specify)	
4	Mother/care giver's religion?	1. Muslim 2. Orthodox Christian 3. Protestant 4. Catholic	
5	Number of individuals in the house hold	_____ (in number)	
6	Number of under five children in the household	_____ (in number)	
7	How decision is made on feeding condition of the child in the household?	1. Mother involved 2. Mother not involved	
8	Source of Drinking water	1. Pipe 2. Protected well	

		3. River/pond 4. Other Mention	
9	Latrine availability for the family	1.yes 2.No	
10	What is the educational status of your husband/partner? (for those who are married or have partner)	1. Unable to read and write 2. Able to read and write 3. Grade 1-8 4. Grade 9-12 5. College and above	
11	What is the occupation of your husband/partner? (for those who are married or have)	1. Farmer 2. Merchant 3. Daily laborer 4. Private employee 5. Government Worker 6. Others (specify	
12	Sex of the child	1. Male 2. Female	
13	How old is your child? (in completed months)	_____	
Part II: Children feeding practice			
14	Have you ever breast-fed your child?	1.Yes 2.No	If No, Q16
15	How soon after birth, did you try to breast-feed this child?	1.Within one hour 2.with more than one hour	
16	What was given for your infant before the breast milk?	1. Nothing other than breast milk 2. water 3. Butter 4. Cow milk 5. Sugar solution 6. Others	
17	Is your child currently breastfeeding?	1.Yes 2. No	
18	If No to Q 17 When did stop breast-feeding after delivery of this child?	----- in months	

19	Did you feed the child with bottle yesterday during day or night? (breast milk/ other foods)	1. Yes 2. No	
20	Do you give additional food to your current child (Name)?	1. Yes 2. No	If No, Q22
21	If yes to Q 20, at what age you give to your child?	1. Less than 6 month 2. at 6 month 3. > 6 month	
22	How many times did eat Solid, semi-solid or soft drinks other than liquids yesterday during the day and night?	1. One times 2. Two times 3. Three times 4. Four times and above	
23	Is the child vaccinated	1. Yes 2. No	
Part III: Household food security status			
24	In the past four weeks, did you worry that your household would not have enough food?	1. Yes 2. No	If No, Q26
25	If yes, how often did this happen?	1. 1 or 2 time 2. 3 to 10 times 3. > 10 times	
26	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	
27	If yes, how often did this happen?	1. 1 or 2 times 2. 3 to 10 times 3. > 10 times	
28	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	if No, Q30
29	If yes, how often did this happen?	1. 1 or 2 times 2. 3 to 10 times	

		3. > 10 times	
30	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	1. Yes 2. No	If No, Q32
31	If yes, how often did this happen?	1. 1 or 2 times 2. 3 to 10 times 3. > 10 times	
32	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	If No, Q 34
33	If yes, how often did this happen?	1. 1 or 2 times 2. 3 to 10 times 3. > 10 times	
34	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	If No,Q36
35	If yes, how often did this happen?	1. 1 or 2 times 2. 3 to 10 times 3. > 10 times	
36	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	If No, Q38
37	If yes, how often did this happen?	1. 1 or 2 times 2. 3 to 10 times 3. > 10 times	
38	In the past four weeks, did you or any household member go to sleep	1. Yes 2. No	If No, Q40

	at night hungry because there was not enough food?		
39	If yes, how often did this happen?	1. 1 or 2 times 2. 3 to 10 times 3. > 10 times	
40	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	
41	If yes, how often did this happen?	1. 1 or 2 times 2. 3 to 10 times 3. > 10 times	
Part V: Maternal and child health care			
42	How old is the preceding child if any? (in completed months)		
43	Has your child been sick in the last two weeks?	1. Yes 2. No	
44	If yes for question 42, which illness?	1. Diarrhea 2. Vomiting 3. Fever with chills 4. Fever with cough and difficulty in breathing 5. Accident 6. Other specify.....	
45	Did the mother have history of illness during pregnancy of this child (Name)?	1. Yes 2. No	
46	What was your ANC follow up status during pregnancy of the index child?	1. No visit 2. One-three visits 3. Four and above visits	
47	Where was the place of delivery for	1. Home	

	the index child?	2. Health facility 3. Others (specify)	
48	What was your postnatal care follow up status after delivery of the index child?	1. No visit 2. One visit 3. Two visits 4. Three and above visits	
Part VI: Dietary diversification practice			
49	What kinds of foods did you provide to your child yesterday during the day and night?		
50	Yesterday during the day and night, did your child eat porridge, bread, Injera fitfit, rice, pasta, biscuit or any food made from cereals and grains?	1. Yes 2. No 3. Do not know	
51	Yesterday during the day and night, did your child eat potato, sweet potato or any other food made of tubers or roots?	1. Yes 2. No 3. Do not know	
52	Yesterday during the day and night, did your child consume carrot, pumpkin, spinach, lettuce, red pepper, ripe papaya and mango or other dark green leafy vegetable?	1. Yes 2. No 3. Do not know	
53	Yesterday during the day and night, did your child consume onion, watermelon, banana, orange, avocado, tomato, cabbage or any other vegetables and fruits?	1. Yes 2. No 3. Do not know	
54	Yesterday during the day and night, did your child consume egg?	1. Yes 2. No 3. Do not know	
55	Yesterday during the day and night, did your child consume dairy products (cheese, butter, whey, or yogurt) or infant formula?	1. Yes 2. No 3. Do not know	
56	Yesterday during the day and night, did your child consume flesh foods such as meat, poultry, or fish?	1. Yes 2. No 3. Do not know	
57	Yesterday during the day and night, did your child consume foods made from beans, peas, lentils, or nuts including plumpy nut?	1. Yes 2. No 3. Do not know	

Part VII: Household properties (assets)

Asset type	Response		
Domestic animals			
Cattle (ox, cow, calf)	1. Yes	2. No	
Sheep	1. Yes	2. No	
Goat	1. Yes	2. No	
Hen	1. Yes	2. No	
donkey/mules	1. Yes	2. No	
Durable assets			
Radio	1. Yes	2. No	
Watch/clock	1. Yes	2. No	
Mobile phone	1. Yes	2. No	
Cart	1. Yes	2. No	
Table	1. Yes	2. No	
Chair	1. Yes	2. No	
Bed	1. Yes	2. No	
Own living house	1. Yes	2. No	
Own agricultural land	1. Yes	2. No	
Bee hive	1. Yes	2.No	
Housing characteristics			
Water source	1. Pipe	2. Non-pipe	
Type of floor	1. Cement/wood	2. Earth	3. Others (specify)
Type of wall	1. Cement	2. Mud	3. Others (specify)
Type of roof	1. Concrete	2. Iron sheet	3. Others (specify)

Part VIII: Anthropometric Measures

Types of Measurement	Measurement result
Weight of the child	_____ Kg
Height/Length of the child	_____ cm
Bilateral pitting	1=Yes2=NO

Annex IV: Amharic version of questionnaire for acute malnutrition

ክፍል አንድ: ማህበራዊና ህዝባዊ ሁኔታ

ተ.ቁ	ተለዋዋጭ	ምላሽ	እለፍ
1	የእናቶች / ተንከባካቢዎች ዕድሜ? (በተጠናቀቁ ዓመታት)	_____ አመት	
2	የእናቶች / ተንከባካቢዎች የትምህርት ደረጃ	1. ለማንበብ እና ለመጻፍ አልተቻለም 2. ለማንበብ እና ለመጻፍ የሚችል 3. ክፍል 1-8 4. ክፍል 9-12 5. ኮሌጅ እና ከዚያ በላይ	
3	እናቶች / ተንከባካቢ የጋብቻ ሁኔታ?	1. ነጠላ 2. ያገባ / አጋር 3. ፍቺ 4. ባሏ የሞተ	
4	እናቶች / ተንከባካቢዎች ሃይማኖት?	1. ሙስሊም 2. ኦርቶዶክስ ክርስቲያን 3. ፕሮቴስታንት 4. ካቶሊክ 5. ሌሎች (ይጥቀሱ) _____	
5	በቤቱ ውስጥ ያሉ ግለሰቦች ብዛት	_____ (በቁጥር)	
6	በቤተሰቡ ውስጥ ከአምስት ዓመት በታች የሆኑ ልጆች ቁጥር	_____ (በቁጥር)	
7	በቤተሰቡ ውስጥ የልጁን የአመጋገብ ሁኔታ በተመለከተ እንዴት ውሳኔ ይደረጋል?	1. እናት ትሳትፋለች 2. እናት አትሳትፍምም	

8	የመጠጥ ውሃ ምንጭ	1. ፓይፕ/ቧንቧ 2. በጥሩ ሁኔታ የተጠበቀ ምንጭ 3. ወንዝ / ኩሬ 4. በእጅ ሚወዘወዝ 5.ሌላ	
9	ሽንት ቤት ለቤተሰቡ መገኘቱ	1.አለ 2.የለም	
10	የባለቤትዎ / የትዳር አጋርዎ የትምህርት ሁኔታ ምንድን ነው? (ላገቡ ወይም አጋር ላላቸው)	1. ለማንበብ እና ለመጻፍ አልተቻለም 2. ለማንበብ እና ለመጻፍ የሚችል 3. ክፍል 1-8 4. ክፍል 9-12 5. ኮሌጅ እና ከዚያ በላይ	
11	የባለቤትዎ / የትዳር አጋርዎ ሥራ ምንድን ነው? (ላገቡ)	1. አርሶ አደር 2. ነጋዴ 3. ዕለታዊ ሰራተኛ 4. የግል ሰራተኛ 5. የመንግስት ሰራተኛ 6. ሌላ (ይግለጹ-----)	
12	የልጅ ጾታ	1. ወንድ 2. ሴት	
13	ልጅዎ ስንት አመት ነው? (በተጠናቀቁ ወራት ውስጥ)	_____	
ክፍል ሁለት: የልጆች አመጋገብ ስርዓት			
14	ልጅዎን ጡት አጥብተው ያውቃሉ?	1.አዎ 2.የለም	የለም ከሆነ ቁ16
15	ከተወለደ በኋላ ምን ያህል ጊዜ ይህንን ልጅ ጡት ለማጥባት ሞክረዋል?	1. በአንድ ሰዓት ውስጥ 2.ከአንድ ሰዓት በላይ	
16	ከጡት ወተት በፊት ለህፃንዎ የተሰጠው ምንድን ነው?	1. ከጡት ወተት በስተቀር ምንም ነገር የለም	

		2. ውሃ 3. ቅቤ 4. ላም ወተት 5. የስኳር ውጤት 6. ሌሎች	
17	ልጅዎ በአሁኑ ጊዜ ጡት እየጠባ ነውን?	1.አዎ 2.የለም	
18	ጥ.ቁጥር 17 መልስዎ የለም ከሆነ ይህ ልጅ ከተወለደ በኋላ ጡት መጥባት ያቆመው መቼ ነው?	----- በወር	
19	ትላንትና ቀን ወይም ማታ ሕፃኑን ጠርሙስ/በጡቶ መግበውታል? (የጡት ወተት / ሌሎች ምግቦች)	1.አዎ 2.የለም	
20	ለልጅዎ ተጨማሪ ምግብ ሰጠውታል?	1.አዎ 2.የለም	የለም ከሆነ,ጥ.ቁ22
21	ለቁ20 መልስዎ አዎ ከሆነ ለልጅዎ በየትኛው ዕድሜ ላይ ይሰጣሉ?	1. ከ 6 ወር በታች 2. በ 6 ወር 3.> 6 ወር	
22	ትናንትና ቀን ከሌሊት ከሌላው ፈሳሽ ሌላ ጠንካራ ፣ ግማሽ-ጠንካራ ወይም ለስላሳ መጠጦች ስንት ጊዜ ተመገቡ?	1. አንድ ጊዜ 2. ሁለት ጊዜ 3.የሦስት ጊዜያት 4. አራት ጊዜ እና ከዚያ በላይ	
23	ልጁ ክትባት ወስዷል?	1.አዎ 2.የለም	
ክፍል ሶስት: የቤተሰብ የምግብ ደህንነት ሁኔታ			
24	በአለፉት አራት ሳምንታት ውስጥ ቤተሰብዎ በቂ ምግብ አያገኝም ብለው ተጨንቀዋል?	1.አዎ 2.የለም	የለም ከሆነ,ጥ.ቁ26
25	አዎ ከሆነ ፣ ይህ ስንት ጊዜ ተከሰተ?	1. 1 ወይም 2 ጊዜ 2.ከ 3 እስከ 10 ጊዜ 3.> 10 ጊዜ	

26	በአለፉት አራት ሳምንታት ውስጥ እርስዎ ወይም ሌላ የቤተሰብ አባል በሀብት እጥረት ምክንያት የመረጣቸውን አይነት ምግቦች መብላት አልቻሉም?	1.አዎ 2.የለም	
27	አዎ ከሆነ ፣ ይህ ስንት ጊዜ ተከሰተ?	1. 1 ወይም 2 ጊዜ 2.ከ 3 እስከ 10 ጊዜ 3.> 10 ጊዜ	
28	በአለፉት አራት ሳምንታት ውስጥ እርስዎ ወይም ሌላ የቤተሰብ አባል በሀብት እጥረት ምክንያት የተወሰኑትን የተለያዩ ምግቦች አልተመገባችሁም?	1.አዎ 2.የለም	የለም ከሆነ,ጥ.ቁ30
29	አዎ ከሆነ ፣ ይህ ስንት ጊዜ ተከሰተ?	1. 1 ወይም 2 ጊዜ 2.ከ 3 እስከ 10 ጊዜ 3.> 10 ጊዜ	
30	ካለፉት አራት ሳምንታት ውስጥ እርስዎ ወይም ሌላ የቤተሰብ አባል ሌሎች የምግብ ዓይነቶችን ለማግኘት ሀብትን በማጣት ምክንያት እርስዎ መብላት የማይፈልጉትን አንዳንድ ምግቦች ተመግበዋል?	1.አዎ 2.የለም	የለም ከሆነ,ጥ.ቁ32
31	አዎ ከሆነ ፣ ይህ ስንት ጊዜ ተከሰተ?	1. 1 ወይም 2 ጊዜ 2.ከ 3 እስከ 10 ጊዜ 3.> 10 ጊዜ	
32	በአለፉት አራት ሳምንታት ውስጥ እርስዎ ወይም ሌላ የቤተሰብ አባል በቂ ምግብ ባለመኖሩ ከሚያስፈልጓቸው ያነሰ ምግብ ተመግበዋል?	1.አዎ 2.የለም	የለም ከሆነ,ጥ.ቁ34
33	አዎ ከሆነ ፣ ይህ ስንት ጊዜ ተከሰተ?	1. 1 ወይም 2 ጊዜ። 2.ከ 3 እስከ 10 ጊዜ 3.> 10 ጊዜ	

34	በአለፉት አራት ሳምንታት ውስጥ እርስዎ ወይም ሌላ ማንኛውም የቤተሰብ አባል በቂ ምግብ ባለመኖሩ በቀን ውስጥ አነስተኛ ምግብ ተመግበዋል?	1. አዎ 2. የለም	የለም ከሆነ,ጥ.ቁ36
35	አዎ ከሆነ ፣ ይህ ስንት ጊዜ ተከሰተ?	1. 1 ወይም 2 ጊዜ። 2.ከ 3 እስከ 10 ጊዜ 3.> 10 ጊዜ	
36	በአለፉት አራት ሳምንታት ውስጥ ምግብ ለማግኘት የሚያስችል አቅም በማጣቱ ምክንያት በቤተሰብዎ ውስጥ የሚበላ ምግብ አልነበረም?	1. አዎ 2. የለም	የለም ከሆነ,ጥ.ቁ38
37	አዎ ከሆነ ፣ ይህ ስንት ጊዜ ተከሰተ?	1. 1 ወይም 2 ጊዜ 2.ከ 3 እስከ 10 ጊዜ 3.> 10 ጊዜ	
38	በአለፉት አራት ሳምንታት ውስጥ በቂ ምግብ ባለመኖሩ ምክንያት እርስዎ ወይም ሌላ የቤተሰብ አባል በማታ ምግብ ሳይበሉ ተኝተው ያውቃሉ?	1. አዎ 2. የለም	የለም ከሆነ,ጥ.ቁ40
39	አዎ ከሆነ ፣ ይህ ስንት ጊዜ ተከሰተ?	1. 1 ወይም 2 ጊዜ 2.ከ 3 እስከ 10 ጊዜ 3.> 10 ጊዜ	
40	በአለፉት አራት ሳምንታት ውስጥ እርስዎም ሆነ ማንኛውም የቤተሰብ አባል ምግብ ባለመኖሩ ምክንያት ቀኑንና ሌሊቱን በሙሉ ሳይበሉ የዋሉበት ቀን ነበር?	1. አዎ 2. የለም	
41	አዎ ከሆነ ፣ ይህ ስንት ጊዜ ተከሰተ?	1. 1 ወይም 2 ጊዜ 2.ከ 3 እስከ 10 ጊዜ 3.> 10 ጊዜ	

ክፍል አራት: የእናቶች እና የህፃናት ጤና እንክብካቤ

42	የቀዳሚው ልጅ ዕድሜው ስንት ነው? (በተጠናቀቁ ወራት ውስጥ)		
43	ልጅዎ ባለፉት ሁለት ሳምንታት ውስጥ ታምሞ ነበር?	1. አዎ 2. የለም	
44	ለጥያቄ 42 አዎ ከሆነ ፣ የትኛው ህመም ነው?	1. ተቅማጥ። 2. ማስታወክ 3. ከቀዝቃዛዎች ጋር ትኩሳት። 4. ትኩሳት በሳል እና የመተንፈስ ችግር። 5. አደጋ 6. ሌላ--	
45	እናት በዚህ ልጅ እርግዝና ወቅት የታመመ ታሪክ አልነበራትም?	1. አዎ 2. የለም	
46	መረጃ ጠቋሚው ልጅ በእርግዝና ወቅት የኤኤንሲ (ANC) ሁኔታዎ ምን ይመስላል?	1. ጉብኝት የለም 2. አንድ-ሶስት ጉብኝቶች 3. አራት እና ከዚያ በላይ ጉብኝቶች	
47	ህጻኑ የተወለደው የት ነው?	1. ቤት 2. የጤና ተቋም 3. ሌላ (ይግለጹ----	
48	የመረጃ ጠቋሚውን ልጅ ከወለዱ በኋላ የወሊድ ክትትልዎ ምን ነበር?	1. ጉብኝት የለም 2. አንድ ጉብኝት 3. ሁለት ጉብኝቶች 4. ሶስት እና ከዚያ በላይ ጉብኝቶች	

ክፍል አምስት: የአመጋገብ ስርዓት ማባዛት ልምድ			
49	ትናንት ቀን እና ማታ ልጅዎ ምን አይነት ምግቦችን ሰጠዎል? (ሌላ ህጻን በቤት ውስጥ እና ከቤት ውጭ የሚጠቀሙባቸውን ምግቦች ሁሉ እናት ትናገር)		
50	ትናንት ቀን እና ማታ ልጅዎ ገንፎ ፣ ዳቦ ፣ ኢንጂራ fitfit ፣ ፋዝ ፣ ፓስታ ፣ ብስኩስ ወይም ከእህል እህሎች እና እህሎች የተሰራ ማንኛውንም ምግብ በልቷል?	1. አዎ 2. የለም 3. አይታወቅም	
51	ትናንት ቀን እና ማታ ልጅዎ ድንች ፣ ጣፋጩ ድንች ወይም ከቡናዎች ወይም ከሥሩ የተሰሩ ሌሎች ምግቦችን በልቷል?	1. አዎ 2. የለም 3. አታውቅም	
52	ትናንት ቀን ልጅዎ ካሮት ፣ ዱባ ፣ ስፒናች ፣ ሰላጣ ፣ ቀይ በርበሬ ፣ የበሰለ ፓፓያ እና ማንኛ ወይም ሌላ ጥቁር አረንጓዴ ቅጠል አትክልት በልቷል?	1. አዎ 2. የለም 3. አታውቅም	
53	ትናንት ቀን እና ማታ ልጅዎ ሽንኩርት ፣ ሐብሐብ ፣ ሙዝ ፣ ብርቱካናማ ፣ አሾካይ ፣ ቲማቲም ፣ ጎመን ወይም ሌላ ማንኛውንም አትክልትና ፍራፍሬ በልቷል ወይ?	1. አዎ 2. የለም 3. አታውቅም	
54	ትናንት ቀን እና ማታ ፣ ልጅዎ እንቁላል በልቷል	1. አዎ 2. የለም 3. አታውቅም	
55	ትናንት ቀን እና ማታ ልጅዎ የወተት ተዋጽኦዎችን (አይብ ፣ ቅቤ ፣ ጎመን ፣ ወይም እርጎ) ወይም የሕፃን ምግብ ተጠቅሟል?	1. አዎ 2. የለም 3. አታውቅም	
56	ትናንት ቀን እና ማታ ልጅዎ እንደ ስጋ ፣ የዶሮ እርባታ ወይም ዓሳ ያሉ የስጋ ምግቦችን ተመግቧል?	1. አዎ 2. የለም 3. አታውቅም	
57	ትናንት ቀን ቀን እና ማታ ልጅዎ ባቄላ ፣ አተር ፣ ምስር ፣ ወይም የጤፍ እህልን ጨምሮ ለውዝ የተሰሩ ምግቦችን በልቷል?	1. አዎ 2. የለም 3. አታውቅም	

ክፍል ስድስት: የቤትንብረቶች

የንብረት አይነት	ምላሽ	ዘላቂ ንብረቶች	
የቤት እንስሳት		ፊዲየ	1. አዎ 2. የለም
ክብት (በሬ ፣ ላም ፣ ጥጃ)	1. አዎ 2. የለም	ሰዓት	1. አዎ 2. የለም
በግ	1. አዎ 2. የለም	ሞባይል	1. አዎ 2. የለም
ፍየል	1. አዎ 2. የለም	ጋሪ	1. አዎ 2. የለም
ዶሮ	1. አዎ 2. የለም	ጠረቤዛ	1. አዎ 2. የለም
አህያ / በቅሎዎች	1. አዎ 2. የለም	ወንበር	1. አዎ 2. የለም
አልጋ	1. አዎ 2. የለም	መኖሪያ ቤት	1. አዎ 2. የለም
የእርሻ መሬት ባለቤት	1. አዎ 2. የለም	ንብ ቀፎ	1. አዎ 2. የለም
የመኖሪያ ቤት አሰራር			
የውሃ ምንጭ	1. ፓይፕ	2. ቧንቧ-አልባ	
የወለል አይነት	1. ሲሚንቶ / እንጨት	2. ምድር	3. ሌላ(ግለጽ)--
የግድግዳ ዓይነት	1. ሲሚንቶ	2. ጭቃ	3. ሌላ(ግለጽ)
የጣሪያ ዓይነት	1. ኮንክሪት	2. የብረት ለሀ	3. ሌላ(ግለጽ)

ክፍል ሰባት: የህጻናት ልኬት

የመለኪያ ዓይነቶች	የልኬቱ ውጤት
የልጁ ክብደት	_____ ኪ.ግ
የልጁ ቁመት / ርዝመት	_____ ሴ.ሜ
የሁለት እግሮች እብጠት	1=አዎ 2=የለም

Annex V: Declaration form

I, the under signed, declared that this is my original work, has never been presented in this or any other University, and that all the resources and materials used for the research, have been fully acknowledged.

Principal investigator

Name: _____

Signature: _____

Date: _____

Advisors

Name _____

Name _____

Signature _____

Signature _____

Date _____

Date _____

Examiner

Name _____

Signature _____

Date _____