DETERMINANTS OF ACUTE UNDERNUTRITION AMONG CHILDREN AGED 6-59 MONTHS IN META DISTRICT, EASTERN HARARGE, ETHIOPIA.

MPH THESIS

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ACRONYMS AND ABBREVIATION

AOR: Adjusted Odd Ratio

ANC: Antenatal care

BCG: Bacillus Calmette -Guerin

BMI: Body Mass Index

CI:Confidence Interval

CSA: Central Statically Agent

DHIS: District Health Information System

EDHS: Ethiopia Demographic Health Services

ETB: Ethiopia Birr

FANTA: Food and Nutrition Technical Assistance

HEW: Health Extension Worker

HFIAS: Household Food Insecurity Access Scale

MDDS: Minimum Dietary Diversity Score

MUAC: Mid-Upper – Arm-circumference

SAM: Severe Acute Malnutrition

SD: Standard Deviation

SPSS: Statically Power For Social Science

PI: Principal Investigator

PNC: Postnatal Care

UNICEF: United Nation Children Fund

WFH: Weight- For- Height

WHO: World Health Organization

ABSTRACT

Background: Despitegovernmental and non-government organization effort to reduce the problem, acute undernutrition continues to be among the leading cause of morbidity and mortalityin under five children in developing country including Ethiopia. Understanding the determinant of acute undernutrition in the given society helps to identify the area of priority for intervention. However, there is limited study conducted on the determinants of acute undernutrition among under-five children using case-control study design in Ethiopia including the current study area.

Objective: Th is study aimed to assess the determinants of acute undernutrition among children aged 6-59 months inMeta district, Oromiya, eastern Ethiopia.

Methods:A community-based case-control study was conducted among406(203 cases and 203 controls) children aged 6-59 months included in the survey,of which 390(195 cases and 195 controls) included in the analysis with overall reponse rate 96 %,from March 01to March 30, 2020. Six Kebeles were selected by simple random sampling and 4320 target population founded .The cases were 203 children with acute undernutrition selected by simple random sampling from total 472 cases andcontrols were 203 children without acute undernutrition selected from total 3848 controls in the same Kebele.Data were double entered into Epi-data version 3.1 and export to SPSS version 23for analysis. Bivariate and multivariate binary logistic regression analyses were used to identify determinants of acute undernutrition. Adjusted odds ratio with 95% confidence interval was used to declear stastistical significance at P-value <0.05.

Results:-The current study revealed, acute undernutrition was significantly associated with Age 12-23 months[AOR=3.32,95%CI: 1.49,7.37],household food insecurity [AOR=2.64,95%CI: 1.24,5.61], service inaccessibility [AOR=10.70,95%CI: 5.25,21.84],lack of maternal counseling about child feeding during postnatal follow up[AOR=2.39,95%CI: 1.22,4.65],None exclusive breastfeeding[AOR=2.16,95%CI:1.02,4.55], and fever in the last two weeks [AOR=6.44,95%CI(2.75,15.09)]and diarrhea in last two weeks[AOR=2.68,95%CI(1.15,6.21)].

Conclusion:-Child age 12-23 months, HH food insecure, lack of exclusive breastfeeding, infection, service inaccessibility, and lack of maternal counseling on child feedingwas significant determinants of acute malnutrition in this study.Multi-sector approach is crucial to address child acute undernutrition. There is need intervention on identified predictor in the study area.

Keywords: Acute undernutrition, Case-control,Determinants, Ethiopia,Under five –children.

1. INTRODUCTION

1.1. Background

Acute child undernutrition is a condition children who loses their bodyweight rapidly and or nutritional edemaand measured by using weight for height or mid-upper arm circumference (MUAC)(WHO, 2018a, WHO, 2013).Acute child undernutrition in children aged 6-59months either severe acute undernutrition which is defined as mid-upper arm circumference less than 11.5 cm or presence of bilateral pitting edema of nutritional origin and moderate acute undernutrition which is MUAC between 11.5cm and 12.5cm(WHO, 2009, Grellety and Golden, 2016).

Despite an ongoing worldwide effort focused on the complete eradication of hunger and poverty, acute undernutrition or wasting is continue to be the major public health problem in the world(UN, 2003, UNICEF, 2015). Particularly in low and low-middle income countries, wasting is threatening the lives of millions under-five children, (Black et al., 2013). Global, over 49.5 million under-five children were wasted and 14 million cases were found in Africa. In sub-Saharan Africa, 13.3 million children are affected by the problem of acute undernutrition in 2018(UNICEF et al., 2019). In Ethiopia where many under-five children are sufferingfrom undernutrition,the magnitude of the problem was about 7%among under-five years children(EDHS, 2019).

Malnutrition encompasses undernutritionand over nutrition (Black et al., 2008, Amy L.Rice et al., 2000). Undernutrition is the group of disorders that include underweight, stunting, and wasting (WHO, 2018b). Acute malnutritionhappens in children when the child loses their bodyweight rapidly. It is the outcome of insufficient dietary and poor quality food intake, acute shortage of nutrition, or repeated episodes of infectious diseases or a combination of both (Black et al., 2013, WHO, 2018a).

Wasting in children leads to immunity dysfunction and vulnerable to infection, the risk for long-term developmental delay, high rate of relapse, and increased risk for death (McDonald et al., 2013, Wijiwinarsih et al., 2019). It also increased the severity, duration of illness,the risk for non-communicable disease and affect the economy of the country(Blessing et al., 2017, UNICEF, 2015). Besides undernutrition is responsible for over 45% of death(about 5.6 million) of under-five children in 2018(UNICEF et al., 2019).Acute malnutritionis related to poverty, low socioeconomic status and presence of infectious disease, suboptimal nutrition, and unhealthy environments(Black et al., 2013, Dodos et al., 2018),Lack of access to maternal health services, narrow birth interval, individual decision making for the care of the ill child and non-exclusive breast feeding(Egata et al., 2014), large family size, infrequent hand washing,merchant mother and complementary feeding started before and after six months (Abuka et al., 2017),lack of maternal autonomy on decision making(Dereje, 2014).

1.2. Statements of TheProblem

Acute Undernutrition is one of the critical public health problems, for under-five children, as contributes to child morbidity and mortality in the developing world (Hill and Pelletier, 2008, Black et al., 2013, UNICEF et al., 2019). In 2018, globally,around 49.5 million(7.3%) children less than 5 years were affected byacute undernutrition. Out of this, 16.5 million under-five children developed severe acute undernutrition. Africa is the second home of acute undernutritionamong unde-five children next to Asia (33.8 million in Asia and 14 million in Africa)(UNICEF et al., 2019).

The wasting is life-threatening condition for under-five childrenas it contributes to child mortality and disability(Black et al., 2008).Study indicated that wasting is responsible for 800,000 child death annually(Bhutta et al., 2008, Black et al., 2008). Out of those 449,000 child death is attributed to severe wasting. Severely wasted children aged 6-59 months were 9 to 12 times more likely to die than their healthy counterparts(Black et al., 2008, Olofin et al., 2013). Another study founded that severe wasting is responsible for up to two million child death annually(Bhutta et al., 2008).It is the underlying cause of death for 12.6 percent(about 875,000) under-five children annual worldwide(Black et al., 2013).

In 2018,wastingis the most common type of undernutrition threateningthe life of many children** under five years in Ethiopia. Around 3.9 million under-five children are wasted (BMJ, 2018).According to the min EDHS report of 2019, 3 out of 10 or 7% of under-five children were suffering from wasting(EDHS, 2019).In 2019,around 6.8 million children were affected byundernutrition, and nearly half found in the Oromia region (personal communication, MOA umer husen). This is very high when compared tothe cut-off value for public health significant less than 5% bythe world health assemble(WHA, 2012).

The factors leading to acuteundernutrition are multidimensional, complex, and interrelated. Differentworks of the literature revealed thatrisk factors across countries and individual countries, includes socio-demographic characteristics at the household levelsuch as maternal and husband illiteracy, household poverty, and occupation (Dereje, 2014, Egata et al., 2014, Ahmed A et al., 2017, Berhe et al., 2019), family size, andhealth-seeking behavior of legal guardian(s) of the child(Abuka et al., 2017, Ayana et al., 2015). Similarly atcommunity-level factors such as communities cultures and norms on nutritional intake during pregnancy, lack of maternal and child health services; lack of adequate and safe water supply; and proper environmental sanitation are among the commonpredisposing factors for an acute child undernutrition(Abuka et al., 2017, Egata et al., 2014).Furthermore,suboptimal breastfeed age of the child is the main triggering factors for acute undernutrition(Egata et al., 2014, Abuka et al., 2017, Berhe et al., 2019).

However, some study finding shows that acute child undernutrition is not associated with diarrhea and IYCF (Ritu et al., 2019). This indicates thatthe cause of acute undernutrition is complex and it needs further study.

In the last two to three decades governmental and non-government organization is highly working collaboratively to reduce acute under-nutrition globally (WHO, 2018a). In the Ethiopian context, the government has introduced a guideline to screen for malnutrition at the community level with the help of coordinated efforts of community-based health extension workers and women development army(NNP, 2016).

Although there is a persistently high magnitude of acute undernutrition in Ethiopia, available studies do not provide sufficient evidence on the risk factors at all corners of the country and in the study area. Asan expected outcome, the finding of this study may be identifyingdeterminants of acute undernutrition in the district.However, most the studies were conducted in cross-sectional study which is inappropriate to identify the risk factors and there is no study conducted on determinants of acute undernutrition in the study area. Hence, this study aims to identify the determinant of acute undernutrition among children aged 6-59 months in the Meta district, Oromia, eastern Ethiopia.

1.3. Significant of the study

The feeding from this study was highlighting the determinant of acute undernutrition among the target population in the Meta district. The primary beneficiaries of this feeding will be the Meta district and East Hararge zonal health office, and Non-governmental organization working in the district on child health. That office may use the identified gaps in planning and implementing the intervention activities to improve the child health and reducing cost for treatments in the Meta district and East Hararge Zone.It also serveas baselinefor the future researcher.

1.4. Objectives

1.4.1.General objective

- To assess determinants of acute under-nutrition among children 6-59 months inMeta district, eastern Hararge,Ethiopia.

1.4.2. Specific objectives

- To determine whether the proportion of determinants among case and control are the same.

2. LITERATURE REVIEW

2.1. Overview of Acute under Nutrition among Children under Five Years.

Acute under -nutrition, characterized by loss of muscle and fat tissue. It is caused by food insecurity, poor diet and disease and infection is both cause and consequence of wasting(Bhutta et al., 2017b).Unhealthy environmentis the risk factors for acute under nutrition. Study conducted in afar in 2019, indicated that, unprotected drinking water is risk factors for wasting with (AOR=3.78,p<0.05), absence of latrine(AOR=5.24,P<0.05), childhood diarrheal disease (AOR=2.72,P<0.05)(Gizaw et al., 2019),Birth interval less than 2 years significant association with wasting were(AOR=3.34,95%CL=1.55-7.20)(Awoke et al., 2018).

Magnitude of acute under nutrition among under five children in Ethiopia range from 7%-15%(Ahmed A et al., 2017, EDHS, 2019)

2.2. Determinants of acute under-nutrition

Acute child under nutrition is causedby multiple factors and complex. The factors significant in one context no in another contexts(Akombi et al., 2017, Bhutta et al., 2017a). In this regard, United Nation Children Emergency Fund UNCEF and other literature categorized as three group namely immediate(individual level),intermediates (household and community) and distal including socioeconomic variable (Hien and Hoa, 2009, Boah et al., 2019).

Based on previous studies conducted on risk factors of child undernutrition list the following determinant of acute under nutrition for this study: distal factors(socio economic and demographic factors);place of residence, maternal and husband level of education, maternal occupation,religion,ethnicity, household wealth index, intermediate(maternal and environmental) factors; mother age at birth birth interval, maternal information on nutrition of children, lack of maternal and child health services access,source of drinking water, environmental hygiene andsanitation;immidaite(individual) factors including; minimum dietary diversity, duration of breastfeeding, time of starting complementary feeding, frequencies of complementary feeding, diarrhea and fever.

2.2.1. Socio-demographic factors

A community based matched case control study conducted in Nepal in 2017,indicate that children whose their mother age at birth less than 20 years or greater than 35 years were 3.21 times more likely to develop acute malnutrition [AOR= 3.21, 95% CI=1.30-7.94)] than children who their mother age at birth is between 20 and 35 years(Pravana et al., 2017).

A study conducted from Pakistan DHS in 2019, indicated that, Children whose mothers had education were three times less likely to be wasted [AOR = 3.61, 95%(CI =1.33 – 9.82)] compared to those children whose mother had no educational(Khan et al., 2019). Similarly, a facility based one to two case control study in Ibadan, southwest Nigeria ,in 2013, indicate that children whom their maternal level of education below secondary level or uneducated were 3.6 time higher risk to develop acute child under nutrition [(35% versus 26%), orAOR=3.6 95% ,(CI 2.0-6.4)]than children whom their mother educational level is greater than primary level education(Owoaje et al., 2014) .

Furthermore, facility based case control study conducted in Gedeo zone, Southern Ethiopia in 2017 indicated that maternal illiteracy is significant association with acute malnutrition [AOR=4.18, 95% (CI=1.36-12.8)]. However,cross sectional study conducted in Ethiopia by Taye *et al*. showed that, there is no association between maternal education status and wasting. Also this study showed, significant association between father education and wasting(Taye et al., 2016) .
A facility based case control study conducted in Gedeo zone, Ethiopia in 2017 indicted that children from family size more than four were six times at risk to acute malnutrition [(AOR=5.9, 95% CI=2.1-16.7)] as compared to those children from family size less than four (Abuka et al., 2017). Similarly, case study by Ayana *et al* ,showed confirmed the association between large family size and acute under nutrition (Ayana et al., 2015).

A community based case control study conducted in Nepal, 2018, indicated that, children from low socio economic status were 17 times more likely to develop acute malnutrition [AOR= 17.13, 95% CI (5.85 to

50.13)] as compared to children from the high socio economic status(Pravana et al., 2017).Also A case-control study conducted on (n=451) under-five children in Gedeo Zone,Ethiopia,in 2017,indicated that those children household monthly income less than 750 *ETB* were 4.6 times at risk to develop acute malnutrition [AOR=4.6, 95% (CI=1.1-21.6)], when compared with children their household monthly income greater than 1500 ETB(Abuka et al., 2017).

A facility base Case control study conducted (n=303) in Machakel Woreda, Northwest Ethiopia, in 2014, indicated that, children whose father's is illiterate(cannot read and write) were 5 times at risk to have malnutrition when compared to children with literate fathers [AOR=5.02, 95%CI =2.06-13.14)] (Bantamen et al., 2014).Similarly, seid et al 2017 ,indicate association between father illiterate and acute malnutrition among under five children (Seid et al., 2017).

A facility based case control study conducted in North West Ethiopia, 2019, indicated that children from household food insecure were 2.9 times more likely to be severe acute malnutrition [AOR= 2.9, 95% CI(1.17-7.28)] as compared to those children from household food secure(Nebro et al., 2019).

2.2.2. Environmental related factors

Various study indentified several health benefits from healthy environments. For instance community base one to two matched case control study conducted to identify risk factors of SAM among under children in Mao, Chad ,in 2018, found that, those children from household have not toilet facility were 1.9 times at risk (AOR=1.9,95% (CI=1.1-3.6)] to develop the severe acute malnutrition as compared to those children their household have toilet facility(Dodos et al., 2018).

A community based one to four nested case control study in Dabat district, North Gondar, Ethiopia, in 2017,indicated that, In the multiple logistic regression analysis, infants who their family with no toilet facility were 2.42 times at risk to have malnutrition [AOR=2.24, 95% (CI=1.16–4.33)] when compared to infants whose family with toilet facility(Wubante, 2017). Another study, using multivariable logistic regression analyses found that, the odds of acute malnutrition was significantly higher among children from household have not toilet facility were 2.99 times more likely at risk [(AOR=2.99, 95% (CI=1.23-7.06)] as compared to children whose household have toilet facility(Ayana et al., 2015).

Other important underlying risk factor is water source for drinking and food preparation, which has significant association with acute under-nutrition. For instance, study conducted in Ethiopia to examines the impact of access to basic environmental services, such as water and sanitation and externality association with nutritional status of children (Patricia Silva World Bank, 2005) found that as proportion of household in the community access to water increased, good nutritional outcome of children increased. This Indicates significant association between access to water and sanitation.

A study conducted in Zambia in 2011, found that children from household using unprotected source of drinking water were 1.21 times more likely to develop wasting [AOR=1.21,95% CI=1.19-1.23] as compared to those children their household using protected well/spring source of drinking water (Nzala et al., 2011)

A cross sectional study conducted in Hadaleala district,Afar region, northeast Ethiopia in 2018, founded the several risk factors of acute malnutrition, unprotected source of drinking water has significant association [AOR=3.78,p<0.001) and absence of latrine [AOR=5.24,p<0.05) with acute malnutrition(Gizaw et al., 2019). Also, study founded that, hand washing with soap is a protective factors for acute malnutrition [AOR=0.21,p<0.05)].

2.2.3. Accessibility of health facility.

As we going on with underlying factors different literature from low-and middle-income countries show that access to health facility is the main contributor for acute under-nutrition. For example, a case control study conducted in Kersa district, eastern Ethiopia in 2014, indicated that , children whose mothers had access to health facility were 1.56 less likely [AOR=1.56,95% (CI= 1.14-2.20)] to be wasted as compared to their counterpart(Egata et al., 2014). Similarly, the study conducted in Haramaya district,eastern Ethiopia in 2015,showed that, children whose Mothers did not ANC visit were 3.93 times more at risk to wasting [AOR=3.93,95% (CI=1.35-9.6)]compared to children whose mothers had ANC visit during pregnancy(Yisak et al., 2015).

Systemic review and meta-analysis study finding shows that family size and birth spacing are the most common predisposing factor(Ahmed A et al., 2017). For instance, a community base nest case control study conducted in east rural Ethiopia in 2014, indicates that, the odd of acute under nutrition were higher among children whose mother had short birth interval less than two years with OR= 1.65 than those children greater than two years(Egata et al., 2014).

2.2.4. Child characteristics, care and feeding related factors

A study conducted in Ghana, 2019, indicate that, odd of wasting is higher among female were with OR 2.52 as compared with male children, indicates, female children were 2.52 times more likely at risk of wasting[AOR=2.52,95% (CI=1.18-5.41)] as compared with male(Boah et al., 2019).

A facility base case control study conducted in Afar,in 2017,indicate that ,odd of acute malnutrition higher among children age group 12-23 month with OR =10.51 as compared with children age group 24-59 month [AOR=10.5,95% (CI=4.93-22.23)] (Seid et al., 2017).

The addition of a variety of food groups into complementary foods essential to improve child nutritional status(Rah et al., 2010).

The most common precursor of acute under-nutrition is inappropriate infant and young child feeding practice(Tickell and Denno, 2016).For example,a mixed method matched case control study conducted in Bangladesh, show that inappropriate feeding practice by caregivers of the children is recognized as one of the major cause of acute malnutrition(Hoq et al., 2019).

A community based case control study conducted in public hospital, Oromia region,western Ethiopia in 2015,found that children who did not exclusive breastfeed were 2.63 times more likely to develop wasting[AOR=2.63,95% Cl=(1.29-4.82)] as compared to children had exclusive breastfeed (Ayana et al., 2015).

Community based cross sectional study conducted(n=811) in Ethiopia in 2017,indicates that,children experienced frequency complementary feeding less three per day were 1.58 times at risk to wasting [AOR=1.58,95% (CI=1.23-4.48)] as compared to those children take at least three times per day (Darsene et al., 2017).

A case control study conducted in Gedeo Zone, Ethiopia in 2017 founded that initiation of complementary feeding before 6 month or after 6 months is significant association with acute malnutrition [AOR=4.4,95% CI=1.16-11.8] as compared with those children initiated at 6 months(Abuka et al., 2017).Systemic review and meta-analysis study indicated that child immunization and childhood infectious diseases are among the front line risk factors for acute under-nutrition. For instance, Children who had not properly vaccinated were 35 more likely risk to malnutrition [AOR=35, 95% (CI=1.75-71.82)] as compared to those children who had properly vaccinated with appropriate dose and age (Bantamen et al., 2014).

A Systemic review and meta-analysis study conducted in Ethiopia in 2017, indicated that improper child immunization and childhood infectious diseases are among the front line risk factors for acute under-nutrition(Ahmed A et al., 2017). For instance, Children who had not properly vaccinated were 35 more likely risk to malnutrition [AOR=35, 95% (CI=1.75-71.82)] as compared to those children who had properly vaccinated with appropriate dose and age (Bantamen et al., 2014)

2.2.5. Healthstatus related factors

Similarly, a case study conducted in Chad, in 2013 indicated that, children with fever in previous two weeks were eight times more likely to being severe acute malnutrition[OR=7.55,95% (CI=2.64-21.62)], as compared to those children without it. Also study indicated children with diarrhea in the previous two weeks were eleven times more likely to being severe acute malnutrition[AOR=10.72, 95% (CI = 4.27-26.88)] as compared to children without it (Ratnayake et al., 2013).

Additionally a facility base case control study conducted in Public Hospitals, Oromiya region, West Ethiopia in 2015, found that, after controlled potential confounder, children who experienced diarrheal disease in the last weeks were 3.94 times at risk [AOR=3.94, 95 % (CI=2.01–7.73)] as compared to those children without diarrheal disease(Ayana et al., 2015).

2.2.6. Maternal knowledge on exclusive breast feeding

Maternal knowledge on nutrition of children is important to improve nutritional status of children(Agize et al., 2017, Kalid et al., 2019).The adequate maternal knowledge on exclusive breastfeeding is relative benefit for child and mother health status(Cascone et al., 2019).Improving maternal knowledge and attitudes through nutrition counseling and education can lead to improved infant and young child feeding practices, child growth and developments, especially in settings with low maternal literacy(Gyampoh et al., 2014, Owais et al., 2019)

2.3. Conceptual framework

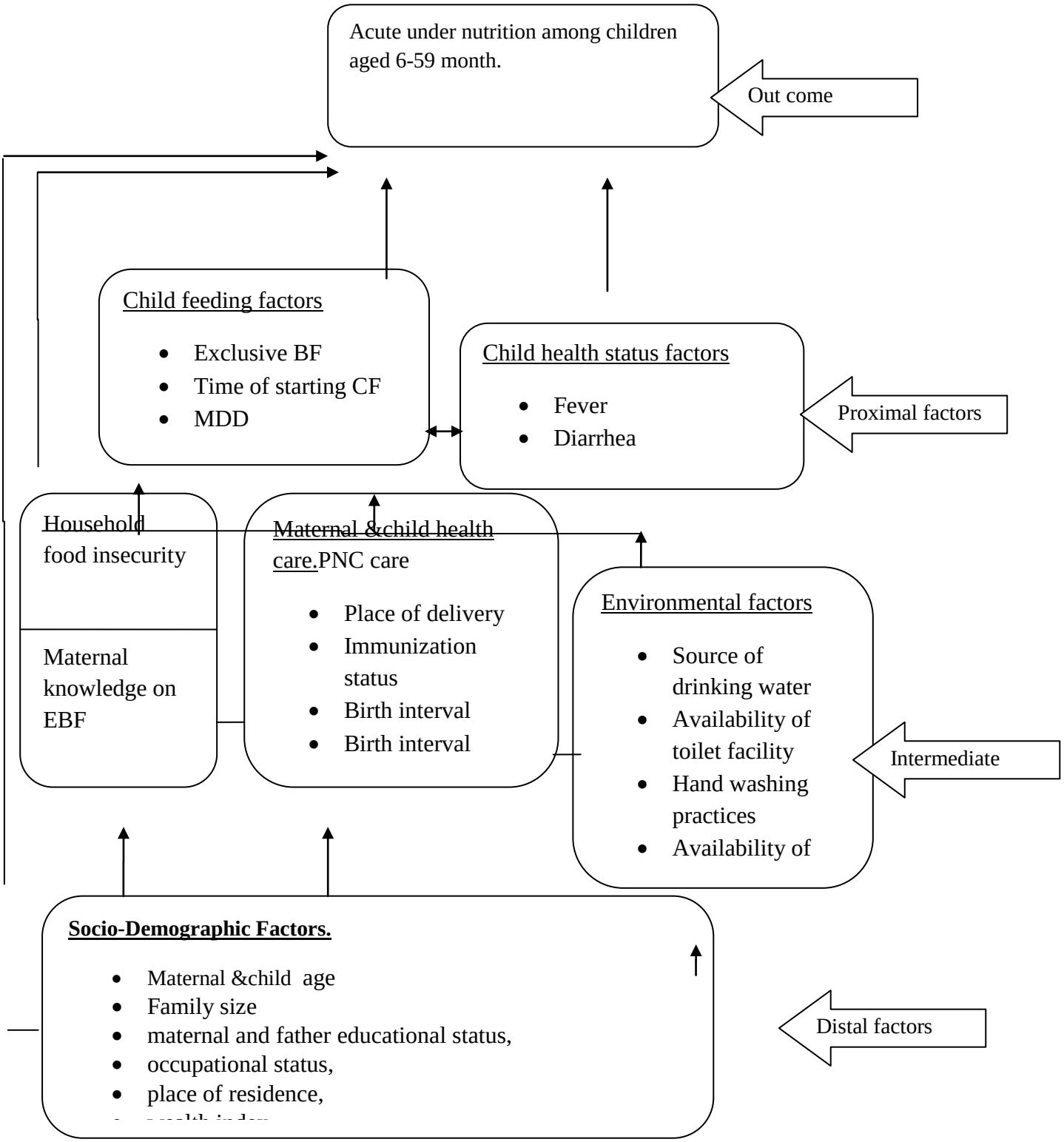

Figure 1 .The conceptual framework shows factors related toacute undernutrition among children aged 6-59 months, in Meta district, eastern Hararge, Ethiopia, 2020**.**

Source: Adapted from UNICEF 2013 conceptual framework.

3. METHOD AND MATERIALS

3.1. Study Area and period

This study was conducted inthe Meta district, Oromia National Regional State, eastern Hararge, Ethiopia. Meta district is one of the 24 districts in East Hararge Zone of the Oromia. It is located 435 Km from Addis Ababa, the capital city of Ethiopia. The district has a total of 42 Kebele (lowest administrative unit in Ethiopia) (3 urban Kebele and 39 rural Kebele). In the year 2019/2020(2012 EFY),thedistrict has2,38,215total populations, of whomis 39, 139 were under-five and children aged 6-59 months accounts around35,732(CSA, 2007).Meta district has one primary hospital, seven health centers, 42 health posts, and23private clinics. The study was conducted from March1toMarch 30,2020.

3.2. Study design

A community-basedunmatchedcase-control study design was employedfor the current study.

3.3. Population

3.3.1. Source population

All children aged 6-59 months found in the district were the source population.All children aged 6-59 months, who had acute undernutrition werethe source population for cases, while those children aged 6-59 months found in the district and who had no acute undernutritionwasthe source population for the controls.

3.3.2. Study population

All children aged 6-59 months who had acute undernutrition,whose mothers live in the selected kebeleswereselected as a study population for cases, while those children aged 6-59 months who had no acute undernutrition and mothers in the same selected Kebele werethe study population for controls in the each selected Kebele.

Definition of the cases: children aged 6-59 months and who were diagnosed with acute undernutrition by using MUAC less than 12.5 cm and or presence of edema.

Definition of control: children aged 6-59 months and who have MUAC greater than 12.5cm and without edema.

3.4. Inclusion and exclusion criteria

3.4.1.Inclusion criteria

Children aged 6-59 months who were permanent residents (live in the study area at least 6 months beforethe current study) and above in the selected kebele was included.

3.4.2.Exclusion Criteria

Children aged 6-59 months who had a physical deformity (deformity one or both extremity), who are critically sick/ill, and children whose mothers cannotgive a response to the interview were excluded due to child-mothers pairs anthropometric measurements' inconvenience.

3.5. Sample size determination and sampling technique

3.5.1. Sample size determination

The sample size is calculated by the STATCAL module of Epi-Info version 7.1.0.6 Software andusing double population proportion formula for unmatched case-control study,95% CI,80% power of study and case to control ratio 1:1 with the following assumption. First, four important independent determinants (Illness in the past 2 weeks,-sub-optimal frequency of CF,maternal illiteracy, and duration of EBF) of acute undernutrition among children aged under five years(Ayana et al., 2015, Dereje, 2014)were considered to calculate sample size and those factors were taken from the previous study conducted in our country on the same study population. Finally, the factor which givesthe largest sample size was used to determine the final desired sample size for the study (Table1).

Table 1: Sample size estimation for determinants ofacute undernutrition among children aged 6-59 months in Meta districts, Oromiya region, eastern Hararge, Ethiopia 2019/2020.

s/n		P2(%)	r	AOR	Power,1-Ɓ	α %	CI %	**Sample size**				nf	Reference
								Case	**control**	**Total=n**	**nr%**		
1	Suboptimal frequency of CF	12.5	1	3.21	80	5	95	85	85	170	18	188	(Dereje, 2014)
2	Febrile illness in the past 2 weeks	52.21	1	1.89	80	5	95	177	177	354	52	406	(Ayana et al., 2015)
3	Maternal illiteracy	16.37	1	2.16	80	5	95	170	170	340	34	374	
4	Duration of EBF	39.89	1	2.63	80	5	95	77	77	154	16	170	

By considering the above assumptions febrile illness was taken as a major independent variable in this study(Ayana et al., 2015).Thus, the required minimum sample size for the study was406(cases 203 and controls 203)by consideringthe case to control ratio 1:1and 15% non-response rate.However,390 mother – child pairs (195 cases and 195 controls) included in the analysis with overall response rate 96% in this study,sixteen mother-child pairs excluded due to incomplete data. Where, P2= proportion of exposed control, OR=adjusted odd ratio, 1-β (80%)= power of study, CI= 95% confidence interval, α=significance level, n=initial sample size, nf = final sample size.

3.5.2. Sampling technique

A multistage sampling technique was used in this study. Meta districthas 42 Kebele and it was stratified as urban and rural Kebele. one urban and five rural Kebele was select by lottery method from the total of 3 urban and 39 rural Kebeles. Then,households with 6-59 months aged children were identified by consulting health extension workersin the selected Kebele. In the six selected kebelesa total of 4320households with 6-59 months aged children were identified. Then well trained twelve health extension workerswere mobilizedto screeningchildren aged 6-59 months for acute undernutrition by color coded mid-upper arm circumference (MUAC) of the UNICEF and edema to categorize children as cases or controls. Giving identification number for case and control during the survey in each selected Kebele and sampling frame was prepared for both groups in each Kebele. Children with MUAC less than 12.5cm and/or bilateral petting edema during the survey was considered as case, while children with MUAC greater than 12.5 cm and without bilateral pitting edema was considered as control. Cases and controlswere allocated proportionally to all selected Kebeleand both groups were selected from the sampling frame by simple random sampling(figure.2). In case were more than one eligiblechildren was found in the selected household,one was selected by lottery.The summary of the sampling technique is depicted in figure 2 below.

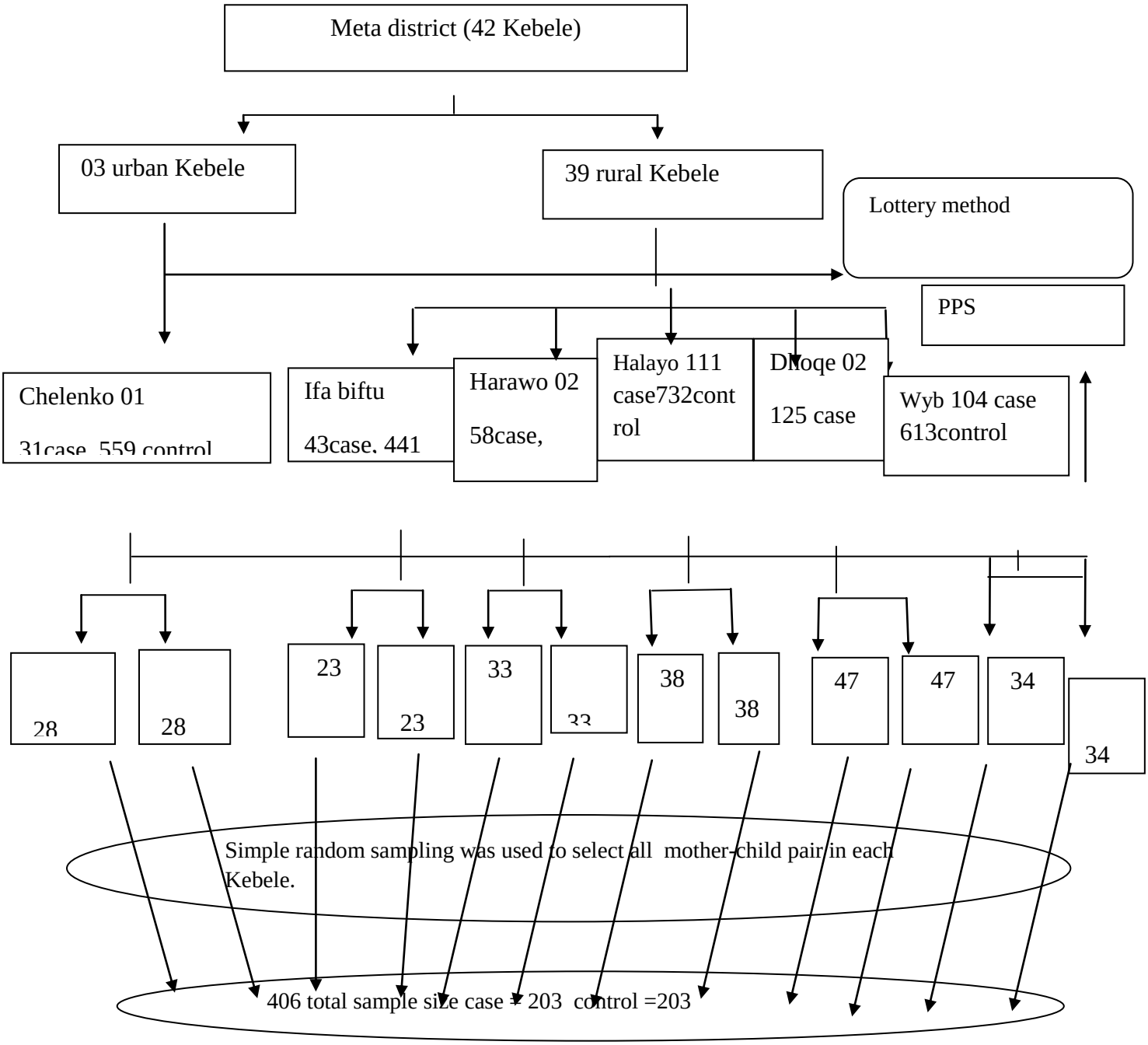

Figure 2.Schematic persentation of thesampling procedure used to select the study participants for the determinants of acute undernutrition among children aged 6-59 months in Meta district,eastern Hararge,Ethiopia from March 01 to March 30 in 2020.

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3.6. Data Collection Methods

3.6.1. Data collection instruments

A structured and pre-tested questionnaire was used to collect the data. The questionnaire was prepared in English and translated to the local language (Afaan Oromo).Then translation to English language-by-languageexpert to check for consistency.The questionnairecontainssix subsections including demographic and socio-economic factors, environmental-related factors (EDHS, 2016),maternal and child health care, child feeding practices, child illness,(Bantamen et al., 2014, Egata et al., 2014, Yisak et al., 2015, Ayana et al., 2015, EDHS, 2016),household food insecurity(FANTA 2007)and maternal knowledgeof exclusive breastfeeding(FAO, 2014).The questionnaires were developed by review of different literature and considering the local situation of the study areas.

3.6.2. Data collectors

Twelve health extension workers were recruited and trained to collect the dataand two BSCnurse,one diploma nurse health worker and principal investigater weresupervisingthe data collection process. All team were recruited from district health post and health center.Two days data collection training was given to data collectors and supervisors on thecontents of the questionnaires, data collection methods, how to communicate with participants, and anthropometric measurements of children.

3.6.3. Data collection procedures

The data collection procedure has two stages: first visit:-screening of children aged 6-59 months in the selected Kebele by data collectors. Duringthe survey nutritional status of children identified by Mid Upper Arm Circumference (MUAC) tape that graduated in cm on the left arm commonly used for screening of children for the CMAM program. The MUAC readings were recorded to the nearest 0.1cm. All children 6-59 months old MUAC less than 12.5cm (125mm) and/or prescience of edema was case and children with MUAC greater than 12.5 cm and no edema was control in the study population(WHO, 2006, WHO, 2013)and identification numberswas written on each checklists. Then principal investigator (PI) prepareda sample frame for the group in each selected Kebele.

The second visit:- background information was collected by structured and pre-tested questionnaires from mothersof both groups throughthe house to house visits by trained data collectors.

Household food securitystatus wasassessed by using nine standard questions household food insecurity access scale (HFIAS)was developed by Food and Nutrition Technical Assistance (FANTA 2007). The respondents were asked about the amount and variety of meal eaten, and the occurrence offood shortage for the household members, causing them not to eat the whole day or eat at night only, in the past four weeks preceding the survey(Coates et al., 2007). In codining “No” response was coded as zero(0) and “Yes” response was given one(1).Finally, the responses wereadded to produce an index of household food insecurity. The minimum and maximum value for response zero and 27 respectively, At the end household food secure will code as one (1) and household food insecure code as zero (0) foranalysis.

Minimum dietary diversity for children was assessed as children experienced variety food group from seven food group in 24 hours before the survey, children ate less than four food groups was categorized as poor dietary diversity and children eat greater than or equal four food group was good dietary diversity(WHO, 2010a). Exclusive breastfeeding was defined as feeding a child only breast milk for the first six months of life except medicine for treatments purpose. Maternal access to health services facility was mothers reported of health care and geographical availability of health facility, how far from your home, and asking key informants in the study community. Child immunization status was collected by asking the mother child immunization card if available, if no card, BCG was checked on the right arm by data collectors. Maternal postnatal care was assessed by asking mothers time of caretaking, services taken.

Child illness in the last two weeks by asking mothers.

3.7. Variables

3.7.1. Dependent variable

Acute undernutritionstatus.

3.7.2.Independent variables

Socio-economic and demographic variables: sex and age of the child, age of mother, mother and father levels of education, place of residence,household wealth index, motherand father occupation, number of under-five children, and family size which was included in distal level.

Household food security, maternal and child Health care; place of delivery,birth interval, the immunization status of children, maternal knowledge on EBF,maternal access to health facility,postnatal care(maternal counseling on child feeding during postnatal follow-up) and environmental factors(source of drinking water, hand-washing practices, toilet facility) was included in the intermediate level.

Child feeding-related factors: time starting of complementary feeding,exclusive breast-feedingand minimumdietary diversity, and Child health status: diarrhea and fever were includingat proximal level.

3.8. Operational definition

Case:children aged 6-59 months with MUAC less than 12.5 cm and/or bilateral pitting edema

Control: children aged 6-59 months with MUAC greater than 12.5cm and no bilateral pitting edema.

Household Wealth index: a proxy measure of household living standards based on the sum of available assets of the owner like a productive asset, durable asset, domestic animals, and housing characteristic(EDHS, 2016).

Maternal illiterate: Respondents who had not attended formal education or who cannot read a given sentence if they could not read all or part of the sentence(EDHS, 2016).

Household food secure: Households those experience none of the food insecurity (access) conditions or just experience worry, but rarely in the past 4 weeks or worry about not having enough food sometimes or often, and/or are unable to eat preferred foods, and/or eats a more monotonous diet than desired and/or some foods considered undesirable, but only rarely(Coates et al., 2007)

Household food insecure: Household sacrifices quality more frequently, by eating a monotonous diet or undesirable foods sometimes or often, and/or has started to cut back on quantity by reducing the size of meals or number of meals, sometimes or often or experience any of the three most severe condition(Coates et al., 2007).

Exclusive breastfeeding: feeding only breast milk without anything else for the first six months of life,except for medicines for the therapeutic purpose(WHO, 2010b)

Timely introduction of complementary feeding: begin to give solid, semi-solid, or soft foods at the age of six months in addition to breastfeeding (WHO, 2010c)

Diarrhea: mother/caregiver report of a child experiencing ≥ 3 times loose stool or watery or bloody diarrhea per day in the last two weeks.

Good maternal knowledge on EBF: mother response thecorrect answerfor all questions related to EBF.

Poor maternal knowledge on EBF: those mothers respond at list one incorrect answers for all questions to EBF.

Accessibility health services facility: availability of health facility for all clients within 10km radius.

3.9.Data quality control

Data quality assurance mechanisms were applied at several points, particularly validation of data from both hard and soft copy.Two days of intensive training were given to data collectors and supervisors on the objective of the study, anthropometric measurement, how to fill in the question, and data record. The questionnaires werepre-testedon the 5% of the sample size at unselected Kebele with similar characteristics with that of the selectedone (Biftu Odaa). Finally,onequestionnaire was modified and used for actual data collection. The principal investigator on the data collection process, ensured completeness and consistency of questionnaires day today carried out the overall supervision.

3.10. Dataprocessing and analysis

Collected data were checked for completeness and consistencies, then data were double entered into Epi-Data Version 3.1 and Export to SPSS version23 for analysis.Descriptive statistics; frequency, mean and cros-tabulationwere used to present data. Multicollinearity among independent variables was checked by using variance inflation factors (VIF) and tolerance tests. The result of the VIF range from 1.011 to 5.093 which is less than 10while the tolerance test was less than one which was in a normal range(P A N and J A C K S O N, 2008). The presence of an association between the outcome variable and all independent variablesand their proportion was observed by using binary logistic regression with crude odd ratio,95% CI. Those variables with P -value less than 0.25 in bivariate analysis were a candidate to multivariate binary logistic regression analysis. Hosmer –Leme show goodness-of-fit was used to test for the model fitness. However, the known determinants of child undernutrition like ageand sex were entered into the final model regardless of the p-value. P-Value less than 0.05 of 95%CI at Multivariate analysis was declared as a statistically significant association.

3.11. Ethical consideration

Ethical clearance wasobtained from the Institutional Health Research Ethics Review Committee (IHRERC) of Haramaya University CHMS before conduct this study.An official permission letter from the school of postgraduate (SGS) was written to the East HarargeZonal health office. Similarly from the zonal health office, the circular letters were written toMeta district Administration and Health office. Informed voluntary, written signed consent was obtained from each mother of children before the interview. Participants werenotifiedofthe purpose of the study and their right to refuse or to participate in the study. The participants' confidentiality was maintained and data was used only for research purposes. Personal identification of participants like the name was notrecorded. Maximum possible care was taken while interviewing and taking anthropometric measurements. Finally, a child with acute undernutrition was linked to the nearest health facility. The mother of children wasgot advices on child feeding and care.

4. RESULTS

4.1.Socio-demographic characteristics

Out of the 406 (203 case and 203control) sampled study participants, 390 (195 case and 195 control) of 6-59 months of children were analyzed yielding the response rate of 96% .The mean (±SD) age of cases was 23.31 (±13.39) months and 25.02 (±13.06) months for controls.Nearly half,50.3% of controls and 53.3%of cases were female in gender. The mean (±SD) age of the mothers of the cases was 27.4 (±7.44) years and 27.55(±5.46) years for the mothers of the controls. Out of surveyed 390 mothers, 118(60.5%) of the mothers of cases and 167(85.6%) of the mothers of controls were in the age interval of 20-35 years. Equal proportion, 85.6% of the cases and controls were from the ruralresidence.Most of the mothers of cases 69.2% were illiterate as compared to mothers of controlswere 37.4% were illiterate.Similarly, most of partners of the cases (55.4%)were illiterate compared with partners of controls which was28.2%. The majority of the study participants,93.8%of cases and96.9% of controls were from the Oromo ethnic group. Similarly,92.3% of cases and 90.8% of controls were Muslim religion follower (see table.2).

In multivariate binary logistic regression, acute undernutrition was significantly associated with child age groups12-23months[AOR=3.3, 95%CI: 1.49, 7.37], household food insecurity [AOR=2.64, 95%CI: 1.24, 5.618], lack of maternal access to health services facility[AOR=10.7,95%CI:5.23,21.84],mother did not got counseling about child feeding during postnatal follow up [AOR=2.385,95% CI: 1.22, 4.65],not practicing exclusive breastfeeding [AOR=2.16, 95%CI: 1.023, 4.55], children who had fever 2 weeks before surveye[AOR=6.44,95%CI: 2.75, 15.09] and children who had diarrhea 2 weeks before the surveye[AOR=2.68,95%CI: 1.15,6.21](see table.6).

Table 2.Socio-demographic and economic characteristics of the study participants by nutritional status, Meta district, eastern Hararge, Ethiopia, 2020.

Variables	Nutritional Status		
	Category	**Cases (%)**	**Controls (%)**
Place of residence	Urban	28(14.4%)	28(14.4%)
	Rural	167(85.6%)	167(85.6%)
Age of child (months)	6-11	29(14.9%)	31(15.9%)
	12-23	99(50.8%)	66(33.8%)
	24-35	30(15.4%)	42(21.5%)
	36 -59	37(19%)	56(46%)
Sex of the child	Male	91(46.7%)	97(49.7%)
	Female	104(53.3%)	98(50.3%)
Maternal age in years	15-19	38(19.5%)	9(4.6%)
	20-35	118(60.5%)	167(85.6%)
	36and above	39(20%)	19(9.7%)
Mother's education	Illiterate	135(69.2%)	73(37.4%)
	Literate	60(30.8%)	122(62.6%)
Father's education	Illiterate	108(55.4%)	55(28.2%)
	Literate	87(44.6%)	140(71.8%)
mother's occupation	Housewife	145(74.4%)	169(86.7%)
	Merchant	43(22.1%)	12(6.2%)
	Others*	7 (3.6%)	14(7.2%)
Father's occupation	Farmer	162(83.1%)	149(76.4%)
	Merchant	7(3.6%)	18(9.2%)
	Others¶	26(13.3%)	28(14.4%)
Marital Status	Married	175(89.7%)	189(196.9%)
	Others¥	20(10.35)	6(3.1%)
Sex of the head of the HH	Female	25(12.8%)	31(15.9%)
	Male	170(87.2%)	164(84.1%)
Number of U5 children	≤1	108(55.4%)	121(62.1%)
	≥2	87(44.6%)	74(37.9%)
Family size	<5	75(38.5%)	93(47.7%)
	≥5	120(61.5%)	102(52.3%)
Ethnicity	Oromo	183(93.8%)	189(96.9%)
	Others£	12(6.2%)	6(3.1%)
Religion	Muslim	183(92.3%)	177(90.8%)
	Othersβ	12(6.2%)	18(9.2%)
HH wealth index	Poor	73(37.4%)	55(28.2%)
	Middle	63(32.3%)	69(35.4%)
	Rich	59(30.3%)	71(36.4%)

Others*=employed, farmer; Others¶=unemployed, employed; others¥=single, separated& windowed; others; £=Amhara, Somali, Guragie,others; β=Orthodox, Protestant

4.2. Household Food Security Status of study participants

Of the total participants, 36.9%of cases and 11.3% of controls were suffering from food insecurity.About 296 household was food secured including category of householdfood secure and mild food insecure and 94 household was food insecure indcluding category of the household of moderate food insecure and severe food insecure (figure.1).

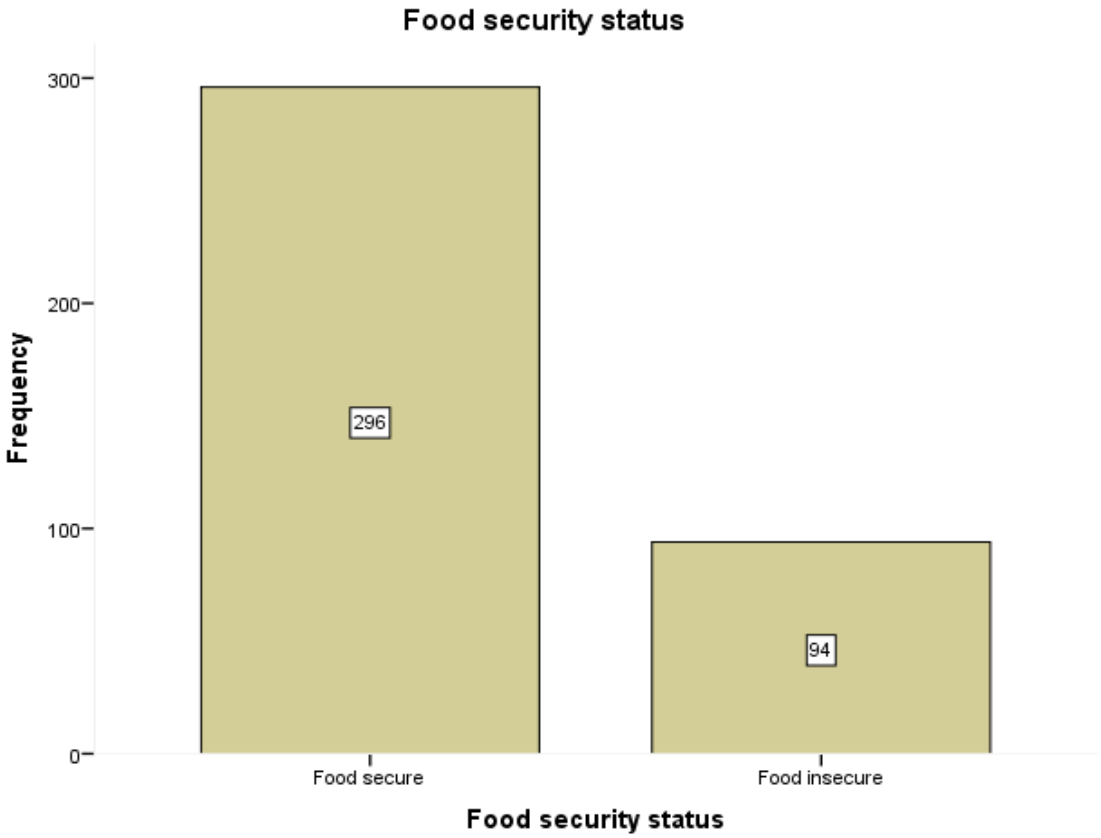

Figure1. Household food security status among household of children aged 6-59 months in Meta district,eastern Hararge,Ethiopia,2020.

4.3. Childfeeding practices and health-related characteristics

The proportion of non-exclusive breastfeeding among cases and controls children,non-exclusive breastfeeding was high in (38.5%) of cases as compared to (12.3%) of the control groups.The timeof starting complementary feeding before six months or after six months in cases were(37.4%)and(11.3%)controls. Dietary diversity practice were 75.9% of cases and 53.8% of controls had poor dietary diversity.

Concerning the health status of children, 53.8% of the cases and 7.2% of the controls had fever two weeks before the survey and 53.8% of the the cases and 8.2% of controls had diarrhea two weeks before the survey(see table3).

Table 3.Bivariate analysis of selected child feeding practices and health status-related factors of study participants in Meta district, eastern Hararge, Ethiopia, 2020.

Variables	Nutritional Status			COR,95%CI	P-value
	Category	Cases (%)	Controls (%)		
Exclusive breastfeeding for six months	Yes	120(61.5%)	171(87.7%)	1	
	No	75 (38.5%)	24(12.3%)	4.453(2.659,7.457)	0.000
Time at complementary feeding started	At six month	122(62.6%)	173(88.7%)	1	
	Before or after six months	73(37.4%)	22(11.3%)	4.705(2.768,7.994)	0.000
Dietary Diversity Practices	Good	47(24.1%)	90(46.2%)	1	
	Poor	148(75.9%)	105(53.8%)	2.699(1.752,4.159)	0.0007
Illness' in the last 2 weeks	Yes	122(62.6%)	31(15.9%)	8.841(5.465,14.304)	0.000
	No	73(37.4%)	164(84.1%)	1	
Fever in the last 2 weeks	Yes	105(53.8%)	14(7.2%)	15.08(8.177,27.823)*	0.000
	No	90(46.2%)	181(92.8%)	1	
Diarrhea in the last 2 weeks	Yes	105(53.8%)	16(8.2%)	13.05(7.28,23.40)*	0.000
	No	90(46.2%)	179(91.8%)	1	
Difficult to breathing	Yes	38(19.5%)	7(3.6%)	6.5(2.825,14.96)*	0.000
	No	157(80.5%)	188(96.4%)	1	

4.4. Maternalknowledge and Health care-related factors

Concerning mother knowledge on exclusive breastfeeding,52.8%of the mothers of casesand 13.8% of the controls had a low level of knowledge about exclusive breastfeeding. The level of knowledge is significantly higher among controls than cases (P<0.0001).

The proportion of birth intervalless than two years were 45.1% in casesand 16.9% in controls. Cases that completed vaccinations were 40% which was lower as compared to 54.4%of controls. There was a high proportion of home delivery in cases68.2% as compared to controls, 53.3%.Around two-thirds of the mothers

66.7%of cases and 9.2% of the controls had lacks of access to health services facility (see table 4).The propotion of mother of 63.1% cases and 16.9% of mother of controls were had not counseled on child feeding during postnatal care visit,this indicated high missed opportunity.

Table 4.Bivaraite analysis maternalknowledge and healthcare-related factors of Study Participants in Meta district, eastern Hararge, Ethiopia, 2020.

Variables	Nutritional Status			COR (95% CI)	P-value
	Category	Cases (%)	Controls (%)		
Place of delivery	Health facility	62(31.8%)	91(46.7%)	1	
	Home	133(68.2%)	104(53.3%)	1.87(1.24,2.84)*	0.003
Birth interval	First birth	36(18.5%)	34(17.4%)	1.91(1.10,3.31)*	0.022
	less than 2 years	88(45.1%)	33(16.9%)	4.81(2.93,7.88)*	0.000
	Greater than 2years	71(36.4%)	128(65.6%)	1	
Immunization status	Completed	78(40%)	106(54.4%)	1	
	In completed	117(60)	89(45.6%)	1.79(1.195,2.67)*	0.005
Maternal access to health services facility	yes	65(33.3%)	177(90%)	1	
	no	130(66.7%)	18(9.2%)	19.67(11.13,34.74)*	0.000
Postnatal follow-up	yes	96(49.2%)	165(84.6%)	1	
	no	99(50.8%)	30(15.4%)	5.67(3.51,9.16)*	0.000
Counseling during PNC follow up about child feeding	yes	72(36.9%)	162(83.2%)	1	
	no	123(63.1%)	33(16.9%)	8.38(5.22,13.47)*	0.000
Maternal knowledge on EBF	Good	92(47.2%)	168(86.2%)	1	
	Poor	103(52.8%)	27(13.8%)	6.96(4.25,11.41)*	0.000

4.5. Environmental health-related factors

Regarding the source of drinking water used, 76.4% of households of casesand 65.4% of the controls were used unprotected source of drinking water and latrine was available among 69.7% of the cases and 92.8% of the controls. The majority of mothers of the cases, 69.7% and 89.2% of the controls experienced the practice of handwashing with soap and water after a toilet visit (see table 5).

Table 5. The bivariate analysis of selected environmental condition related factors of study participants in Meta district, eastern Hararge, Ethiopia, 2020.

Variables	Nutritional Status			COR,95%CI	P-value
	Category	Cases (%)	Controls (%)		
Source of drinking water	Protected	46(23.6%)	67(34.4%)	1	
	Unprotected	149(76.4%)	128(65.6%)	1.69(1.08,2.64)*	0.02
Availability of Toilets facility	Yes	129(66.2%)	181(92.8%)	1	
	No	66(33.8%)	14(7.2%)	6.62(3.56,12.28)*	0.000
Toilet facility	Improved Toilet	16(8.2%)	113(57.9%)	1	
	Unimproved Toilet	179(91.8)	82(42.1%)	15.42(8.58,27.67)*	0.000
Hand washing practices with soap and water for care givers					
After toilet use	Yes	136(69.7%)	174(89.2%)	1	
	No	59(30.3%)	21(10.8%)	3.59(2.08,6.20)*	0.000
Before food preparation	Yes	70(35.9%)	129(66.2%)	1	
	No	125(64.1%)	66(33.8%)	3.49(2.30,5.29)*	0.000
Before feeding	Yes	71(36.4%)	128(65.6%)	1	
	No	124(63.6%)	67(34.4%)	3.34(2.20,5.05)*	0.000
Before feeding child breast milk	Yes	61(31.3%)	113(57.9%)	1	
	No	134(68.7%)	82(42.1%)	3.03(1.99,4.58)*	0.000
After dropping the child stool	Yes	101(51.8%)	158(81%)	1	
	No	94(48.2%)	37(19%)	3.97(2.52,6.26)*	0.000

4.6. Determinants of acute undernutrition

Multivariable binary logistic regression analysis was computed for selected variables using binary logistic regression by setting backward logistic regression (backward,LR) criteria for the variables with P-value ≤ 0.25 in bivariate analysis. Toavoid the risk of overfitting of the multivariate model,

researcherselect the most significant variables in bivariate logistic regressionanalysisand

basedonthe available literature and theoretical knowledge.

In the final multivariable analysis, age of the child, household food insecurity, access to the health services facility, counseling about child feeding during postnatal follow up, none exclusive breastfeeding, and child illness were significantly associated with acute undernutrition. Accordingly,the children aged 12-23 months were 3.3 times more likely to develop acute undernutrition than those childrenaged 36-59 months [AOR=3.3, 95% CI: 1.49, 7.37],the children from household food insecure were nearly 3 times more likely to be acute undernutrition than those children from household food secure [AOR=2.64, 95%CI (1.24, 5.618)],the children whose mother had not access to health services facility were 10 times more likely to be wasting than those children whose mothers had access to health services facility[AOR=10.7,95%CI(5.23,21.84) and children whose mothers had not got counseling about child feeding during postnatal follow up were 2.4 times more likely to be wasting than those children whose mother did not got counseling about child feeding during postnatal follow up [AOR=2.385,95%CI(1.22,4.65)],odd of acute undernutrition were 2 times higher in none exclusive breastfeeding children [AOR=2.16, 95%CI (1.023, 4.55)], than those children who had exclusive breastfeed,the children who had fever 2 weeks before surveyed were 6 times more likely to be acute undernutrition than those children who had not fever 2 weeks before surveyed [AOR=6.439,95%CI(2.75,15.09)] and children who had diarrhea 2 weeks before surveyed were 2 times more likely to be acute undernutrition than those children who had not diarrhea 2 weeks before surveyed[AOR=2.68,95%CI(1.15,6.21)](seenTable.6).

Table 6.Determinants of acute undernutrition in multivariable analysis among children aged 6-59 months in the Metadistrict, eastern Hararge, Ethiopia, 2020.

Variables	**Category**	**Nutritional status**		**COR 95%CI**	**AOR 95%CI**
		Cases(%)	Controls(%)		
Child age(months)	6-11	29(14.9%)	31(15.9%)	1.416(.736,2.725)	2.63(0.95,7.27)
	12-23	99(50.8%)	66(33.8%)	2.27(1.351,3.815)	3.321(1.49,7.37)*
	24-35	30(15.4%)	42(21.5%)	1.08(0.578,2.022)	1.258(0.47, 3.32)
	36 -59	37(19%)	56(46%)	1	1
Maternal education	Literate	60(30.8%)	122(62.6%)	1	1
	Illiterate	135(69.2%)	73(37.4%)	3.76(2.47,5.724)	1.33(0.65,2.74)
Father education	Literate	87(44.6%)	140(71.8%)	1	1
	Illiterate	108(55.4%)	55(28.2%)	3.16(2.07,4.81)	1.12(0.54,2.32)
HH food security	Food secure	123(63.1%)	173(88.7%)	1	1

	Food insecure	72(36.9%)	22(11.3%)	4.603(2.708,7.824)	2.64(1.24,5.61)*
Maternal access to health services	yes	65(33.3%)	177(90%)	1	1
	no	130(66.7%)	18(9.2%)	19.667(11.13,34.74)	10.70(5.25,21.84)*
Maternal counseling on child feeding during PNC follow up	yes	72(36.9%)	162(83.2%)	1	1
	no	123(63.1%)	33(16.9%)	8.386(5.22,13.47)	2.39(1.22,4.65)*
Maternal knowledge on EBF	good	92(47.2%)	168(86.2%)	1	1
	poor	103(52.8%)	27(13.8%)	6.966(4.25 ,11.418)	1.27(0.58,2.76)
Availability toilet	Yes	129(66.2%)	181(92.8%)	1	1
	No	66(33.8%)	14(7.2%)	6.615(3.561,12.288)	1.53(0.63,3.68)
Source of drinking water	protected	46(23.6%)	67(34.4%)	1	1
	unprotected	149(76.4%)	128(65.6%)	1.69(1.08,2.64)	1.17(0.57,2.42)
Practiced Exclusive BF	Yes	120(61.5%)	171(87.7%)	1	1
	No	75 (38.5%)	24(12.3%)	4.453(2.659,7.457)	2.16(1.02,4.55)*
Minimum DD	Good DD	47(24.1%)	90(46.2%)	1	1
	Poor DD	148(75.9%)	105(53.8%)	2.699(1.752,4.159)	0.74(0.36,1.49)
Fever in the last 2weeks	Yes	105(53.8%)	14(7.2%)	15.08(8.177,27.823)	6.44(2.75,15.09)*
	No	90(46.2%)	181(92.8%)	1	1
Diarrhea in the last 2 weeks	Yes	105(53.8%)	16(8.2%)	13.05(7.28,23.40)	2.68(1.15,6.21)*
	No	90(46.2%)	179(91.8%)	1	1

*=p-value less than 0.05, COR= Crude odd ratio, AOR=Adjusted odd ratio, CI= Confident interval, DD =Dietary diversity

5. DISCUSSION

The current study reveled ,aged 12-23 months, household food insecurity,lack of maternal access to the health service facility, not getting counselingon the child feeding during postnatalvist, not practicingexclusive breastfeeding, fever, and diarrhea in the last two weeks were significant determinants of acute undernutritionamong children aged 6-59 months.

In these study,children aged between 12 and 23 months were 3.32 times more likely to develop acute undernutrition children aged 36-59 months. This result is in line with a study conducted in Afar, Ethiopia and north Darfur,Sudan(Seid et al., 2017, Belal and Fadalalla, 2019).This may be dueto the exposure to contaminatedmaterial as children start exploring their environment and cannot demand food when he/she needed as older children. The other evidence support this finding, in the lancet series, the highest estimate risk of pneumonia and diarrheal mortality beginning at 12months rather than 6 months of age(Black et al., 2013). Besides, undernutrition increase in age 12-23due to low energy intake because children do not feed often enough with household food(Ramachandran, 2009).

In these study children from household food insecure were2.6 times more likely to be acutely undernourished than those children from their counterparts. This finding is consistence with the study conducted in Brazil(Kac et al., 2012) and Ethiopia(Motbainor et al., 2015, Nebro et al., 2019).This might be due to lack of enough food intake because of shortage of food. The finding of this study is support by study conducted in Ethiopia in 2012,household food insecurity have significant determinants of wasting (World.B, 2012).While there are substantial evidence indicating that household food security is one of keydeterminants of children nutritional status(Santos and Gigante, 2013).

In contrast with other study, in which household food insecurity is not associated with wasting(Egata et al., 2014). The possible justification for this discrepancy is supported by this study which indicated household food security is not solution for wasting, it affected by the maternal educational status, maternal knowledge on child feeding, poor socioeconomic status, environmental health condition and access to health care(Demilew and Alem, 2019).Other justification is might be due to difference between study population due to different study area and different study period.

This study showed that children whose mothers did not getchild feeding information during postnatal follow-up were 2.4 times more likely to develop acute undernutrition than those children whose mothers got feeding information.This study was supported by the Ethiopia demographic and health survey of 2016in which the lack of prompt postnatal care can delay early identification of newborn complications and initiation of appropriate care and treatments(EDHS, 2016). This might be due to the contribution of poor maternalpractice on child nutritional.Thus,information during the postnatal period increasesmothersawereness on how to careand feed their child. Besides, the postnatal period is a critical time for improvements of a child nutritional and healthstatus because it is a time of initiation of appropriate care and feeding practices for children as showed in EDHS 2016.

This study showed that,children whose mothers did not access to health services facility were10.7times at higher odds of developing acutel undernourished than those children whose mothers had access to health services facility. This finding is in line with the study conducted in east rural,Ethiopia(Egata et al., 2014) and

Bangladesh(Musa *et al*., 2017).Lack of maternal access to health service facilities significantly affected children's nutritional status.This factor might be associated with behavioral attributes of the majority of the rural mothers of the study community.The finding of current study supported by this study in whichthe expansion of health care infrastructures has significantly reduced the risk of child undernutrition(Oyekale, 2009, Monteiro et al., 2009). In this study, maternal access to health services facility was estimated based on the report of themother from the main source of the health care service and availability of health facility.Bisedis,accordingto the principle of primary health care, accessibility wasreferred to as the availability of health care facilities for the clients within 10 kilometers radius(FMOH, 2007).

In this study, children who had not exclusive breastfeed during the first six months were 2.16 times more likely to be acutely undernourished than those children had been exclusively breastfed. This finding goes in line with the study conducted ina low and middle-income country like Sudan(Gezahegn et al., 2017), Nigeria(Ogunlesi et al., 2015), and east rural,west Oromia,Ethiopia(Egata et al., 2014, Ayana et al., 2015). Exclusive breastfeeding is essential for the prevention of undernutrition in under-five children and breast milk contain essential nutrients for children(Wijiwinarsih et al., 2019).This might be due tothe lack of these nutrients from breast milk in the first six months and later life.These nutrients contain various immune components that fight against bacterial and viral infection and through interrupting the vicious cycle of infection-malnutrition. For this reason, breast milkcan prevent wasting in children by optimizing growth, development, and health of children under five-years-old(Wijiwinarsih et al., 2019), and exclusive breastfeeding in the first six months of life a key intervention for child survival(Ladomenou et al., 2010).

This study also showed children who had a fever in the last two weeks were 6.44 times more likely to develop acute undernutrition than those children who had no fever in the last two weeks. This study result is similar to other case-control studiesconducted in Bangladesh(Hoq et al., 2019) and western Oromia,Ethiopia (Ayana et al., 2015).The explanation might be infection affect nutritional status due to loss of appetite, but the energy and nutritional requirement increased(Ladomenou et al., 2010).In contrast, child morbidity status, fever 2 weeks before surveyed not associated with wasting(Gezahegn et al., 2017, Dereje, 2014).This difference may be due to different proportionsof casesand controls exposed to variables. In this study, 53.8% of cases and 7.2% of controls were exposed, but only 18.1% of cases and 3.7% of controls were exposed to variable in Gezahegn et al., 2017.Another explanation for this difference might be health care given to those children due to different study settings.

In this study, children who had diarrhea two weeks before the survey were 2.7 more likely to develop acute undernutrition than those children who had no diarrhea.This study finding Consistent with the study conducted in Gedeo zone; west Oromia,Shashogo Woreda, Southern Ethiopia and Bangladesh (Abuka et al., 2017, Hoq et al., 2019, Ayana et al., 2015, Dereje, 2014, Bantamen et al., 2014)The infection affects children's nutritionalstatus by losing appetite, reducing nutrient absorption, increase metabolic requirements and increasing nutrientlosses(Ladomenou et al., 2010), and being wasted increase probability of occurrence of diarrhea by 14% compared to their counterpart(Bbaale, 2011).The above explanation indicatesa vicious cycle of infection-malnutrition.

Unlike other similar studies(Pravana et al., 2017, Egata et al., 2014)the household wealth index was not a significant determinant of acute undernutrition.Lack of association between household economic status and children's nutritional status may be attributed to the overall economic status of the study setting in that the majority of the households involved in the study were found in the same economic status. The others may be different tools used to assess the wealth index in the study. For instance, in Egata et al 2014,banking account was included in the components of the wealth index, but not in the current study.

The strengths of this study, unlike facility based case-control study, this study was conducted in the community level having a representatives sample of cases and controls.In this study maternal knowledge on exclusive breastfeeding was included which was not considerd in the others similar studies.Maternal counselingabout child feeding during postnatal care was included in the current study.However,this study has the following limitation, misclassification of children's nutritional status, recall, and interwers bias due to the retrospective tracking of background information beyond case-control study design.However, attention was given to the study procedures, including theprocess of training data collectorsand a close supervision throughout the activity to minimize the expected biases.

6. CONCLUSION AND RECOMMENDATION

6.1.Conclusion

This study showed that acute child undernutrition were associated with child aged 12-23 months, household food insecurity, lack of maternal access to health services facility, lack of maternal child-feeding information during postnatal follow up, not practicing exclusive breastfeeding, history of fever and diarrhea in the last two weeks before the survey among under-five children.The problem can be addressed by targeting children since their early ages and by conducting tailored nutrition education to mothers or caretakers to improve the nutritional status of their children.

6.2.Recommendation

- For Meta Woreda health offices:
  - ✓ Should be made an organizedeffort at all levels to improve infant and young child feeding, health services, protected source of drinking and exclusive breastfeeding practice of therural population particularly mothers to curb theproblems of child undernutrition.

- For health care providers:
  - ✓ Counseling mother about child feedingpractices.
  - ✓ Reduce missed opportunity.
- For researchers:
  - ✓ Further research with longitudinalstudy design by considering the specific context area.

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8.ANNEXES

Annex. 8.1. English Version questionnaires of Determinants of Acute Undernutrition Among children aged 6-59 months in Meta districts in 2019/2020.

Instructions: Please circle (○) on the number provided in the questionnaire or fill in the empty spaces. Kindly respond to all questionsfreely and honestly. Do not write your names.

SECTION 0: QUASTIONNIER IDENTIFICATION DATA

S01. Kebele _____

S02. Survey Code:_____

S03 .**Interview Codes:_____**

Completed =1, partially completed =2, Refused =3, Others =4

S03. Date Of Interview: _____/____/_____

S04: Name and signature of data collector----------

Signature----------

Date----------

Part I. Socio-demographic characteristics of the study participants(mother_ child pairs) (SDC)			**Skip**
SDC1	Place of residence of mother	1.Urban2. Rural	
SDC2	Age of mother (in completed years)	_____ Years	
SDC3	Current marital status (mothers)	1.Married 2.Separated 3.Widowed 4.Single (Never Marred) 6.Other (specify) ----------	
SDC 4	What is sex of your child (name)?	1.Male 2.Female	
SDC5	When did the birth date of your child	_____;_____;_____ Date Month Year	

SDC6	How old was(name of the child) at his/her last birthday?	In complete month_____	
SDC 7	Sex of head of the household?	1. female 2.male	
SDC 8	What is your religion?	1.Muslim 2.Orthodox 3.Protestant 4.Other(specify)_____	
SDC 9	Education level of the mother?	1. Illiterate 2. Able to read/write, 3. Grade 1-4 4. Grade (5-8) 5. Grade 9-12 6. Above secondary	
SDC10	Educational level of the father	1. Illiterate 2. Able to read/write, 3. Grade 1-4 4. Grade (5-8) 5. Grade 9-12 6. Above secondary	
SDC11	Occupation of the mother?	1. House wife 2. Employee 3. Farmer 4. Merchant 5. Other specify_____	
SDC12	Occupation of the father?	1. Unemployed 2. Farmer	

		3. Merchant 4. Employee 5.Others (specify)	
SDC13	Number of household members	_____	
SDC14	Number of less than five years children in home?	_____in number	
SDC15	Do the household have land for agricultural purpose?	Yes No I don't know/not sure	If no skip to Q. HP1
SDC16	If the above answer is yes, how many hectares do you have?	_____ hectare Please insert "00" if less than 1 Hectare	
SDC17	What types of the crop do you produce?	1. Cereals 2. Legumes/Pulses 3. Vegetables 4. Tree crops/fruits 5. Others_____	Multiple answer is possible
SDC18	If you do produces either of one, which one is more abundantly consumed at house levels?	1. Cereals 2. Legumes/Pulses 3. Vegetables 4. Tree crops/fruits 5. Others_____ Note: describe specific crops if necessary	Multiple answer is possible
SDC19	What types of feed crop do you purchase for home consumption?	_____	Multiple answer is possible

Part II. Wealth index (WI).				
Code	**Question**	**Response**		**Skip**
Domestic animals				
WI1	Cattle (ox,cow)	1.YES	2. NO	
WI2	Sheep	1.YES	2. NO	
HP3	Goat	1.YES	2. NO	
HP4	Hen	1.YES	2. NO	
HP5	Horse/donkey/mules	1.YES	2. NO	
b.durable asset				
WI1	Television	1.YES	2. NO	
WI2	Radio	1.YES	2. NO	
WI3	Electricity	1.YES	2. NO	
WI4	refrigerator	1.YES	2. NO	
WI5	Car	1.YES	2. NO	
WI6	Motor cycle /bajaj	1.YES	2. NO	
WI7	Electric mitad	1.YES	2. NO	
WI8	Own living house	1.YES	2. NO	
WI9	Own agricultural land	1.YES	2. NO	
WI10	Sofa	1.YES	2. NO	
WI 11	Stove	1.YES	2. NO	
WI12	Mobile phone	1.YES	2. NO	
C.housing characteristics				
WI 1	Plough plow	1.YES	2. NO	
WI 2	Axe	1.YES	2. NO	
WI 3	Modern Beehive	1.YES	2. NO	
WI 4	Traditional Beehive	1.YES	2. NO	

WI5	Hoe	1.YES	2. NO	
WI6	Shovel	1.YES	2. NO	
WI7	Sickle	1.YES	2. NO	
WI8	Water source	1.pipe	2.non-pipe	
WI12	Table	1.YES	2. NO	
WI13	Chair	1.YES	2. NO	
WI14	Bed	1.YES	2. NO	
WI15	Electric "Mitad"	1.YES	2. NO	
WI16	Own living house	1.YES	2. NO	
WI17	Own Agricultural land	1.YES	2.NO	
WI18	Type of floor	1.Cements/wood	2. Earth	3.Others(specify__
WI19	Type of wall	1.Cements	2.Mud	3.Others(specify)___
WI20	Type of roof	1.concrete	2.iron sheet	3.others(specify)___
WI21	Toilet facility	1.ventilatedimproved pit latrine	2.traditional pit latrine	3.Other (specify)___

Part II. Infant and young child feeding Practices (CFP)					
Code	Questionnaire			Respo nse	Skip
CFP1	Did you ever breast-feed your recent child?	1. Yes	2. No		If no, skip to CFP5
CFP 2	Have you breast fed your recent child within an hour of birth ?	1. YES	2. NO		
CFP 3	Did your child exclusively breastfed for the first six months?	1.Yes	2. No		
CFP	Is your child currently feeding breast milk	1. Yes	2. No		

4	?			
CFP5	What was given for your infant before the breast milk?	1. Only breast milk 2. Water 3. Butter 4. Cow milk 5. Others (specify)---		
CFP6	Do you give additional food to your current child (Name)?	1. Yes 2. No 3. Not sure		If 2,3, skip to part III
CFP7	If yes for CFP4, at what age you start feeding additional food?	1. Less than six months 2. At six months 3. I don't remenber		
CFP8	If yes for CFP4, how much times you feed your child yesterday at day and night?	1.Once 2.Twice 3.Three 4. Four times 5. Five and above five		
CFP9	If not for CFP4, how much times you feed your child yesterday at day and night?	1.Once 2.Twice 3.Three 4. Four times 5. Five and above five		
CFP10	For how long you feed your child brestmilk totally only for non breastfeeding children?	1 .One years 2. Two years 3.Three years 4. I don't remember		

Part III. **Child Dietary Diversity Practices**

. Now I would like to ask you about <u>everything</u> that (**name**) ate yesterday during the day or thenight. Please include foods consumed outside of your home.

Think about when (**name**) woke up yesterday. Did (he/she) eat anything at that time?

If 'Yes' ask: Please tell me everything (**name**) ate at that time. Probe: Anything else?

Record answers using the food groups below.

Repeat this string of questions, recording in the food groups, until the respondent tells you that the child went to sleep until the next morning

For data collectors: Please tick "Yes" if the respondent ate even a single food item in each category (a single food item under each category is enough to say "Yes".

			response
	Food group	Items of food found in group	Yes=1,no=0
A	Cereals products?	teff, sorghum, rice, maize, millet, wheat, barley	Yes=1 No=2
B	Root and tubers?	sweet potato, red paper, carrot, dinichi	Yes=1 No=2
C	Vitamin A rich vegetables and fruit?	white potatoes, white yams, cassava, or foods made from Roots.	Yes=1 No=2
D	Milk and milk products?	milk, cheese, yogurt or other milk products	Yes=1,No=2
E	Others Vegetables?	Leaf, leaf of pumpkin, cabbage, lettuce. tomato, onion, egg plant ,	Yes=1 No=2
F	Other fruits?	mango, papaya, Orange, avocado, banana, pineapple	Yes=1 No=2

G	Meat and meat products?	liver, kidney, heart or other organ meats or blood-based Foods from cow, ox, goat, camel and hen.	Yes=1 No=2
H	Eggs?	Eggs and it products	Yes=1,No=2
J	LEGUMES, NUTS AND SEEDS?	beans, peas, lentils, nuts, haricot beans seeds or foods made from these	Yes=1 No=2

Part III.Maternal and child health care (HC).

HC 1	Birth interval for the index child (name)		1. First birth 2. < 2 years 3. 2 yrs to 3yrs 4.3yrs and above	
HC 2	Place of delivery of this child?		1. At home 2. health facility	
HC 3	Immunization status of this child?	1.incomplete	2.complete	
HC 4	Did your child illness in last two weeks?	1.Yes	2. No	If no, skip to HC5
HC 4a	If yes what was his illness in the last two weeks?	1.Fever in last 2 weeks	2. Diarrhea in the last two weeks 3. Difficult to breathing in last two weeks 4.Other(specify)____	
HC 5	Did you visit health facility for check up after delivery of this child (name)?	1.Yes	2.No	If no skip to part IV
HC 5a	If yes for HC7, at what time you visit?	1.At 2 day	2.other (specify)____	

HC 6	Did you consulted about child feeding during your PNC visit?	1.Yes	2. No	
Part V.Maternal Knowledge On Exclusive Breastfeeding				
KEB 1	What is the first food a newborn baby should receive?	1.olny breast milk 2. Others 3. not know		
KEB 2	Have you heard about exclusive breast feeding?	1. Yes 2.No 3. Not sure		If No question is end
KEB 3	If yes to KEB2, what does mean EBF?	1.giving for six months 2. Others		
KEB 4	Do you think that breast milk is the only food recommended for children from birth to six months old?	1.yes 2.No		if no Skip (Q5)
KEB 4a	If yes to KEB4, why breast milk alone sufficient to feed babies during the first six months?	1.baby can't digest other 2. brestmilk is enough for children from birth to six months 3.other(specify)_____ 4.don't know		
KEB 5	Did you think exclusive breastfeeding have advantage for mother and child?	1.Yes 2.No		
KEB 5a	If yes tall me benefits for baby?	1she/he growth health 2.protection from diarrhea 3.protection against obesity& chronic disease in adulthood 4.other (specify)__		
KEB 5b	If yes tall me benefits for mother?	1.dealy fertility 2.lower risk of cancer(breast &ovaries)		

		3.improve bonding b/n mother-child	
Part VI.Environmental Factors			
EF1	What is the source of drinking water for your household?	Pipe water Protected spring Unprotected spring protected well Unprotected well surface water(pond,lake,river) other (specify)__--	.
EF3	Do you consistently wash your hand with water and soap for mother at key moments?	1.yes 2. no	If 2, skip to Q5
EF4	If yes for Q3, at what time circle on response of mother?	1.after toilet/latrine 2. Before food preparation, 3.before eating, 4.after dropping child feces 5. before feeding child breast milk 6.others(specify)	More than one response is possible
EF5	Is it health facility available in the place of you living?	1.yes 2.no	If no skip to part VII
EF5a	How far from your home in kilometer?	1.less than ten KM 2.Greater than ten KM.	
EF5b	Did you get the services you want at any time when you go health facility?	1.Yes if yes ask services she taked 2. No	
EF6	Did you have Toilet facility	1. Yes 2. No	
EF7	If yes for EF6, what types of toilet you had?	1.improved toilet 2. Unimproved toilet	
Part VII.Household Food Insecurity Access Scale (HHFIAS) Tool			

	Question	response	Response Code	Skip to Q
Q1	In past 4 weeks, did you worry that your House Hold (HH) would not have enough food?	0 = No 1=Yes		If no skip to Q(2)
Q1a	How often did this happen?	1 = Rarely (1-2X in past 4wks 2 = Sometime (3-10X in past 4 wks) 3 = Often (≥ 11X in past 4wks		
Q2	In past 4 wks, did you or any HH member have to eat limited variety of foods due to lack of money?	0 = No 1 = Yes		If no (skip to Q(3)
Q2a	How often did this happen?	1 = Rarely (1-2X in past 4wks) 2 = Sometime (3-10X " ") 3 = Often (≥ 11X in past 4wks		
Q3	In past 4 weeks, did you or any HH member have to eat some foods that you really didn't want to eat due to lack of money to get other food type?	0 = No 1 = Yes		If no(skip to Q(4)
Q3a	How often did this happen?	1 = Rarely (1-2X in past 4wks) 2 = Sometime (3-10X " ") 3 = Often (≥ 11X in past 4wks		
Q4	In past 4 wks, did you or any HH member have to eat smaller meal than you felt you needed due to no enough food?	0 = No 1 = Yes		If no skip to Q(5)
Q4a	How often did this happen?	1 = Rarely (1-2X in past 4wks)		

		2 = Sometime (3-10X " ") 3 = Often (≥ 11X in past 4wks		
Q5	In past 4 wks, did you or any HH member have to eat fewer meals in day due to no enough food?	0 = No 1 = Yes		If no,(skip to Q(6)
Q5a	How often did this happen?	1 = Rarely (1-2X in past 4wks) 2 = Sometime (3-10X " ") 3 = Often (≥ 11X in past 4wks		
Q6	In past 4 wks, did you or any HH member have to eat fewer meals in day due to no enough food?	0 = No 1 = Yes		If no skip to Q (7)
Q6a	How often did this happen?	1 = Rarely (1-2X in past 4wks) 2 = Sometime (3-10X " ") 3 = Often (≥ 11X in past 4wks		
Q7	In past 4 wks, did you or any HH member go to sleep at night hungry due to not enough food?	0 = No (skip to Q109) 1 = Yes		If no skip to Q (8)
Q7a	How often did this happen?	1 = Rarely (1-2X in past 4wks) 2 = Sometime (3-10X " ") 3 = Often (≥ 11X in past 4wks		
Q8	In past 4 wks, did you or any HH member go a whole day and night without eating	0 = No 1 = Yes		If no skip to

	anything due to there was not enough food?			Q(9)
Q8a	How often did this happen?	1 = Rarely (1-2X in past 4wks) 2 = Sometime (3-10X " ") 3 = Often (≥ 11X in past 4wks		
Q9	In past 4 wks, did you or any HH member go to sleep at night hungry due to not enough food?	0 = No 1 = Yes		If no Q is ended
Q9a	How often did this happen?	1 = Rarely (1-2X in past 4wks) 2 = Sometime (3-10X " ") 3 = Often (≥ 11X in past 4wks		

Thank You Very Much!

For Enumeration of Household.

Anthropometric questionnaires for children aged 6-59 months.

Please before starting the record, check eligibility criteria for all children by asking biological mother and observation. **Eligibility criteria**

Part A00: Anthropometric information panel

AN1. Woreda: Meta districts
AN2. Name of Kebele and village _____&_____
AN3. Full name of mother_____
AN4.Full name of father_____
AN5. Full name of child _____
AN6.Number of under five children in the house hold _____
AN7. Survey code_____

Anthropometric measurements for children aged 6-59 months					
MUAC in mm/cm	First measurement		Second measurement		Average
	_____Cm		_____Cm		_____
Presence of edema	1.yes	2.no	1.yes	2.no	
Weight in kg					
Length/Height in cm					

Hirmannaa Keeysanif Baay'ee Galatooma !

Annex.4. Ibsa hirmaattota qorannoof kennamuu fi Uunkaa Hayyama Guddiftuu (hadha daa'iima) kan daaima urmi isani waagga 18 gad ittin gutamu.

Seensa: Akkam bultan/ooltan, maqaan koo_____jedhama. Ganda/Araddaa kana keessatti qorannoo Obbo JibrilAbdujabar Mohammed digrii lammaaffaaf (mastarsiif) Yunivarsiitii Haramaya, kolleejjii Saayinsii Fayyaatti barachaa jiruuf sassaabaan jira. Waa'ee qorannoo kanaa fi akkaataa qorannoo kanatti akka hirmaattan daaimni keessan ittin filatamtan akkaan isinii ibsuuf yeroo muraasa akka naaf kennitan isin gaafadha.

Mata duree Qorannichaa: waantoota mutresso hanqina nytaata daa'imman bati jaha hanga bati shantami sagali jiddu jiran itti fidan kan Aanaameetta, Godina Harargee bahaa,Baha Etiyoophiyaa keessaa jiran.

Sababa qorannichaa: Sababni guddaan qorannoon Kun barbaachiseef abbaan qoranichaa **obbo Jibril Abdujabar Mohammed** qorannoo digrii lammaffaa argachuuf isaan barbaachisu guutuufi dha. Dabalataanis, bu'aan qorannoo kanaa galtee hoggantoota fayyaa fi deeggartoota fayyaa biroof kanfayyaduu fi sababoota hanqina nyaata daa'iimman urmi kana addanbaasuuf kan gargaaru dha. **Adeemsaa fi turtii qoranichaa**:Ani gaaffilee qophaa'aniin kanan handha/ guddiftu daaima gafadha Yoo guddate hamma daqiiqa 30 qofa irra fudhata waan ta'eef yeroo kana naaf kennuun haala bilisa ta'een waan sitti dhagahamu naaf deebisaan.

Faayidaa fi miidhaa qoranichaa:Sababa qorannoo kanatti hirmaattaniif rakkoon guddaa isin irra gahu hin jiru, yeroo keessan muraasa isin irraa fudhachuu keenyaan alatti.Faayidaa kallattiin sababa hirmaannaa keessaniin argattan hin jiru. Fayidan isin argatan daimana yeroo qorannoo kana hanqinni nyata irrattti mulate osoo gara mana yaala hin demin jirran gara mana yaalaa akka deman ni gona, dabalatan immoo hubanno fayya ni aragatan ogessota fayyaa irraa.

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

Mirga: Hirmaannaa fedhii keessan irratti kan hundaa'e dha. Qorannoo kana irratti hirmaachuuf murteessuu yookiin dhiisuu dandeessu.Hirmaachuuf murteessitan illee yeroo barbaaddan qorannoo kana addaan kuttanii bahuuf mirga guutuu qabdu. Sababa kanaan faayidaa isin argachuu qabdan kan dhabdan hin jiru. Gaafii isin deebisuu hin barbaanne yoo jiraate deebisuuf dirqama hin qabdan.

Walquunnamtii kamuu barbaachisuuf: Gaafii yoo qabaattan yookiin ibsa yoo barbaaddan yeroo barbaaddanitti lakkoofsa bilbilaa qorataa qorannoo kanaa:

Obbo Jibril Abdujabar Mohammed

Teessoon: Meetta

Bilbilaa: 0920452836

Email: jibrila08@gmail.com

Karee naamusa dhaabbataqorrannokolleejii saayinsii fayyaa, YunivarsiitiiHaromaaya qunnamu yoo barbadan isaan kana fayyadamuudandeessu:

Lakkoofsabilbilaa : 0254662011

Lakkoofsa poostaa 235, Harar,xophiyaa

Ibsa fedhii hirmaataa qorannoo ta'uu ykn mirkaneessuu: Ibsa hirmaattota qorannoof kennamuu dubbiseera/ naa dubbifameera. Faayidaan qorannoo kanaa sirriitti naaf galee jira, akkaataa, rakkoo fi faayidaa akkasumas Waa'ee iccitii eeguu, mirga hirmaataan qabu, akkasumas walquunnamtii (walitti dhufeenya) kamuu barbaachiseef teessoon natti himameera. Waan naa hin galle gaafachuuf carraan naa kennameera.wayita kam iyyuu qorannoo kana addaan kutte bahuu akkan danda'an, akkasumas gaaffiin debisuu hin barbaanne deebisuuf akkaan hin dirqamne naaf himame jira.Kanaafuu qorannoo kanatti daaiimni koo fi hati mana koo Ykn daaimni koo fi anis fedhii koon kan hirmanne tahu maallattoo kiyyanin mirkanessa.

Maqaa fi Mallattoo hirmaataa_____guyyaa_____

Maqaa raga sassaabaa _____Mallattoo _____Guyyaa _____

Annex.8.2. Gaffannoolee kuta Afaan Oromoo wantoota hanqina nyaata daa'iimman bati jaha hanga bati shantami sagali tahan aanaa meettaa, Hararge baha,naannoo oromiyaa, baha xophiyaa.

Ragaa buu'uraa kan hirmattoota.

001:Lakkoofsa eenyummaa nama qorannoo keessatti hirmaatuu----------

002: Naannoo Oromiya

003: GodinaHararge Baha

004: Aanaa Meettaa

005: Araddaa/Ganda----------

006: Haala deebii gaaffaannoolee _____

1, Xumurame 2.Walakkaan isaa xumurameera 3. Ni dide 4. Kan biro-------

007: Guyyaa gaaffaannoon itti gutame ----------

008:Sa'aa fi daqiiqaa itti eegalame----------

009: Sa'aa fi daqiiqaa itti xumurame----------

010: Hordoofa(too'ataa) ilaalee Maqaa----------Mallattoo----------

Lakk.	Ragaa buu'uraa kan hirmattoota.	

001	Lakkoofsa eenyummaa nama qorannoo keessatti hirmaatuu-	_____
002	Naannoo	Oromiya
003	Godina	Hararge Baha
004	Aanaa	Meettaa
005	Araddaa	_____
006	Ganda	_____
007	Haala deebii gaaffaannoolee?	1. Xumurame 2. Walakkaan isaa xumurameera 3. Ni dide 4. Kan biro-------
008	Guyyaa gaaffaannoon itti gutame (guy/bati/waggaan)	_____/_____/_____
009	Sa'a gaaffaannoon itti egalame	Sa'a_____,daqiiqa_____
010	Sa'a gaaffaannoon itti xumurame	Sa'a_____,daqiiqa_____
Maqaa too'ataa ykn suparviyizera ilaalee _____-mallattoo_____		

Kuta I.Gaafannoole Haala Wali gala				
Lakk.	Gafaannoole	**Deebisaa**	**Kodii**	Irraa dabrii
101	Urmii kee (hadhaa) wagga meqaa?	**_____**		
102	Haala gaa'ilummaa hadhaa?	**1.**kan hermte 2.kan waal hikan 3.kan abbaan mana irra du'e 4.kan biro maqan _____		
103	Bakka jirenya keessani kan ammaa?	**1.badiyaa** **2.magala**		
104	Amantin keysan maali?	1.muslima 2.ortodoksi 3.protestanti 4.waqeffata 5. kan biiroo maqaan_____		

105	Sablammi teysan mali?	1.oromoo 2.somale 3.afar 4.amara 5.gurage 6. kan biro maqaan ____		
106	Haala barnota haadha?	1. barnoota idile hin baranne 2.sadaraka 1ffaa (1-8) 3. sadarka 2ffaa(9_12) 4. sadarka barnoota olaanaa		
107	Haala barnoota abbaa mana keysni?	1. barnoota idile hin baranne 2.sadaraka 1ffaa (1-8) 3. sadarka 2ffaa(9_12) 4. sadarka barnoota olaanaa		
108	Hojii idile haadha mana?	1.haadha mana 2.hojjatu mootummaa 3.daldaltu 4.qotee bula 5. kan bira maqaan_____		
109	Hojii idile abba mana?	1.qote bula 2.hojjata mootummaa 3.daldaltu 4.qotee bula 5. kan biraa maqan_____		
110	Urmii haadha kan yeroo daa'imaa kaan dessuu waggaa meqaa?	Waggaa_____		
111	Baayyina mati keysani kan wajjiin mana tokko keessaa jirtatn meqaa?	Lakkofsan_____		
112	Hamma gaali matin ji'atti argatan giddulan meqaa mallaaqa/birrii xophiytin?	_____ETB		
113	Mana keysan keessatti hogannan enyuu?	1.haadha		

		2.abbaa		
Kuta II. Haala ,eegumsaa fi nyaata daa'imaa wajjin walqabate				
201	Saala daa'imaa kana?	1.dhiira 2. Dubara		
202	Urmiin daaiima kana meeqa batidhaan?	Baati gutun _____		
203	Daa'iimni kuni kitibati hunda godhate jira?	1. Eeyyeen 2.miti(lakki hunda hingodhane)		
204	Daa'imnii kuni erga dhaalate boda yeroo turti hangam takkatti aanaan harma keeti itti kennite?	1. sa'a takka keessaatti. 2. sa'a takka boda		
205	Daa'imaa kana harma ke'ee qofa bati(ji'aa) meqaaf luysifte(hosifte)?	1.ji'aa jaha gadii 2. ji'aa jahaf 3.numahu hin luynee		
206	Minimum dietary diversity (MDD) 24 hours before survey	1.less than 4 group 2. greater than 4group		
207	Daa'imaa kana torban laman darbe keessaa dhukkube ni beka?	Miti=0, Eeyyee=1		Yoo miti=0 tahe Irraa dabra gara gaafii(kuta sadafa)
207a	Eyyee yoo jettan Akkamitti dhukkube /eysatu dhukkube?	1.qamaa ho'isa 2. garaatu yasaa 3. hafura bafachu dadhaba		
Kuta III.Haal eegumsa faayyaa haadha fi daa'imaa ishi				
301	Yeroo daa'imnaa ke'e dhukkube osoo mana yaala hin geysine hangam takka ni tursifta guyyaadhaan?	1. guyyaa takka keysatin geysa 2.guyyaa takka bodan geysaa		
302	Yeroo daa'imaa ke'e dhukkube iddoo walansa kamitti wallansifta(yaalchifta)?	1.maala walnsa aadaa(fkn.sheka faa bira) 2. maala walansa ammaya(fkn.doktara,nursi…f		

		kk)		
303	Yeroo daa'imaa ke'e kan dhukkube haala walansa isaa irratti abbaa mana walin mariataniti walantani?	1.lakki waalin hin mariannu 2. eeyyeen walin mariana		
304	Hordofi ulfaa dura gafa daa'ima kana gara qabdu godhate beyta?	Lakki=0,eeyyee=1		**Yoo lakki tahe gara gafi 305 dabra**
304a	yoo eeyyee jette guyyaa dura dhayxu ulfi kee isaa bati meqati ?	1. bati afuri gad 2.bati jaha 3.bati sadet 4.bati sagala		
304b	Yeroo meqaa hordoffi gote	1. yeroo takka 2. yeroo lama 3.yeroo sadi 4.yeroo afur 5. yeroo afuri ol		
304c	Dhabbile fayya isaa kamitti godhate ?	1. kellaya fayya 2. buufata fayya 3.hospitala 4. mana yaala dhunfaa		
305	Kitibati godhate jirta yeroo ulfaa daa'ima kana ?	Lakki=0,eeyyee=1		**Lakki yoo tahe gara gaafi 306 dabra**
305a	Eeyyee yoo tahe yeroo meqaa godhate?	1.yeroo takka,2.yeroo lama,3.yeroo sadii		
306	Eysatti deyse daa'imaa kan?	1.mana,2.mana yaalaa		
307	Daa'imaa kana dhosan deysan moo jaaluman deysan?	1.Dhosaa,2. jaaluman		
308	Ergaa dessee boda hordoffi dahumsa boda gote beyta guyyaan ?	Lakii =0,eyyee=1		**"o"dabra gara gafi 309**

308a	Guyyaa meqaa keysatti	1.guyyaa lamaa keysatti 2. Guyyaa jaha tii.		
Kuta IV. haala naannoo(bishaan,qulqullina,dhaabile faayaa jirachu)				
401	Bishaan dhugaati keysan eysaa irraa argatu?	1.bishaan bomba 2.bishaan bolla,3. bishaan mandaa 4. kan birroo maqaan		
402	Tajajiala mana fincani niqabdani	1.eeyyee2.miti		**Yoo miti tahe gara Gafi kuta V darba**
403	Yoo Eeyyee jettan, haali qulqullinqa isi akkami ?	1.mijawadhaa 2.mijawamiti		
Kuta V. Gaaffaannoolee haala nyaata madalawa daa'iimmani ilaallatu				
	Adde nyaataa daa'iima kee kalessaa guyya fi halkan nyachifte nati himi tokko tokkon ganaama irraa egali	Kalessaa guyyaa kan nyachifte	Kalessaa gal gala kan nyachifte	
	Erga isheen xumurte boodaa bakka isheen irranfatte haala kanan yadachisi bifa gaafitin.			
	Gartule nyaata	Fakkenyaaf	**Eyyee =1** **Miti=0**	
501	Midhaan nyaata bu'ura irraa tolfaman?	Boqqollo,bishinga,kamadi,past,ruza		
502	Nyaata vitamina A of keessaa qaban?	Mango,papaya,appil,avokado		
503	Nyaata mudraa nyachifte jirta?	Muza,burtukana, xuxo,		
504	Nyaata kudra nyachifte jirta	Timatim,dinicha,		
505	Foon kuta qama	Kale, tiru, foon dhiiga.		
506	Kudrale biro	Karota,		
507	Mudrale biroo	Rafuu,shunkurta dima fi adii		

508	Buphaa/killee		
509	Aanaan fi nyaataa irraa omishame	Ittitu,badu,	

Kutaa jahaffaa:- gafillee waabii nyaataa warra beekkuf gaafii qophaayee			
601	Torbaan afran darbaniiti maatilee keessatti nyaanii gahaan hinjirraatu jatee shakitee beektaa?	1.Eyee 2. hinshakinee →	602
601 a	Deebiin 601 Eeyee yoo ta'ee yeroo meeqaaf shakitee	1. yeroo tokko ykn yeroo lamaa 2. 3irraa hangaa 10 3. yeroo 10 ol	
602	Torbaan afuan darban sii ykn miseensa wara keessa haafina maalaqa dhabuun ossoo hin yaatiin haaftan ni jirraa	1. Eeyee 2. hin jiruu →	603
602 a	Deebiin 602 Eeyee yoo ta'ee yeroo meeqaaf?	1. yeroo tokkoo ykn yeroo lama 2. 3 irraa hanga 10 3. yeroo 10 Ol	
603	Torbaan afuan darban sii ykn miseensa wara keessa haafina maalaqa dhabuun ossoo hin yaatiin haaftan ni jirraa	1. Eeyee 2. hin jiruu →	604
603 a	Deebiin 603 Eeyee yoo ta'e yeroo meeqaaf?	1. yeroo tokkoo ykn yeroo lama 2. 3 irraa hanga 10 3. yeroo 10 Ol	
604	Torbaatii afuraan darban ati ykn miseense maattii birraa dhabinsa qabeenyaatiin irraa kan ka'ee nyaataalee adda adaa argachuu dhabutiin nyaataalee hin barbaane haalii nyaatan jirraa?	1. 1. Eeyee 2. hin jiruu →	605
604 a	Deebiin gaafii 604 Eeyee yoo ta'ee yeroo meeqaaf?	1. yeroo tokkoo ykn yeroo lama	

		2. 3 irraa hanga 10 3. yeroo 10 Ol	
605	Torbaan afuran darbaan ati ykn miseensamaati birraa nyaannii ga'aawaan hin jireef nyaata yeroo birraa irraa xiqaa haala nyaatan ni jirraa	1. Eeyee 2. hin jiruu →	606
605 a	Deebiin gaafii 605 Eeyee yoo ta'ee yeroo meeqaaf?	1. yeroo tokkoo ykn yeroo lama 2. 3 irraa hanga 10 3. yeroo 10 Ol	
606	Torbaan afuran darban ati ykn miseensa maati birra nyaata ga'aawaan hin jireef faxara laaqana ykn irraata haali hin nyaanee ni jirraa	1. Eeyee 2. hin jiruu →	607
606 a	Deebiin gaafii lakkofsa 606 Eeyee yoo ta'ee yeroo meeqaaf?	1. yeroo tokkoo ykn yeroo lama 2. 3 irraa hanga 10 3. yeroo 10 Ol	
607	Torbaan afuran darban maatilee keessati dhabinsa qabeenyaatiin nyaata tokkolee haali hin nyaatiin ni jirraa	1. Eeyee 2. hin jiruu →	608
607 a	Deebiin gaafi lakkofsa 607 Eeyee yoo ta'e yeroo meeqaaf?	1. yeroo tokkoo ykn yeroo lama 2. 3 irraa hanga 10 3. yeroo 10 Ol	
608	Torbaan afuran darbaan ati ykn miseensi maatikee kan birraa nyaata tokkoolee haali hin nyaatiin oso beelooftan haali itti ragtan ni jirraa	1. Eeyee 2. hin jiruu →	509
608 a	Deebiin gaafi lakkoofsa 608 Eeyyee yoo ta'e yeroo meqaaf?	1. yeroo tokkoo ykn yeroo lama 2. 3 irraa hanga 10 3. yeroo 10 Ol	

609	Torbaan afuran darban ati ykn miseensa maatii birraa nyaanii waan hin jireef haalkani fi guyyaa haali hin nyaatiin ni jira	1. Eeyee 2. hin jiruu	gafin keessaan dhumate jira.
609 a	Deebiin gaafi lakkofsa 608 Eeyee yoo ta'e yeroo meeqaaf?	1. yeroo tokkoo ykn yeroo lama 2. 3 irraa hanga 10 3. yeroo 10 Ol	

Lakk. gaafi	Kuta VIII.Haala Qabeenya Maatii		koodi	Irraa darbii
701	A.horii mana	Filannoo		
702	Lowwan (qottiyo,sa'aa,jabbii)	1.eeyyee 2. miti		
703	Hoola	1.eeyyee 2. miti		
704	Re'ee	1.eeyyee 2. miti		
705	lukkuu	1.eeyyee 2. miti		
706	Farda/harree/gaangee	1.eeyyee 2. miti		
	B. qabenyaa dhaabbataa			
708	Televiyiin	1.eeyyee 2. miti		
709	raadiyoonii	1.eeyyee 2. miti		
801	Elektrica	1.eeyyee 2. miti		
802	firriji	1.eeyyee 2. miti		
803	Konkolata	1.eeyyee 2. miti		
804	Motorcycle/bajaj	1.eeyyee 2. miti		
805	Eelee elektrican hojatu	1.eeyyee 2. miti		

806	Mana jirenya dhunfa	1.eeyyee 2. miti		
807	Lafa qonnaa	1.eeyyee 2. miti		
808	Soofaa	1.eeyyee 2 . miti		
809	istoovi	1.eeyyee 2. miti		
901	C.akkaataa manni jirenya itti hojatame			
902	Maddaa bishanni	1.ujummoo 2. ujummoon ala		
903	Lafti mana jirenya keesssan mal irra hojatame	1.Simintoo /mukaa 2.biyyoo 3. kan biro ibs ____		
904	Gidarri mana jirenya kessaan maal irraa hojatame	1.simintoo 2.dhoqee 3. kan biroo (ibsaa)___		
905	Gosa baaxii mana jirenyaa	1.concrete 2.qorqoorroo 3. kan biroo(ibsa)____		
906	Gosa mana fincani	1.Kan ujummoo qilleensa basu qabu 2. kan addaa 3.kan biroo (ibsa)-----		

Kuta VII. Saafartu antiropometiri daa'iimman bati 6 hanga bati shantami sagali jiran			
1.MUAC mm/cm'n	Saafara dura	Saafaraa lammaffaa	Giddugala isaa.
	_____mm	_____mm	_____mm'n
Height/length(Cm)			
Weight(in Kg)			

Annexe 7.7. Curriculum Vitae

1.Personal Profile

Name: Jibril Abdujbar

Sex:Male

Place Of Birth: Wayiber,Meta Woreda ,East Hararge,Oromiya,Ethiopia.

Date of Birth**:** December 8, 1992 G.C.

Nationality: Ethiopian

Marital status: Single

Mobile: 0920452836

E-mail:jibrila08@gmail.com

Address (current)**:** Haramaya, East Hararge.

2. Educational Background

S/n	Institution	Certificate awarded	Year
1	Wayiber primary school	Secondary school entrance certificate	1992– 1999 EFY
2	Chelenko senior secondary school	Preparatory entrance certificate	2000– 2001 EFY
3	Chelenko preparatory school	University entrance certificate	2002– 2003 EFY
4	Ambo University	BSc. Degree in Midwifery	2004- 2007 EFY
5	Haramaya University	MPHN candidate	2011-2012 EFY

3. Work Experience

I am licensed in juniorhealth professional in governmental health institution (Haramaya general hospital) with 4 **y**ears work experience in maternal and child health department inmidiwify. During my stay I was attended different training from different organization and giving training for different stakeholder.

3.1. Training attended

Training Topics	Organization	Certificate
Helping baby breathing(HBB)	Ethi-canada Maternity foundation	Basic
Basic emergency obstetric and newborn care	Ethiopia midwifery association(EMwA)	Basic, TOT
Compressive abortion care and family planning	IPAS	Basic and TOT

Post abortion care	Ethiopia midwifery association(EMwA)	Basic and TOT
Training on basic Infection Prevention	ORHB with USAID.	Basic
Post partum IUCD	IFHP	Basic
Sexual transmitted infection	Haramaya university (HU)	Basic
Training on community based therapeutic care (CTC) and stabilization center management (SC)	IMC with East Hararge health office	Basic and TOT
Minimum activity of mother and new born(MAMAN)	HCS	Basic
Minimum initiative services package(MISP)	EMwA	Basic
Training on CBNC	ORHB with IFHP at Harar	Basic
Gender Based Violence	FGM and IMC at harar	Basic

4. Skill and hobbies

Language skill

Language	Listening	Speaking	Reading	Writing
Afaan Oromo	Excellent	Excellent	Excellent	Excellent
Amharic	Very good	Very good	Very good	Very good
English	Very good	Good	Excellent	Excellent
Arabic	Good	Good	Very good	Very good
Afsomalei	Good	Good	Good	Good

Annexes 8. Approval sheet

Haramaya University School of Postgraduate studies

Determinants of acute Undernutrition among children aged 6-59 months in Meta district, East Hararge Zone ,Oromiya, eastern Ethiopia in 2019/2020.

Submitted by:

Name of student(PI)Signature Date

Jibril Abdujabar _____ _____

Approved by:

Name of major advisor Signature Date

Tesfaye Gobana (PhD, Asso.Prof) _____ _____

Name of co-advisor: Signature Date

Behailu Hawulte (Assi. Prof) _____ _____

Name of Chair person Signature Date

_____ _____ _____

Name of Dean SGS Signature Date

_____ _____ _____

Name of chairman,CGS Signature Date

_____ _____ _____