Magnitude of Wasting and Associated Factors among Children aged 6-23 months in Hargeisa, Western Somaliland.

MPH THESIS

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December 2020

Haramaya University, Harar

A Thesis Submitted to the School of Graduate Studies, Haramaya University

In Partial Fulfillment of the Requirements for the Degree of Master of Public Health in Nutrition

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ACKNOWLEDGEMENT

In the name of Allah, the Most Gracious and the Most Merciful Alhamdulillah, all praises to Allah for the strengths and His blessing in completing this thesis.

Firstly, I would like to express my heartfelt thanks to my Advisors Dr.Kedir Teji Roba and Dr. Nega Assefa for unreserved and continuous comments and guidance throughout the work in preparing this thesis. Also I would like to acknowledge the staffs in Hargeisa city health administration office for their competiveness in providing all the necessary data on the target population used in this thesis.

Finally, I thank the data collectors, supervisors, study participants, and all my family and friends who were beside and helped me in the successful completion of this thesis.

ACRONYMS/ABBREVIATIONS

AOR	Adjusted Odd Ratio
CF	Complementary Feeding
CI	Confidence interval
COR	Crude Odd Ratio
DHS	Demographic and health survey
FAO	Food and Agriculture Organization
FSNAU	Food security and nutrition analysis unit
HHG	Hargeisa hospital group
GAM	Global acute malnutrition
IYCF	Infant and young child feeding
MCH	Mother and child health
SAM	Severe acute malnutrition
SD	Standard deviation
SHDS	Somali health and demographic survey
SLSH	Somaliland Shilling
SPSS	Statistical Package for Social Science
UNICEF	United Nations International Children's Emergency Fund
WHZ	Weigh for Height Z-score
WHO	World Health Organization

TABLE OF CONTENTS

LIST OF TABLES

Table **Page**

LIST OF FIGURES

Figure **Page**

ABSTRACT

Background: Wasting reflects a recent onset of nutritional deficiency related to insufficient food intake or malabsorption of nutrients which in results weight loss. However, regarding the magnitude of wasting and associated factors among children in weaning age (6-23 months) in Somaliland is not well investigated.
The study was conducted in Hargeisa, western Somaliland, from September 14 to September 29, 2020**.**
Objectives: The aim of this study is to assess the magnitude of wasting and associated factors among infants and young children aged 6-23 months in health facilities in Hargeisa, Western of Somaliland.

Methods and materials: Facility based cross-sectional study was conducted among 422 mothers with their infants/young children pairs. A pretested and structured questionnaire was used to collect socio-demographic data. Weight for length was measured to assess the nutritional status. Trained data collectors weighed the subjects on a calibrated portable hanging spring scale and recorded the value to the nearest 0.1kg; length was measured to the nearest 0.1 centimeters using board placed flat on the surface with infants in recumbent position, knee flat and toes pointing upward in movable wooden base and headpiece, the nutritional indices data were calculated using WHO Anthro software; statistical package for social science (SPSS) version 21 software was used for data analysis. The Descriptive statistics were used to describe the data. Binary logistic regression was performed to assess the association between each independent variable and the dependent variables. Odd Ratios along with 95% confidence level were estimated to identify factors associated with the outcome variable using multivariable logistic regression and the level of statistical significance was declared at p-value less than 0.05.

Result: The overall magnitude of wasting in this study was found to be 13.5%, [95% CI :(10%, 19%)]. Moderate wasting was accounted 34 (8.0 %) while severe wasting was 5.5 %. Being boy [(AOR=2.03, 95% CI :(1.03, 4.01)]. Children from mothers with no formal education [(AOR=3.25, 95% CI :(1.07, 8.01)], availability of latrine in household [AOR= 0.41, 95% CI: (0.18, 0.93)]. Children who were living in a household with food secure status [AOR=0.38, 95% CI :(0.15, 0.97)]. Having diarrhea illness [AOR=2.8, 95% CI :(1.11, 7.16)] were significantly associated with child wasting

Conclusion: The findings in this study showed high magnitude of wasting among infants and young children (6-23 months) in the study setting. Thus, efforts should be made to increasing the awareness on diversified nutritious foods, household food security, and the maintenance of home hygiene and sanitation practices. .

Key words: wasting, children aged 6-23 months, Health facilities, Hargeisa, Somaliland.

INTRODUCTION

1.1 Background

Child undernutrition in all its three forms is a global public health concern. Wasting, stunting and underweight are reported to be serious problems affecting developing countries. Child undernutrition has short and long term effects. The short terms effects include morbidity and mortality as it is reported it makes children much more vulnerable to disease, increasing frequency and severity of disease, and it contributes to 53% of deaths among children. The long term effects include preventing children from reaching their full developmental potential, low academic performance and poor IQ level, which in turn has consequences for the country's productivity. (Mgongo M et al., 2017)

Wasting is a symptom of acute undernutrition reflected a nutritionally deficient state of recent onset related to insufficient food intake or malabsorption of nutrients which results weight loss, weight-for-height below -2SD from the NCHS/WHO standards median value. The World Health Organization (WHO) classifies wasting as moderate and severe, according to the WHO growth reference for weight-for-height. Moderate Wasting is defined as (WHZ < -2), and severe wasting is defined (WHZ < -3). (WHO, 2014)

Children suffering from wasting have weakened immunity and they are susceptible to long term developmental delays, and face increased risk of death, particularly when wasting is severe, Severely wasted children are on average 11 times more likely to die than their healthy counterparts. These children require urgent feeding, treatment and care to survive. In 2018, over 49 million children under 5 were wasted and nearly 17 million were severely wasted.(UNICEF et al., 2019)

Because of a transition from exclusive breastfeeding to family foods, referred to as complementary feeding, their high growth velocity and brain development, their unique physiology and socioeconomic characteristics and increased vulnerability to infectious disease; children aged 6-24 months years of age are considered as the most at risk groups for undernutrition including wasting. (Derso T et al., 2017)

Infants from 6 to 18 months are especially vulnerable to developing undernutrition. To sustain the gains made by exclusive breastfeeding for the first six months of life, interventions need to extend into the second half of infancy and beyond. As a result, the World Health Organization designed and supports the implementation of Infant and Young Child Feeding (IYCF) Strategies.(WHO, 2003)

Health and nutrition are closely linked; adequate nutrition is the keystone of survival, especially during the first two years of life is very important to ensure optimal, physical and mental development. At this age, children are particularly vulnerable to growth retardation, micronutrient deficiencies, and common childhood illnesses such as diarrhea .(Demissie S and A., 2013) Therefore; good nutrition protects young children, strengthens their immune system and reduces the risk of non-communicable diseases related to foods during the lifecycle. It also enhances the productivity of the population and can help to get out gradually from the vicious circle of poverty and hunger. However, if the children do not get the necessary nutrients, such as body builders, energy foods and protective nutrients they become wasting (Derso T et al., 2017).

According to UNICEF Somaliland government made efforts to curb the problem, for integrated management of acute malnutrition: there are 5 stabilization centers, 37 outpatient therapeutic, 25 OTP sites covered by 32 mobile times, 7 micronutrient supplementation and infant and young child feeding, There are plans to add 3 nine new SCs, 12 OTPs and 26 TSFPs in the coming 2 years to cover some of the identified gaps (UNICEF, 2019).

1.2 Statement of the problem

Globally 52 million children worldwide suffered from wasting in 2016. More than half of them resided in South Asia. The magnitude of wasting in South Asia is above the 15% threshold that establishes child wasting as a 'critical public health problem". The prevalence of wasting across the 6 countries in South Asia (Afghanistan, Bangladesh, Pakistan, India, Nepal, and Maldives) was ranged from 9% in Afghanistan to 21% in India. While the prevalence of severe wasting ranged from 1.9% in Nepal to 7.4% in India. According to WHO thresholds, the level above 10% represents a "serious public health emergency", and rates above 15% represents to a "critical situation" (Harding K et al., 2018).

According to WHO 14.1 million Children under five years in the UN African Region were wasted (4.3 million of them severely wasted) in 2016. From the 45 countries with data collected between 2007 and 2015, the median wasting prevalence is 6.3% (and ranges from 2% "acceptable situation" in Swaziland to 22.7% "very critical situation' in South Sudan), Famine and repeated droughts in the Horn of Africa in early 2017 will likely exacerbate the situation (WHO, 2017).

The continued high burden of child wasting represents an urgent policy priority. The global Sustainable Development Goals (SDGs) include a global target for 2025 aimed at reducing and then maintaining, child wasting to below 5%. Achieving this goal will require a scale up of evidence based policies and programmes. (Harding K et al., 2018)

From a life-cycle perspective, the most crucial time to meet a child's nutritional requirements is the first 1,000 days, including the period of pregnancy and ending with the child's second birthday. During this time, the child has increased nutritional needs to support rapid growth and development, is more susceptible to infections, has heightened sensitivity to biological programming, and very dependent on others for nutrition, care, and social interactions. Any damage caused during this period can lead to irreversible impaired cognitive development, compromised educational achievement, low economic productivity and malnutrition. Thus, the first two years of a child's life is the most important for the establishment of a healthy growth and development (UNICEF, 2016).

In many parts of Somalia, the global acute malnutrition (GAM) rate persisted above serious levels despite a reduction from 17.4 to 14 per cent between the 2017 and 2018. Between January and September 2018 UNICEF and partners have reached 162,750 children suffering from severe acute malnutrition (SAM) with lifesaving therapeutic nutrition treatment According to UNICEF Somalia humanitarian situation report on May 2019 estimate the children under five years whom will face acute malnutrition in 2019 were 903,100, including 138 200 children with severe acute malnutrition, (UNICEF, 2018).

Accordingly different factors associated with child wasting such socio-demographic factors, household food security, Infant and Young Child Feeding Practices factors, Environmental and health related factors. (Harding K et al., 2018, Derso T et al., 2017, WHO, 2014). Early detection of child wasting-inducing conditions is mandatory. However, no studies highlighted the magnitude of wasting and factors associated with infants and young children aged in Somaliland, and there is no single study from this study area in particular, Thus, the main aim of this study is proposed to fill this gap by studying the magnitude and factors associated with wasting among children in weaning age (6-23 months) in Hargeisa city.

1.3 Significance of the study

After the result have been approved by university ethical committee the study was help to show the magnitude of the problem and its associated factors in the study area among children aged 6-24 months. Result generated from this study will help planners and policy makers to understand the magnitude of the problem and also serve as base line to design policy to intervene the problem, Hargeisa city administration health and non-governmental organizations working on health and nutrition were used as output for identification the nutritional status of the children. Interested researchers in the area for the future studies will use the information generated from the study as a baseline.

1.4 Objectives

1.4.1 General Objective

- To assess the magnitude of wasting and associated factors among children aged 6-23 months in Hargeisa, western Somaliland

1.4.2 Specific Objectives

- To determine the magnitude of wasting among children aged 6-23 months visiting health facilities in Hargeisa, Somaliland.
- To identify associated factors with wasting among children aged 6-23 months.

2. LITERATURE REVIEW

2.1 Magnitude of wasting among young children (6-23 month)

Various studies conducted across different regions of the world indicate that wasting is a global public health problem particularly among young children in developing countries. Surveys on Factors associated with wasting among children under five years old in South Asia, used multistage cluster sampling in Afghanistan, Bangladesh, India, Maldives, Nepal and Pakistan shows that the magnitude of wasting in these populations ranged from 9.5% in Afghanistan to 21.0% in India (Harding K et al., 2018). A Cross-sectional studies completed in Gaza strip, Palestine and Pakistan reveal that 21.3% , 10.7% of children were wasted respectively (Azzam D, 2019, Khan S et al., 2019)

According to studies conducted in Bhutan, Indonesia, and Cambodia show that almost one in ten children (9·3%) aged 0–23 months was wasted and over one third (37·6%) of the wasted children were severely wasted in Bhutan (Aguayo V et al., 2016), while the magnitude of wasting were (10.1%), (19.1%) in Indonesia and Cambodia respectively (Meiandayati R et al., 2018, Miller J and Rodgers Y, 2009).

Cross-sectional studies completed in Mali, SriLanka, Nigeria show that the overall wasting among infants and young children were (13.9%) , (17.1%), (19%) respectively (Sobgui C et al., 2018, Ubeysekara N et al., 2015, Chizoba O et al., 2014). According to the WHO cut-off points to declare the public health importance of wasting, the magnitude of wasting in this countries indicated that a “serious problem”. Also cross-sectional study carried out in north-west Uganda indicates that the prevalence of GAM was 5.6% were SAM was 1.1% (Legason I and Dricile1 R, 2018)

According to cross-sectional studies complete in Dabat district northwest Ethiopia the overall of wasting were (17.0%) , (18.2%,) among children aged 6–24 months (Derso T et al., 2017, Tariku A et al., 2017). Compared to WHO cut-off points to declare the public health importance of wasting the magnitude of wasting is critical public health problem in Dabat. This finding was in line with a magnitude of wasting 20.2% in study conducted in Central Africa Republic. However, compared to this study the lower magnitude of wasting 10% is reported in the rural Cambodia (Derso T et al., 2017).

A cross-sectional study carried out in Kemba Woreda, Southern Ethiopia the overall wasting rate was 21% among children aged 6-24 months, nearly similar finding was observed in a report of regional prevalence of wasting in Afar (19.5%) and Somali region (22.2%). However, compared to this study the lower prevalence of wasting 6.4% was reported in a study completed in Gondar (Agedew E and Shimeles A, 2016). Also a study completed in Bule Hora district, South Ethiopia shows that wasting is significant public health problem, 13.4% of children were wasted.(Asfaw M et al., 2015).

According to Somalia health and demographic survey in 2020 (SHDS) the overall magnitude of wasting in children under five is 12%. A cross-sectional study on predictors of the risk of malnutrition among children under the age of 5 years in Somalia, the findings of the study estimated that the national prevalence of wasting, in children aged 6–59 months at 21% (Kinyoki D et al., 2015). Also according to FSNAU 2018 the prevalence of GAM and SAM among IDPs in Hargeisa, Burco, Berbera, were 9.8% and 1.8%in in Hargeisa, 8.7% and 1.7% in Burco and Berbera, indicating an Alert nutrition situation (FSNAU, 2018).

2.2 Factors Associated with wasting among children aged (6-23 months)

Relying on different articles findings many factors were acknowledged to be associated with wasting among children aged 6-23 months including socio-demographic characteristics, household food security, Infant and Young Child Feeding Practices, Environmental and health related Characteristics of Study Participants. (Harding K et al., 2018, WHO, 2014).

2.2.1 Socio-demographic characteristics

Surveys in Afghanistan, Bangladesh, India, Maldives, Nepal and Pakistan on Factors associated with wasting among children under five years old in South Asia, age of child was significantly associated with wasting in all countries (p-value <0.05), also sex was significantly associated with wasting in most countries, boys were more likely to be wasted than girls, from 16% in India to 36% in Pakistan (p-value <0.05). (Harding K et al., 2018).

A institutional based cross sectional study conducted in Sri Lanka on Nutritional status and associated feeding practices among children aged 6-24 months, showed that sex and age of the child have statistically significant association with a wasting, The overall of wasting was significantly higher among boys than girls (p-value <0.01). Prevalence of wasting increased

significantly with the increasing age of child (p-value <0.05) (Ubeysekara N et al., 2015). Study done in Haramaya on prevalence and risk factors for undernutrition in children under five of age reveals that sex child was significantly associated with child wasting, male children were (AOR = 2.37, 95 % CI (1.19-4.7) more likely to be wasted compared to female children. (Hiwot et al., 2015). A study completed in Somalia reveals that sex and age of child have significantly associated with child undernutrition (Kinyoki D et al., 2015).

In terms of maternal characteristics educational and occupational status were significantly associated with child wasting; unemployed mothers were higher magnitude of child wasting compared to the employed mothers, also illiterate mothers were more likely to have a wasted children compared to literate mothers. According to cross-sectional study completed in Dabat District, northwest Ethiopia, the findings of the study shows that children from unemployed mothers were [AOR = 2.31, 95% CI: 1.56, 3.42] more likely to be wasted compared to children of employed mothers (Tariku A et al., 2017).

According to study carried out in Pakistan on Determinants of stunting, underweight and wasting indicates that children whose mothers had no education were more likely (AOR = 3.61, 95% CI 1.33–9.82) to be wasted (Khan S et al., 2019). Another study completed in Cambodia on Mother's education and children's nutritional status showed that maternal education level were significantly (p-value <0.05) determine a child's nutritional status, children born to educated women suffers less from undernutrition (Miller J and Rodgers Y, 2009). Also cross-sectional study carried out in Gondar city, Ethiopia from 3 to 28 May 2017 on Undernutrition and associated factors among children aged 6–59 months the study result showed that children of uneducated mothers were (AOR=3.30; 95% CI 1.29, 8.46) more likely to be wasted. (Gelu A et al., 2018). Study done in Haramaya on prevalence and risk factors for undernutrition in children under five of age reveals that family size was associated with child wasting children from family size above 12 were more likely to be wasted. (Hiwot et al., 2015).

2.2.2 Household food security

According to a cross sectional study completed in Bangladesh on food insecurity and child undernutrition shows that household food insecurity was significantly associated wasting (OR = 1. 28, 95% CI 1.09, 1.51, p < 0.05) with child undernutrition, (Hasan M et al., 2013). Also a cross sectional study in Nigeria on influence of family size, household food security status, and

child care practices on the nutritional status of under five children the result showed that the prevalence of wasting was 6.3% and households food insecurity were significantly associated with child wasting, Households that were food insecure were five times more likely than the households that were food secure to have wasted children(Ajao K et al., 2010).

2.2.3 Infant and Young Child Feeding Practices

Breast milk is a natural resource that has a major impact on child's health, growth and development. And it is recommended for at least the first two years of a child's life. According to cross-sectional study conducted in Bangladesh on Association between Breastfeeding Practices and Nutritional Status among children Aged 6-24 months, the result reveals that there was a significant association (p= 0.047) between early initiation of breastfeeding and child wasting (Ahmed R et al., 2017). According to a cross-sectional study completed in Dabat District, northwest Ethiopia, the findings of the study shows that late initiation of breastfeeding is significantly [AOR = 1.43, 95% CI: 1.04, 1.95] associated with child wasting (Tariku A et al., 2017).

Inappropriate complementary feeding practices are a major contributor to poor nutritional status of children aged 6-23 months. According to cross-sectional in Bule Hora district, South Ethiopia the findings of the study shows that the likelihood of being wasted was significantly higher for children who started complementary feeding before the age of 6 months. As compared with children who started complementary feeding at 6 months, the risk of wasting was 3.3 times (AOR = 3.3, 95% CI: 1.5-7.4) more for children who started complementary feeding before 6 months (Asfaw M et al., 2015). Several studies across developing countries states that complementary foods have deficient in some essential micronutrients such as: fatty acid, lipid, Iron, zinc and vitamin B-6, so children aged 6-18 months old are at the highest risk for anemia, iodine deficiency disorder, zinc deficiency and marginal vitamin A deficiency(Ahmed R et al., 2017, Kimiywe J and Chege P, 2015).

Dietary diversity has long been recognized as a key element of high quality diets. Minimum Dietary Diversity (MDD) is the consumption of four or more food groups from the seven food groups. According to cross-sectional study completed in Dabat District, northwest Ethiopia, the findings of the study shows that Children with inadequate dietary diversity were more likely to have wasting [AOR=2.08, 95% CI: 1.53, 4.46] compared to those who had good dietary

diversity(Tariku A et al., 2017). Similarly study carried out in Nairobi, Kenya, among children aged 6-23 months attending Kawaha public health center reveals that children who did not attain the minimum dietary diversity were likely to be wasted. (Kimwele A and Ochola S, 2017).

2.2.4 Environmental and health related Characteristics of Study Participants

Lack of access to improved source of drinking water was associated with greater likelihood of young children wasting in Indi and Bangladesh (AOR: 1.03 and 1.78, respectively).(Harding K et al., 2018). According to a study completed in Ethiopia on the association between acute malnutrition and water, sanitation, and hygiene among children aged 6–59 shows that unsafe of source of drinking water ((COR = 1.03, 95% CI [0.89, 1.19])) significantly associated with child wasting, and having a toilet facility at home were associated with a 37% (AOR = 0.63, 95% CI [0.46, 0.86]) reduction odds of the magnitude of child wasting (Cooten M et al., 2018).

Studies show that diarrhea and fever illness were significantly related to wasting in young children. According to community based cross-sectional study completed in Dabat site Ethiopia on Stunting, wasting and associated factors among children aged 6–24 months shows that the odds of wasting were 2.06 times [AOR = 2.06; CI: 1.29, 3.30] higher among children with history of diarrheal disease compared to those who had no history of diarrheal morbidity in the past 2 weeks prior to the date of study ((Derso T et al., 2017). According to cross-sectional in Bule Hora district, South Ethiopia the findings of the study shows that children who had a diarrhea in the past two weeks prior to the data collection were 2.7 times (AOR = 2.7, 95% CI: 1.1-6.4) more likely to be wasted than children had no diarrhea. According to study completed in Haramaya on prevalence and risk factors for undernutrition in children under five of age reveals that children who had fever, (AOR = 2.9, 95 % CI (1.16-7.2)), were more likely to be wasted than their counterparts (Hiwot et al., 2015). Similarly another study in Gondar city shows that presence of a fever in the previous 2 weeks prior to the date of study were significantly (AOR=2.29; 95% CI 1.20, 4.38) associated with child wasting (Gelu A et al., 2018).

2.3 Conceptual framework

This conceptual framework was developed after reviewing different related literatures. The figure below shows the factors associated with wasting among infants and young children aged 6-23 months. The independent variables have direct and in direct contribution to wasting among infants and young children aged 6-23 months (Figure below).

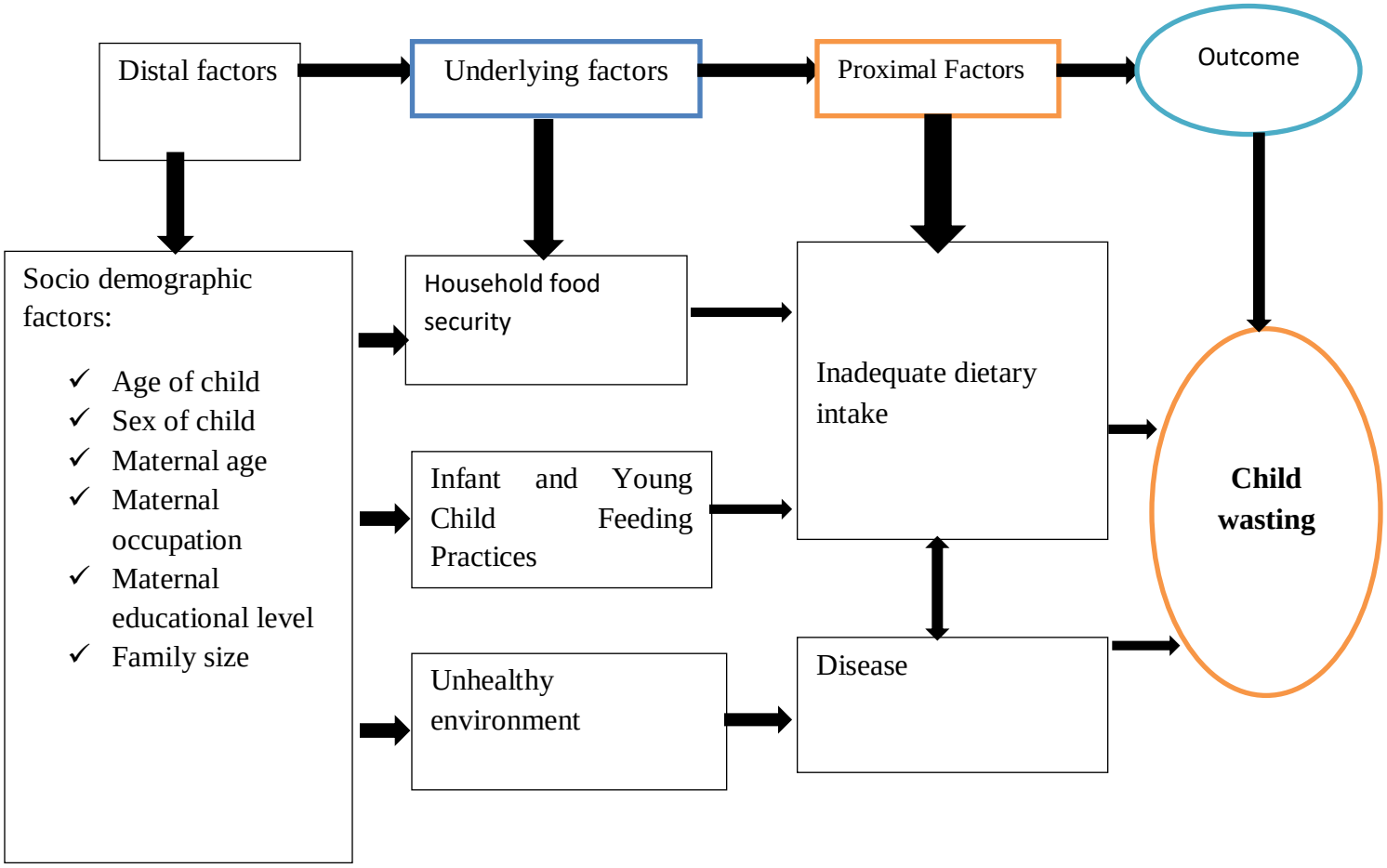


Figure 1: Conceptual framework for factors associated with wasting among children aged 6-23 months, September 2020 in Hargeisa city, Somaliland

Source adapted and modified from UNICEF (2009).

3. METHODS AND MATERIALS

3.1Study area and period

The North West region of Somalia comprises of the areas formerly known as British Somaliland Protectorate and now known as "The Republic of Somaliland'. The absolute location of the Republic of Somaliland is between latitudes of 8' North and 11' 27'' North; and longitudes 42 35' and 49. Somaliland lies in the eastern Horn of Africa. The total area of the Republic of Somaliland is 137, 600sqkms, and it has a coastline which is 850kms long. It is semiarid. The average daily temperatures range from 25oC to 35oC. Somalilanders recognize four seasons in the year. The administrative structure of the state consists of three branches: the judiciary, legislative (the House of Elders and the House of Representatives), and the executive arm. The population of Somaliland was estimated at 3.85 million in 2009 with an annual population growth rate is 3.14%.

Hargeisa city is the biggest urban setting in the Somaliland in the Maroodi jeex region; the city is located at the western of Somaliland and near the border with Ethiopia, and sits at an elevation of 1,334 m (4,377 ft). Hargeisa is a city of roughly 1.5 million people. Hargeisa has undertaken significant reconstruction and rehabilitation activities. It is the destination for a large number of refugees, returnees and IDPs in Somaliland

The study was conducted from 1 September to 25 September/2020 in selected health institutions in Hargeisa, Somaliland.

3.2 Study design

Institutional based cross-sectional study design was used

3.3 Source population

All infants and young children aged 6-23 months and their mothers/caregivers in health facilities in Hargeisa city.

3.3.1 Study population

All randomly selected children aged 6-23 months and their mothers/caregivers who were attending in the selected health facilities in Hargeisa city.

3.4 Inclusion and exclusion criteria

3.4.1 Inclusion

All infants and young children aged 6-23 months whose mothers have lived six months (permanent residents) in the study area during data collection were included in the study.

3.4.2 Exclusion

The study excluded Infants and young children aged 6-23 months who were seriously sick at the time of data collection**.**

3.5 Sample size determination and sampling procedure

3.5.1 Sample size Determination

The required sample for this study was calculated by using single Population proportions formula with following assumptions, 95% confidence interval (CI), 5% level of precision, 50% prevalence of wasting since the magnitude of problem is unknown in the study area, and 10% for non-respondent rate.

$$n = (Z\alpha/2)^2 \times p(1-p)/d^2$$

Where:

n = minimum sample sizes required

Za/2= critical value for normal distribution at 95% confidence interval which equals to 1.96 (z value at alpha: 0.05)

P = prevalence of wasting among children (50%)

d = the level of precision between the sample and population, Z= 1.96 P: 0.5

$$n = \frac{(1.96)^2 * 0.5(1-0.5)}{(0.05)^2} = 384$$

n = 384+38(10% of non-respondent rate): 422

The final sample size for this first objective was 422.

For objective 2: associated factors with wasting in infants and young children 6-23 months

The sample size for associated factors was calculated from some of the factors associated with infants and young children wasting obtained from different literature by using the statistical calculation of EPI INFO statistical software version 7 with the following assumptions. By taking assumptions of power 80%, 95% CI, and ratio of unexposed to exposed 1.

After the sample sizes were calculated for the first and second objective from different associated factors, the largest sample size from second objective was 228 (from table 1) and 422 from objective 1. So 422 were taken as the final sample size for this study.

Table 1 Sample size calculation for factors associated with wasting among infants and young children (6-23 months) in Hargeisa city, Western Somaliland

FACTORS considered	Proportion Wasting		Calculated Sample size	Reference
	Among Exposed	Among Non-exposed		
Sex of child	Male= 59.7 %	Female= 40.3 %	228	(Agedew E and Shimeles A, 2016)
educational level for mothers	Have No formal education = 64 %	Have formal education= 36 %	112	(Derso T et al., 2017)
Source of drink water	Unsafe source of drink water = 67.4 %	safe source of drink water= 32.3 %	74	(Meiandayati R et al., 2018)

3.5.2 Sampling procedure

There are 9 MCH clinic centers and 6 main hospitals (2 governmental and 4 public hospitals), three MCH clinic centers and three hospitals (1 governmental and 2 public hospital) were selected by simple random sampling from the list of health facilities, the list of children was obtained from health extension workers registration books in each selected health facility. Proportional allocation was done to determine the number of children that has to be included in the study from each health facilities based on the number of children. Finally each health facilities study participants were selected using systematic random sampling technique from the list of children in each health facilities after determining k^{th} interval value by N/n, and then the

numbers of kth were selected by lottery method. Then sample size for selected health facilities was allocated proportional to the number of health facilities children found in each health facilities (Hawaadle=173, Dr. kaled = 237, Sahardiid= 192, Gargaar=78, Dr.ediris= 86, HHG= 184) . The sample size for each health facilities is drawn by population to size as N=950 and study sample size 422. For each health facilities n=n/N*n. As per the health facilities population size, the sample size for each health facilities was calculated accordingly Hawadle =422/950*173=77, Dr.kaled =422/950*237=105, Sahardiid=422/950*192=85, Gargaar= 422/950*78=35, Dr.ediris= 422/950*86=38, HHG= 422/950*184=82.

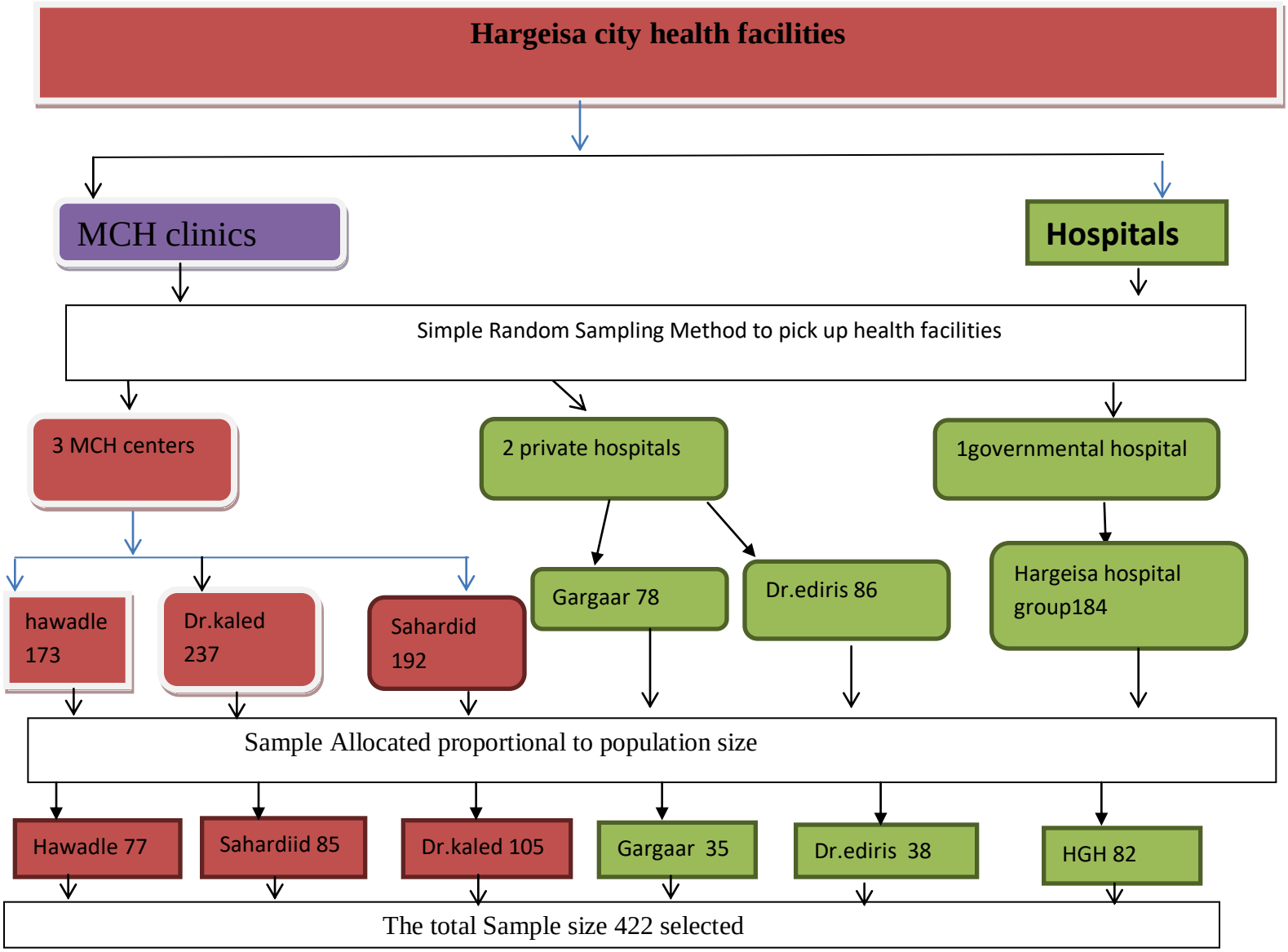


Figure 2: Sampling procedure for the magnitude and factors associated with wasting among children aged 6-23 months attending health facilities in Hargeisa, Somaliland.

3.6 Data collection methods

3.6.1 Data Collection Tools

Mothers/ caregivers paired with infants and young children were interviewed using interviewer-administered questionnaire. Moreover, data on dietary diversity were adapted from WHO standardized questionnaire for IYCN feeding practices. This was based on the mother's recall of foods given to her child in the past twenty-four hours (24hrs) before the study (WHO, 2010). Another tool from Food and Nutrition Technical Assistance (FANTA) was used to collect data on food security, which has nine questions and uses four weeks recall method (Coates et al., 2007).

Anthropometric measurements

Anthropometric measurements were conducted by the four data collectors, trained in all aspects of data collection procedures. One data collector assisted by another took measurement of weight and height of every child enrolled while the another two recorded the measurements in the questionnaire. Hanging spring weighing scale model was designed to take baby weight. Every child was weighed while wearing only a vest and no diaper and child hangs freely. A clean nappy/clothing was placed on the weighing scale. The weight was taken to the nearest 0.1kg (WHO, 2008). Board placed flat on the surface was designed to take baby length, Child lie down on the board. By supporting the child's head with one hand and the trunk of the body with the other hand, the child was gradually lowered onto the measuring board. With cupped hands over child ear, the head were placed against the base of the board to ensure that the child looks up straight with line of sight perpendicular to the ground. The assistant laid the child flat at the center of the board with the knee firmly pressed against the board and foot piece placed firmly against the child's heel. The data collectors were consider five contact points during length measurement. All the measurements were taken to the nearest 0.1cm (WHO, 2008).

3.6.3 Data Collectors and data collection procedure

The data collectors were six in number form combinations of BSC in nutrition and nurses who have more than two year clinical experience, and supervised by two senior clinical health officer, one day intensive training was given for data collectors and supervisor on the questionnaires' interview, taking anthropometric measurement by the principle investigator.

Training was given on how to ask and fill the questions, the selection criteria of participants, and how to measure anthropometric measurements and approach the respondents. The data collector informed the selected participant as she was selected to participate in the study. When the selected participant agreed to participate, consent was obtained, and the data were collected. Trained data collectors weighed the subjects on a calibrated portable hanging spring scale and recorded the value to the nearest 0.1kg; length was measured to the nearest 0.1 centimeters using board placed flat on the surface with infants in recumbent position, knee flat and toes pointing upward in movable wooden base and headpiece.

3.7 Study Variables

3.7.1 Dependent variable

Wasting (Yes/No)

3.7.2 Independent variables

- ✓ Socio demographic factors
- ✓ household food security
- ✓ Infant and Young Child Feeding Practices
- ✓ Environmental and health related Characteristics of Study Participants.

3.8 Operational/ Standard definitions

Anthropometric measurement: a series of quantitative measurements of the muscle, bone, and adipose tissue used to assess the composition of the body. (Collison D et al., 2018)

Wasting: moderate defined as weight for length < –2 SD, and severe wasting as weight for length < –3 SD of the WHO Child Growth Standards median. (WHO, 2014)

Breastfeeding: process of the child received breast milk, direct form breast or expressed. (Labbok M and Starling A, 2012).

Appropriate Complementary feeding: process starting food at 6 months of child age when breast milk alone is no longer sufficient to meet the nutritional requirements of infants and therefore other foods and liquids are needed, along with breast milk (WHO, 2001).

Food security: a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (Havas K and Salman M, 2011).

Access to sanitation: refers to the percentage of population with access to improved excreta disposal facilities. Facilities such as sewers or septic tanks and pour flush latrines, and simple pit or ventilated improved pit latrines (USAID, 2009).

Hygiene: a set of personal practices associated with ensuring good health and cleanliness that contribute to good health. It includes things like hand-washing, bathing and cutting hair/nails, Hand-washing, prevention of hazards from diseases (Temitayo I, 2016).

3.9 Data quality control

The questionnaire was translated into the local language (AF soomali version) questionnaire for data collection and then retranslated back into English. The data collectors and supervisors were given a one-day intensive training by the principal investigator (PI) on the instruments, method of data collection, how to take anthropometric measurements, ethical issues and the purpose of the study was clearly explained. The questionnaire was tested prior to actual data collection period among 5% of the mothers of children aged 6-23 months who were not included in the final data collection. The supervisors and the principal investigator supervised data collectors closely. The principal investigator and the supervisors checked completeness of each questionnaire on daily basis, standardization of anthropometric measures and calibration of instruments were done to minimize the error. Two data clerks entered data and consistency was crosschecked by comparing the two separately entered data on EpiData. Finally, multivariate analysis was run in the binary logistic regression model to control the confounding factors.

3.10 Data processing and analysis

The data were first coded, entered and cleaned using EpiData version 3.02 and exported to SPSS statistical software version 21 for analysis and nutritional indices data were calculated using WHO Anthro 2005 software. Descriptive statistics on demographic characteristics of respondents, socio economic were analyzed, and then the information was presented using frequencies, tables, and figures. Household Food Insecurity Access Scale (HFIAS) analyzed household food security; households were categorized into food secured, mildly food insecure,

moderately food insecure, and severely food insecure, and re-categorized to food insecure and food secured during analysis The outcome variable (wasting) was re-coded to dichotomous outcomes either presence or absence of wasting were coded in to dichotomous outcomes (presence of wasting as “1” and absence of wasting as “0” and the independent variables were coded based on previous studies and distribution of responses in the data. Bivariate analyses were carried out to see the association between each independent variables and dependent variable. All variables with p-value of < 0.25 during bivariate analysis were considered for multivariate analysis. Odd Ratios along with 95% Confidence interval were estimated to identify factors associated with the outcome variable using multivariable logistic regression. The level of statistical significance was declared at p-value less than 0.05. Multi-collinearity test were checked by variance inflation factor (VIF). The fitness of the model was tested using Hosmer-Lemeshow goodness of fit test and it was (p-value=0.673).

3.11 Ethical considerations

Ethical clearance was granted from Haramaya University Collage of Health and Medical science Institutional Health Research Ethical Review Committee (IHRERC). The official letter secured was also delivered to Hargeisa city administration health office. The health office has written cooperation letter to all selected facilities.

A written voluntary signed and informed consent from children's parents were obtained that detail the purpose of the study, focus study population, benefits of the study, risks involved and contacts of all relevant personality to whom clarification of the study can be sort. Mothers of the sampled children were explained importance of weighing the child with minimal clothes.

To protect the confidentiality of study participants, no names were entered into the questionnaire but every questionnaire was identified using a serial number. However, the principal data collectors established a separate identification list that corresponds with serial numbers of every study participant. The rationale is that the file can be made available to key research staff, and the local Ethical Review committee in case a need to reveal the true identify of study participant becomes necessary. All data and information collected during the research process such as field notes, memory sticks, questionnaires, tapes, were kept in strict confidence and secure by the principal investigator.

4. **RESULTS**

4.1. Socio-demographic characteristics

Out of the total sample size drawn of 422 children aged 6-24 months, 422 were participate in this particular yielding 100% response rate. Among the 422 children were participate this study 208 (49.3%) were male, and 214 (50.7%) were female. The mean (±SD) age of young children (12.9± 5.33), the median age of the mothers was 27 years. In terms of the occupational status of mothers, most of the mothers of the study subjects were housewives 244 (57.8%) followed by private employee 84 (19.9%). In terms of educational status of study participants mothers 156 (37%) of the children's mothers were illiterates, followed by university and secondary level 92(21.8%), 88 (20.9%). While 86 (20.3%) were from mothers with primary level educational status. The study subject has a family size which accounts 249 (59.0%) were in categories 2-5 family size, while 173 (41.0%) were in family more 5 family size.

Table 2**:** Socio-demographic characteristics of children's aged 6-23 moths in Hargeisa city, Somaliland 2020

Variable n=422	**Category**	**Frequency**	**Percentage**
Sex (422)	boy	208	49.3
	girl	214	50.7
Age of children	6-10 months	183	43.4
	11-15 months	101	23.9
	16-20 months	87	20.6
	21-24 months	51	12.1
Age of mothers	15-19 years	114	27
	20-24 years	105	24.9
	25-30 years	138	32.7
	>= 31 years	65	15.4
Mothers current occupation	housewife	244	57.6
	Small business scale	48	11.4
	Private employee	84	20
	Civil servant	46	11
Mothers educational status	Have no formal education	156	37
	Primary level	86	20.3
	Secondary level	88	20.9
	University level	92	21.8
Family size	2-5	249	58.9
	>5	173	41.0

Figure 3 Magnitude of wasting by gender among children aged 6-23 months in Hargeisa city, December 2020

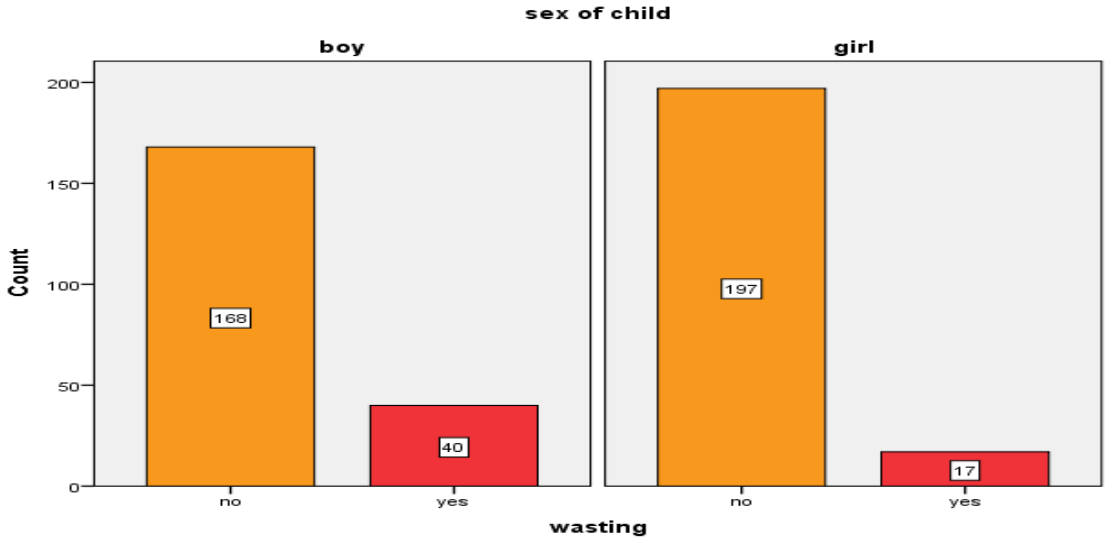
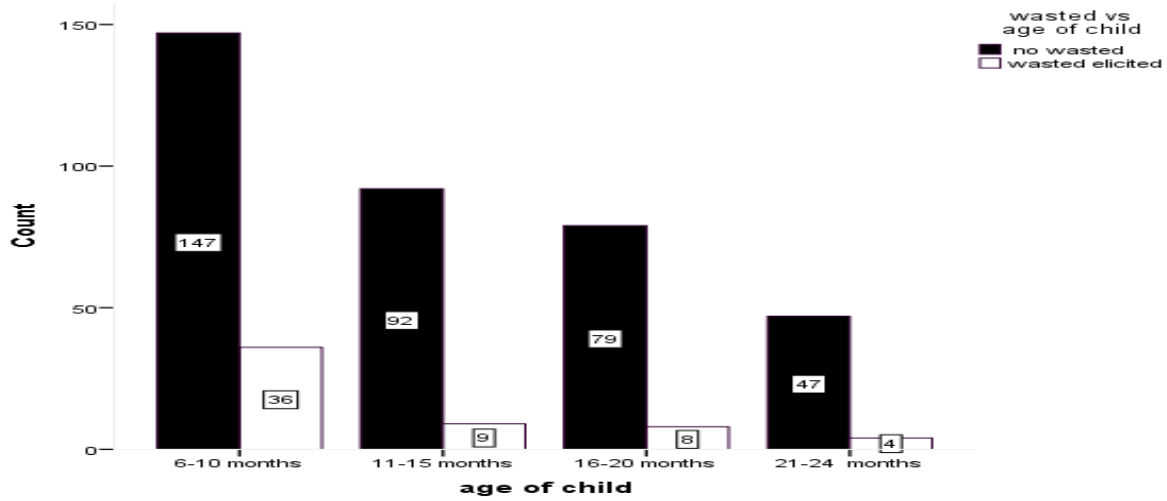


Figure 4 wasting magnitude in-terms of age among children aged 6-23 months in Hargeisa city, December 2020



4.2 Household Food Security

Regarding household food security, 15.2% of the households were food insecure while the remaining 84.8% of the households were food secured during study period

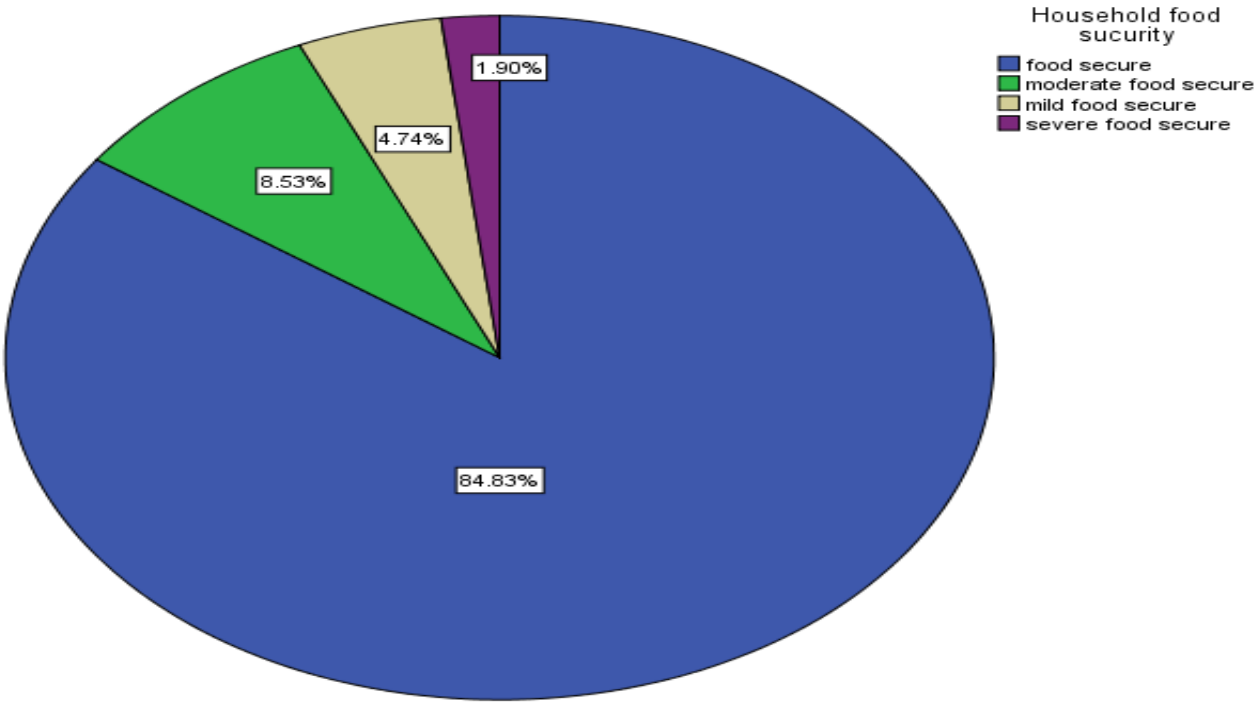


Figure 5 Household food security among children aged 6-23 months in Hargeisa city, Somaliland, December 2020

4.3 Infant and Young Child Feeding Practices

Majority, 312(73.9%) of children initiated breastfeeding early (within an hour) and 284(67.3%) are currently on breastfeeding. In addition, about 223 (50.2%) initiated timely complementary food at 6 months. Based on 24 hrs dietary recalls the proportion of children 6–23 months who meet the minimum dietary diversity (≥4 food groups) was 290 (68.7%) out of eight food group. Among the participant almost 393(93.1%) of them consumed cereals and tubers food group followed by consumption of oils and fats 387(91.7%).

Table 3 child dietary diversity of young children (6-23months) in Hargeisa, western of Somaliland 2020

Food type or group n=422	**Categories**	**Frequency**	**%**
Cereals and tubers	No	29	6.9
	Yes	393	93.1
Pulse and legumes	No	238	56.4
	Yes	184	43.6
Vegetables	No	134	31.8
	Yes	288	68.2
Fruits	No	292	69.9
	Yes	127	30.1
Meat,fish and egg	No	208	49.3
	Yes	214	50.7
Milk and milk product	No	157	37.2
	Yes	265	68.8
Sugar	No	57	13.5
	Yes	365	86.5
Oils and fats	No	35	8.3
	Yes	387	91.7
Dietary diversity score	inadequate DD	132	31.3
	Adequate DD	290	68.7

Health Care and Environmental health related Characteristics of Study Participants

Concerning toilet availability, 299(70.9%) of households included in this study have their own toilet. Protected well was the major source of drinking water among the majority of study subjects' households 307 (72.8%). 163 (38.6%), 117 (27.7%) of study children were suffered diarrhea in the past two weeks prior the study respectively.

4.4 Magnitude of wasting among the study participants

The total magnitude of wasting in this study was found to be 13.5% [95% CI (10% -19%)] moderate wasting accounted 34 (8.0 %) while severe wasting was 23 5.5 %.

4.5 Factors associated with wasting among children aged 6-23 months

4.5.1 Result of bi-variable logistic regression analysis

On Bivariate analysis being male, children aged 6-10 months, being from teenage mother, children from illiterate mothers, children from household with toilet facility, starting complementary at 6 months of age, being from household food secure, immunization status of child, dietary diversity score and having diarrhea and fever illness in the past two weeks prior to this study was associated with their wasting.

4.5.2 Result of multivariable logistic regression analysis

On multivariate logistic regression analysis being male, being from illiterate mother, latrine availability in the household, children from household food secure and having diarrhea illness in the past two weeks prior to this study were significantly associated with wasting. Wasting of children aged 6-23 months were significantly related to their gender. The risk of wasting was 2 times higher for boys [AOR=2.03, 95% CI :(1.03, 4.01)] than the girls.

Children who were born to mothers have no formal education were 3 times more likely [AOR= 3.25, 95% CI :(1.07, 8.01) to develop wasting than whose from mothers with university level of education. Children from a household with toilet facility had 59% lower odds of being wasted as compared to those from a household with no toilet facility [AOR= 0.41, 95% CI (0.18, 0.93).

Children who were living in a household with food secure status were 61% less likely [AOR=0.39, 95% CI :(0.16, 0.96)] to develop wasting compared to those who were living in a household with food insecure status. Moreover the risk of wasting was 2.8 times greater for children who had suffered from diarrhea illness within the last two weeks prior to study than those who were apparently health [AOR=2.8, 95% CI :(1.11, 7.16)].

Table 4 Factors associated with a wasting among children aged 6-23 months in Hargeisa city, Somaliland October 2020.

Independent variables n=422	wasting Yes	No	COR (95% CI)	AOR (95% CI)
Age of child				
6-10 months	36(19.7%)	147(80.3)	2.88 (0.97, 8.51) *	1.23(0.31, 4.82)
11-15 months	9(8.9%)	92(91%)	1.15 (0.34, 3.93)	0.76(0.8, 3.29)
16-20 months	8(9.1%)	79(90%)	1.19(0.34, 4.17)	0.82(0.20, 0.33)
21-24 months	4(7.8%)	47(92.1%)	1	1
Sex of child				
Male	40(19.2%)	168(80.8%)	2.76 (1.51, 5.05)*	**2.03 (1.03, 4.01)****
Female	17(7.9%)	197(92.1%)	1	1
Maternal education level				
Illiterate	37(23.7%)	119(76.3%)	4.05(1.73, 9.49*	**3.25 (1.07, 8.01)****
Primary level	9(10.5%)	77(89.5%)	1.08(0.36, 3.21)	0.83(0.23, 3.02)
Secondary level	4(4.5%)	84(95.5.3%)	0.57(0.16, 2.05)	0.63(0.17, 2.35)
University level	7(7.6%)	85(92.4%)	1	1
Maternal age				
15-19 years	20(17.5%)	94(82.5%)	2.10 (0.79, 5.51)*	1.02(0.68, 6.08)
20-24	14(13.3%)	91(86.7%)	1.15 (0.55, 4.16)	0.88(0.28, 2.79)
25-30	17(12.3%)	121(87.7%)	1.13 (0.52, 3.69)	0.59(0.17, 2.03)
>=31	6(9.2%)	59(90.8%)	1	1
Fever during past two weeks				
Yes	23(19.6%)	94(80.4%)	1.95(1.10, 3.48)*	0.77(0.33, 1.81)
No	34(11.1%)	271(88.9%)	1	1
Toilet availability				
Available	28(9.4%)	271(90.6%)	0.33(0.19, 0.59)*	**0.41(0.18, 0.93)****
Unavailable	29(23.6%)	94(76.4%)	1	1
Age starting CF				
Before six months	34(20.2%)	134(79.8%)	1	1
At six months	19(8.5%)	204(91.6%)	0.37(0.20, 0.67)*	0.72(0.35, 4.45)
After six months	4(12.9%)	27(87.1%)	0.58(0.19, 1.78)	0.90(0.23, 3.65)
Dietary diversity				
Inadequate DD	23(17.4%)	109(82.6%)	1.59(0.89, 2.82)*	0.87(0.21, 3.18)
Adequate DD	34(11.7%)	256(88.3%)	1	1
Child up to date on the immunization				
Yes	26 (10.7%)	217(89.3%)	0.57(0.33, 1.00)*	0.74(0.65, 4.14)
No	31 (17.3%)	148 (82.7%)	1	1
Household food security				
Food secure	38(10.6%)	320(89.4%)	0.28(0.15, 0.53)*	**0.39(0.16, 0.96)****
Food insecure	19(29.7%)	45(70.3%)	1 1	
Diarrhea during the past 2 weeks				
Yes	37(22.7%)	126(77.3%)	3.5(1.96, 6.30)*	**2.8(1.11, 7.16)****
No	20(7.7%)	239(92.3%)	1	1

*=p-value< 0.25 **=p-value <0.05 CI:=Confidence interval AOR= adjusted odds ratio

5. DISCUSSION

The magnitude of wasting in this study was found to be 13.5%, and moderate wasting accounted 34 (8.0 %) while severe wasting was 23 (5.5 %). Factors significantly responsible for occurrence of wasting among children aged 6-23 months in this study population were sex of children, educational level of mother, availability of toilet facility in household, household food security and diarrheal illness in the past 2 weeks.

The total magnitude of wasting in this study is higher compared to a similar study conducted in different parts of Asia particularly in Bhutan 9.3% (Aguayo V et al., 2016), in Pakistan 10.1%, (Khan S et al., 2019), Indonesia 10.1% (Meiandayati R et al., 2018)), and Also a study carried out in north-west Uganda 6.7% (Legason I and Dricile1 R, 2018). This significant difference may be due to difference in socio-economic and geographical feature among the countries. The total magnitude of wasting in this study is with in line with to similar study conducted in Mali (13.9%) (Sobgui C et al., 2018), and In Bule Hora district, South Ethiopia 13.4% o (Asfaw M et al., 2015).

This 13.5% wasting magnitude among young children found relatively lower than institutional studies done in Sri Lanka (17.1%) (Ubeysekara N et al., 2015), and in Nigeria 19% (Chizoba O et al., 2014). Studies in Ethiopia especially in Dabat district northwest Ethiopia 17.0% (Derso T et al., 2017), in Kemba Woreda (21%), and in Afar region (19.5%). This significance difference may be due to geographical distinguishing feature and different population rate among study area and those countries.

The findings of study showed that the magnitude of wasting was found higher 2 times in boys compared to girls. The magnitude was consistent with similar studies done in India, Maldives, Nepal and Pakistan (Harding K et al., 2018). A study conducted in Sri Lanka (Ubeysekara N et al., 2015). Many studies documented that the magnitude of wasting is systematically higher among boys than girls; this is now also seen to hold at global level. However, this relationship deserves further study. (Raj A et al., 2014)

The study reveals that children mother educational level was have significant role for the development of wasting. Children from illiterate mothers who have no formal education were 3.25 times more likely wasting compared to those from mothers who had university level of

education. This finding is similar with study done in Pakistan that indicates children whose mothers had no education were more likely to be wasted (Khan S et al., 2019). A study conducted in Cambodia Mother's education and children's nutritional status showed that maternal education level were significantly determine a child's nutritional status, children born to educated women suffers less from undernutrition (Miller J and Rodgers Y, 2009). Also this is in agreement with study conducted in in Gondar city, Ethiopia that showed the children of uneducated mothers were more likely to be wasted (Gelu A et al., 2018). This may be due to that improved maternal literacy skills give them better knowledge on better child feeding practices and gives them the opportunity for different media exposure and a better understanding of child illness and seeking for earlier treatment

The magnitude of wasting was lower among children in the household with toilet facility; availability of toilet is protective for wasting by 59% compared to children in household with no latrine facility. This finding is consistent with study conducted in in Ethiopia that indicates having a toilet facility at home were associated with a 37% reduction of the magnitude of child wasting (Cooten M et al., 2018). This may be due to fact that lack of a latrine facility in house increase risk of helminthic infection, diarrheal disease which in turn can have negatively impact on child nutritional status.

Household food security was significantly associated with wasting in this study. As per result children who found in a household with food secure status were 61% less likely to develop wasting than those from household with insecurity status, this study findings is consistent with a study done in Bangladesh that showed household food insecurity was significantly associated with child undernutrition, (Hasan M et al., 2013). Also study in Nigeria shows that household food insecurity was significantly associated with child wasting (Ajao K et al., 2010). This is may be due to that household food insecurity status negatively influences children nutritional status by limiting the quality and quantity of dietary intake.

This study revealed that the risk of wasting was 2.8 times greater for children who had suffered from diarrhea illness within the last 2 weeks than children who were apparently healthy. This is in agreement with study from the EDHS of 2011 indicates that children who had diarrhea in the past two weeks were 2 times more likely to have wasting (Cooten M et al., 2018). Study conducted in Dabat site Ethiopia which shows that diarrheal morbidity in the past 2 weeks was

significantly associated with wasting (Derso T et al., 2017). This is also consistent with study in Somalia reveals that children, who suffered from diarrhea in the two weeks before the study, were more at risk of being wasted (Kinyoki D et al., 2015).. This may be due when there is infection, especially recurrent one the dietary intake, catabolism and nutrient sequestration decreased, malabsorption of nutrient occurs, which directly leads to wasting, this is also due to weakness of infection prevention strategies of study area like WASH.

Limitation and strength: A major strength of this study is that it provides empirical analysis of the magnitude of wasting and its associated factors among infants and children aged 6 to 23 months in Hargeisa city, for which nutrition and health care professionals and decision-makers could use to inform programmatic and operational decision-making. Also, non-governmental organizations could use this information as a baseline data to implement programming to address wasting in the study area, standardization of anthropometric measures and calibration of instruments were done to minimize the systematic error. Nevertheless, Being an institutional based study would limit the generalizations of the research findings, Recall bias is one of the limitations of the study since some of the questions were asking for event that occurs 24 hours and 4 weeks back, an attempt was made to minimize this problem by probing the respondents about the event., anthropometric measurement error is also another limitation, intensive training was given for data collectors, standardization of anthropometric measures and calibration of instruments were done to minimize the error.

6. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The period of 6 to 23 months of age is a critical period for child growth, the findings of study shows that the total magnitude of wasting among young children (6-23 months) in Hargeisa city is found to be serious public health problem, which requires monitoring. In this study sex of child, being from illiterate mother, availability of toilet facility in household, household food security and having diarrhea illness in the past two weeks increases risk of having wasting in young children (6-23 months).

6.2 Recommendations

Hargeisa city health extension office:

- The health office should work hard to increase the awareness on infant and young child feeding and strengthen the existing integrated management of neonatal and childhood illness (IMNCI) to reduce the young children wasting which is short-term effect of early child feeding.
- Integrate nutrition assessment and counseling in to mothers of young children

Hargeisa city health extension workers:

- They should give health education for mothers on optimal infant feeding practices, giving special attention to poorer households and mothers with lower educational level to improve complementary feeding practices of mothers/ givers..
- They should educate mothers/care givers on the maintenance of hygienic conditions of home and during feeding of the child to prevent diarrhea and illness and on home management of diarrhea.
- They should give support for mothers to commit to continued and adequate care to older children to protect from deteriorating nutritional status as they grow.

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7. APPENDICES

Annex I: Information Sheet and Informed Voluntary Consent Form for Heads of Institutions (selected health facilities)

Good morning/ good afternoon/ good evening

My name is …….. I am working as a data collector for the study being conducted in this health facility by Mr. Abdirahman Hussein who is studying for his master's degree in public health nutrition at Haramaya University, college of health and medical sciences. I kindly request you to lend me your attention to explain you about the study and your institution being selected as the study setting.

1. The study/project title

Magnitude and factors associated with among children aged 6-24 months at Hargeisa, western Somaliland

2. Purpose/aim of the study

The finding of this study can be of a paramount importance for the Hargeisa administrative health office to plan appropriate intervention programs to prevent and reduce wasting among children aged 6-24 months, thereby improving child health and survival in general. Moreover, the aim of this study is to write a thesis as a partial requirement for fulfillment of a master's program in public health nutrition for the principal investigator.

3. Procedure and duration

I were interviewed mothers of children aged 6-24 months using face-to-face interview questionnaire and taking anthropometric measurement of children, to provide me pertinent data that is helpful for the study. There are 42 questions to answer where i will fill the questionnaire by interviewing the mothers of randomly selected children. The interview will take 30 minutes so i kindly request you to spare me this time for interview.

4. Risks and benefits

The risk of participating in this study is very minimal, but only taking a few minutes from respondent's time. There would not be any direct payment for participating in this study. But the findings from this research may reveal important information for local health planners.

5. Confidentiality

The information that were provided were kept confidential. There were no information that will identify the participants in particular. The finding of the study were general for the study community and will not reflect anything particular of individual child. The questionnaire were coded to exclude showing names. No reference will be made in oral or written reports that could link participants to the research.

6. Rights

Participation for this study is fully voluntary. The participants have the right to declare to participate or not in this study. If they decide to participate, they have the right to withdraw from the study at any time and this will not be cause them for any loss of benefits which they otherwise are entitled. They do not have to answer any question that they do not want to answer.

7. Contact address

If there are any questions or enquires any time about the study or the procedures, please contact:

Principal investigator: mobile phone +252634258155 Email Shuuriye8155 @gmail.com.

Institutional health research Ethics Review committee (IHRERC): office phone 0254662001 or P.O.Box 235, Harar-Ethiopia

8. Declaration of informed voluntary consent

I have read the participant information sheet. I have clearly understood the purpose of the research, the procedures, the risks and benefits, issues of confidentiality, the rights of participating and the contact address for any queries. I have been given the opportunity to ask questions for things that may have been unclear. I was informed that participants have the right to withdraw from the study at any time or not to answer any question that they do not want. I am also informed that the health facility has the right to stop this study from being conducted if any misdeeds and unethical procedures are observed during the data collection process in the health facility's premises. Therefore, I declare my voluntary consent on behalf of …….. Health facility management allows this study to be conducted in the health facility with my initials (signature).

Name of head of the health facility …….. Signature of head of the health facility ……

Name of data collector…… Signature of data collector……

Annex I1: Information Sheet and Informed Voluntary Consent Form for respondents (Mothers of selected children)

Good morning/ good afternoon/ good evening

My name is …….. I am working as a data collector for the study being conducted in this MCH by Mr. Abdirahman Hussein who is studying for his master's degree in public health nutrition at Haramaya University, college of health and medical sciences. I kindly request you to lend me your attention to explain you about the study and your child being selected as the study participant.

1. The study/project title

Magnitude and factors associated with wasting among children aged 6-24 months in Hargeisa, western Somaliland

2. Purpose/aim of the study

The finding of this study from your child can be of a paramount importance for the Hargeisa administrative health office to plan appropriate intervention programs to prevent and reduce wasting among children aged 6-24 months, thereby improving child health and survival in general. Moreover, the aim of this study is to write a thesis as a partial requirement for fulfillment of a master's program in public health nutrition for the principal investigator.

3. Procedure and duration

I were interviewing you using questionnaire, and taking anthropometric measurement of your child, to provide me pertinent data that is helpful for the study. There are 42 questions to answer where I will fill the questionnaire by interviewing. The interview will take 30 minutes so i kindly request you to spare me this time for interview.

4. Risks and benefits

The risk of participating in this study is very minimal, but only taking a few minutes from your time. There would not be any direct payment for participating in this study. But the findings from this research may reveal important information for local health planners.

5. Confidentiality

The information that you were provide us were kept confidential. There were no information that will identify the participants in particular. The finding of the study were general for the study community and will not reflect anything particular of individual child. The questionnaire were coded to exclude showing names. No reference will be made in oral or written reports that could link participants to the research.

6. Rights

Participation for this study is fully voluntary. You have the right to declare to participate or not in this study. If you decide to participate, you have the right to withdraw from the study at any time and this will not label you for any loss of benefits which they otherwise are entitled. You do not have to answer any question that they do not want to answer.

7. Contact address

If there are any questions or enquires any time about the study or the procedures, please contact:

Principal investigator: mobile phone +252634258155 Email Shuuriye8155 @gmail.com.

Institutional health research Ethics Review committee (IHRERC): office phone 0254662011 or P.O.Box 235, Harar-Ethiopia

8. Declaration of informed voluntary consent

I have read/ was read to me the participant information sheet. I have clearly understood the purpose of the research, the procedures, the risks and benefits, issues of confidentiality, the rights of participating and the contact address for any queries. I have been given the opportunity to ask questions for things that may have been unclear. I was informed that participants have the right to withdraw from the study at any time or not to answer any question that they do not want. I am also informed that I have to withdraw from the study at any time or not answer any question that I do not want. Therefore, I declare my voluntary consent on behalf of my child in this study with my initials (signature).

Name of mother …….. Signature of mothers …….

Name of data collector…… signature of data collector……

Annex III: DATA COLLECTION INSTRUMENT

Questionnaire (English Version)

A questionnaire was used to gather data on social demographic, child care and feeding practices, health and household related factors that impacted on children's nutritional status. The interview was conducted by the research team who were responsible for administering the questionnaire and entering all the data. The Data collectors read out the question to the participants and then documented the answer by either ticking, or writing the answer given by the participant on the space provided

*please read the questionnaire carefully.

Section A: CHARACTERISTICS OF RESPONDENTS

	Question	Corresponding response	Skip	Respond
101	Sex of child?	1. Boy 2. Girl		
102	Please How old is the child	Actual age in months: ……		
103	Please how old are you (mother) 'age in years"	Actual age in years: ……..		
104	What Is Your Marital Status	1. Married (living together) 2. Separated 3. Divorced		
105	Please What Is Your Occupation?	1. Housewife 2. small scale business 3. civil servant 4. Private employee		

106	Please, what is your highest Educational Level?	1. Have no formal education 2. completed Primary Level 3. completed Secondary Level 4. University Level		
107	Family size (people who usually eat from the same pot)?	In number ……		
Section B **SANITATION AND HOUSEHOLD HYGIENE**				
201	What is your main source of drinking water?	1. in house water tap 2. public water tap 3. purchase from Tankers 4. Others (specify) …….		
202	How do you make drinking water safe for children?	1. Boiling 2. Filters/Sieves 3. zinc table 4. Use traditional herbs 5. Others (specify)		
203	How do you store drinking water	1. clean open container 2. clean close container 3. Others (specify)		
204	Availability of a latrine facility in household?	1. Available 2. No available 3.		
205	What usually happens with your young child's stools?	1. Throw in the latrine 2. Throw in the open field 3. Throw behind the hause 4. Not disposed of		

206	Do you wash your hands and child's hands before meals?	1. Always 2. sometimes 3. never		
Section C **<u>Breastfeeding, and complementary feeding</u>**				
301	Did you ever breastfeed this child?	1. Yes 2. No		
302	At what time after birth did you first put the child to breast?	1. Immediately 2. Within hour 3. Within days		
303	Are you currently breastfeeding?	1. Yes 2. No		
304	At what age was the child given food/drink other than breast milk?	(Actual age in months) ….		
305	How many times do you feed the child in a day other than breast milk?	1. Once 2. two times 3. three times 4. More		
306	What type of foods was the child introduced to (Tick all that are relevant)	1. Water 2. infant formula 3. Animal milk 4. Cooked rice 5. Mashed potatoes 6. Any others (specify)		
307	Has the child received iron supplementation after 6 months	1. Yes 2. No		

Section D. Households food security and food consumption

	Questions	Response	Skip
Remembering your experience of last 30 days/four weeks answer the following (Fill the box based on the given alternatives)		1=Never in last 30 days (NO) 2=Rarely (1-2 times in 30 days), 3= Sometimes (3-10 times 4= Often(more than 10 times)	
401	Did you worry that your household would not have enough food?	……	
402	Were you or any household member were not able to eat the kinds of foods you would have preferred to eat because of lack of resources?	……	
403	Did you or any household member had to eat a limited variety of foods because of lack of resources?	……	
404	Did you or any household member had to eat some foods that you really did not want to eat because of lack of resources?	……	
405	Did you or any household member had to eat a smaller meal than you felt you needed because there was not enough food?	……	
406	Did you or any household member had to eat fewer meals in a day because there was not enough food?	……	
407	Was there ever no food to eat of any kind in your house, because of lack of resources to get food?	……	
408	Did you or any household member went to sleep at night hungry because there was not enough food?	……	
409	Did you or any household member went a whole day and night without eating anything at all because there was not enough food?"		

	What type of food group? in the past 24 hrs did you consume the following foods *(0=if not consumed and if 1=yes if consumed)*		***Respond***
501		1. Cereal & Tuber……...1.Yes ….. 0. No	
502		2. Pulse……..1.Yes ….. 0. No	
503		3. Vegetable……. …..1.Yes … 0. No	
504		4. Fruit……1.Yes ….. 0. No	
505		5. Meat & Fish and egg……1.Yes 0. No	
506		6. Milk……1.Yes …. .0. No	
507		7. Sugar……1.Yes …. .0. No	
508		8. Oil……1.Yes ….. 0. No	

	Section E **HEALTH CHARACTERISTICS**			
601	Has the child suffers from diarrhea in the last two weeks?	1. Yes 2. No		
602	Has the child suffers from fever in the last two weeks?	1. Yes 2. No		
603	What else illness has the child suffered from in the past Two weeks?	1. Vomating 2. Cough 3. Others (specify)		
604	Is the child up to date on the immunization?	1. Yes 2. No		

Thank you Very Much

Name of data collector …….. Signature …… Date …….

Name of Supervisor ……. Signature ……. Date ……

ANTHROPOMETRRIC MEASUREMENTS

Measurements	1st	2nd
Weight (Kilograms)		
length(cm)		

Annex IV: Somali version of the Participant Information Sheet and Voluntary Consent Form

Subax wanaagsan/ galab wanaagsan/ fiid wanaagsan

Magacaygu waa …….. waxaan ka u shaqaynayaa ka xog uruuriye ahaan cilmi baadis laga samaysn doono xanaanadan oo u samaynayo Mudane Abdirahman Hussein kaas oo dhiganaya heerka labaad e jaamcada oo u ka dhigto jaamacada haramaya, koolajkeda caafimadka iyo sayniska, waxaan si naxariisle kaga codsanyaa in aad I siiso dareenkaga si aan kugu sharxo cilmi baadistu waxay ku saabsan tahay taas oo ilmahaga loo doortay in uu ka qaybqate ka noqdo.

1. **Cilmi baadhista/ ciwaanka borojaga**

Nafaqo daradada iyo waxyaabaha saameeya amaba xidhiidhka la le marka loo eego caruurta da'doodu u dhaxayso 6-24 bilood, ee jooga xarumuha daryeerla hooyada iyo dhalaanka e ku yaala hargeisa, Somaliland

2. **Ujeedada/ danta cilmi baadhista**

Natiijada ka so baxda cilmi baadhistan e ka imanaysa xogta laga qaadayo ilmahaaga waxa macquul ah in ay muhiim u noqoto laamaha dawlada e ay khusayso arintani, si ay qorshe cad uga yeeshan sidi ay u yarayn lahaayen nafaqo darrada ku dhacda caruurta da'doodu u dhaxayso 6-24 bilood, si loo horumariyo caafimadka ilmaha si guud, si kastaba ha aahata danta laga leeyahay cilmi baadhistan waa in la qoro buuga heerka labaad e jaamacada lagaga qalin jabiyo,

3. **Nidaamka iyo waqtiga**

Waxaan ku waydiin doona su'alo waji ka waji ah, ilmaha yarna waxaan cabiri doona dhererkiisa, iyo culayskisa, si aan u helo xog fiican oo caawisa cilmi baadhistan, waxa jira doona 42 su'aalod oo an ku waydiin doono, su'alo waxa laga yaaba in ay qaatan 30 daqiiiqo, sidaa darted waxaan ka codsanayaa in aad I isiiso dareenkaga, inta aan su'aalaha ku waydiinayo amaba aan ilmahaaga cabirayo.

4. **Khattaraha iyo faaidooyinka**

Khatarta ka iman karta in aad qayb ka noqoto cilmi baadhistan waa ay kooban tahay, lakiin waxa ay kaa qaadan doonta woxogaa ka mida waqtigaaga. Ma jiro doono wax dhaqaale ah oo

la siinayo ka qayb qaataha. Lakiin waxa laga yaaba natiijada ka soo baxda cilimi baadhistan in ay fariin iyo wacyi galin muhiima u noqoto laamaha dawlda ee ay khusayso.

5. **Qarsoonida xogta**.

Xogta aad na siiso waa la xafidi doona, ma jiri doonaan wax xog ah u si cad u qeexaysa ka qayb qaataha xogtiisa, natiijada cilmi baadhista si guud un ba loo bandhi dhigi doona, cid si gooniya xogteeda loo sheegi doona ma jiri doonto, su'aalaha lagu waydiin doono magacaa lagu qori maayo, wax tixraaca laga qaadi maayo.

6. Xuquuqda aad leedahay

In aad ka qayb qaadato cilmi baadhistan waa ikhtiyaar, waxaad xaq u leedahay in aad ka qayb qaadato iyo in aad diidaba, haadad go'aansato in aad ka qayb qaadato waxaad xaqu u leedahay in aad iskaga bixi karto cilmi baadhista waqti walba oo aad doonto, waxaad xaq u leedahay in aanad ka jaawabin su'al kasta oo aad rabto.

7. **Meesha aad igala soo xidhiidhi karto**

Hadii ay jiraan wax su'aalo ah amaba iftiinmin kale oo ku saabsan cilmi baadhista fadlan waxaad igala soo xidhiidhi kartaa: moobilka nambarka: 252634258155 amaba iimaylka Shuuriye8155 @gmail.com, amaba xafiiska jaamcada Institutional health research Ethics Review committee (IHRERC): office phone 0254660708 or P.O.Box 235, Harar-Ethiopia.

8. Cadayn in lay ogaysiiyay in aan si mutadawacnimo u ogolaado

Waan akhriyay/ amaba waa la ii akhriyay macluumadki ku qorna warqada ogolaanshaha ka qayb qaataha. Si fiican baan u fahmay ujeedada cilmi baadista, nidaamka ay marayso, dhib iyo dheef waxay leedahay, arinta qarsanaanta xogta aan bixinayo, xuquuqda aan leeyahay iyo meelaha aan kala xidhiidhayo hadii aan u baahdo, waxa jaanis la ii siiyay in aan su'aalo waydiin karro hadii meel muqdi iga galo, waxan la i ogaysiiyay in aan xaq u leeyahay in aan iskaga bixi karo cilmi baadhista markaan doono, amaba aanan ka jaawabin su'aalaha aanan doonayn. Sidaa darted waan ku qancay in aan si mutadawacnio ah aan uga qayb qaadano aniga iyo ilamaha aan maasulka ka ahay iyadoo ku cad (saxuuxayga).

Magaca hooyada …….. saxeexa hooyada …….

Magaca xog uruuriyaha …… saxexa xog uruuriyaha ……

Annex V: Somali Version of the Questionnaire

Su'alahan waxa loo isticmaalay si loo soo uririyo xog qaab nololeedka bulsheed , baxnaaninta carruurta iyo quudintooda, caafimaadka iyo xaalada guriga ee saamaynta ku leh ilmaha xaaladiisa nafaqo. Waraysigan waxa qaaday koox cilmi baadhayaal kuwaas oo masuul ka ah maamulka su'aalaha iyo galinta xogt-ururinta ,una akhriyay ka qaybqaatayaasha kadibna kaydiyay jaawabahooda mid ahaanba inay caalamadiyaan ama qoraan jawaabta uu bixiyay ka qaybqaatuhu kuna qoreen meelaha u banana arinkaas.

*fadlan aqri su'aalaha si taxadar ku jirto:-

<u>Qaybta koobad A</u>: Astaamaha xog laga qaadaha

	Question	Corresponding response	Ka bood	Jawaab calin
101	Jinsiga ilmaha yar ?	1. Wiil 2. Gabadh		
102	Ilamahu waa imisa jir ?	Da'doo bil ah …….		
103	Fadlan, imisa jir baa tahay hooy? (da'doo sanado ah)	Da'doo sanad ah ……		
104	Wa side xaladaada laamane?	1. La guursaday oo wada jooga 2. Kala maqan ama kala tagay		
105	Fadlan waa maxay shaqadaadu ?	1. Guri jog 2. Ganacsi yar haysata 3. Shaaqale dawladeed 4. Shaqaale madax banaan		
106	Heerka waxbarasho u saraysa halkeed ka gaadhay ?	1. Waxbarasho toos ah galin 2. dugsi hoose 3. dugsi sare 4. heera jamacadeed		
107	Waa imisa qof qoysku?	……		
Qaybta B				

Fayadhawrka iyo nadaafada xaafada				
201	Halkee ka heshaan biyaha aad cabtaan?	5. Qasabada guriga 6. Qasabad dad wayne 7. Booyaha biyaha 8. Meel kale(cadee)		
202	Biyaha sideed caruurta ugu nadiifisan?	6. Karkarin 7. kala shaandhayn 8. biyo sifeeye 9. dhir baan isticmaalna 10. wax kale		
203	Biyaha cabitaanka seed u kaydisaan	4. foosto nadiifa oo furan 5. foosto nadiifa oo daboolan 6. wax kale cadee		
204	Suuli ma leedihiin	1. waanu leenahay 2. may ma lihin		
205	Seed u nadiifisaan ilmaha saxaradisa?	5. Banaankan ku tuurna 6. Aqalka dabadiisa ku tuurna 7. Ma fogayno 8. Wax kale (cadee)		
206	Gacmahaaga iyo ilmaha gacmihiisa ma maydha cunt aka hor?	4. Had iyo jeer 5. Mar mar 6. Ma maydho		
Qaybta C **Naasnuujinta iyo ku quudinta cunto kaabis ah**				
301	Ilmahaaga ma naas nuujisay?	3. Haa 4. Maya		
301	Xilimad ilamaha yar siisay naaska marku dhashay ka dib?	4. Markiiba wan siiyay 5. Saacad ka dib 6. Maalmo gudahood		
303	Hada naaska ma siisa ilmaha yar?	3. Haa 4. Maya		
304	Imisa jir baad ilmaha cuntada ugu bilaawday ?	Da'doo bil ah ….		
305	Marka naaska laga reebo, imisa jeer bad ilmaha cunto siisa?	5. Hal mar 6. Labba mar 7. Sadex mar 8. Ka badan		
306	Cunto nooceya ayaad ilmaha siisay markii u horeysay	7. Biyo 8. caano boodhe 9. caano xoolad 10. bariis karsan 11. baradho la kariyay		

		12. wax kale (cadee)		
307	Ilmuhu ma qaatay caawiye iron lix bilood ka dib.	3. Haa 4. Maya		

Qaybta 4aad

Intii aad ka xasuusato 30 ki cishee u dabeeyay ka jawaab su'alahan (Meesha banana ku qor jawaab)		1=May dhicin 30ki cishee u danbeeyay (maya) 2= mar mar iyo dhif (1-2 jeer 30 cishee u danbeeyay) 3= waqtiyda qaar (3-10 jeer) 4= badanaa (in ka badan 10 cisho)	
401	Ma ka warwartay in ayna qoyska haysan cunto ku filan?	……	
402	Miyuu adiga amaba qof qoyska ka mid ahi awoodi waayay in uu cuno, cunto uu jeclaa, sabaabto ah ma jirin dhaaqale ku filan**?**	……	
403	Miyuu adiga amaba qof qoyska ka mid ahi cunay cuno kooban sabaabto ah cuntadu uu haysaty oo yarayd awgeed?	……	
404	Miyuu adiga amaba qof qoyska ka mid ahi cunay cunto aanu rabin, sababto ah dhaaqale ku filan muu haysan oo u ku iibsan lahaa cuntooyin kale?	……	
405	Miyuu adiga amaba qof qoyska ka mid ahi cunay cunto kooban oo ka yar intii u baahna sabaabto ah cunto ku filan muu haysan?	……	
406	miyuu adiga amaba qof qoyska ka mid ahi cunay sadexda waqti maalintii wax ka yar sabaabto ah cunto ku filan may jirin?	……	
407	ma jirtay cunto laaa'ani noocay doonto ha aahaate, sabaabto ah dhaqaale cunto lagu soo iiibsado o an jirin?	……	
408	adiga amaba qof qoyska ka mid ahi miyuu ku seexday gaajo sabaabto ah cunto idinku filan oo aan jirin?	……	
409	miyuu adiga amaba qof ka mida qoyska ku joogay cunto la'aan maalinkii oo dhan sabaabto cunto ku filan oo uu cuno ma uu haysan?		

	Cuntooyinkan hoos ku xusan intaa 24 sacadood e la soo dhaafay (0: hadii aanay cunin, 1: haa waan cunay "tirada inta jeer ay cuneene qor?		Jawaab celin
501		1. galay,garaw,daqiiq,boorassh 1.haa …..0. maya	
502		2. bariis iyo baasto ……..1.haa …..0. maya	
503		3. Khudaar ……. ….. 1.haa ….. 0. maya	
504		4. Midho …… ……. 1.haa …..0. maya	
505		5. Hilib, kaluun iyo beed 1.haa 0.maya	
506		6. Caano 1. haa 0. Maya	
507		7. Sonkor 1. haa 0.maya	
508		8. Saliid 1. haa 0.maya	

Qaybta E **Xaalada caafimaad**			**Ka bood**	**Jawaab celinta**
601	ilmuhu ma ka cawday shuban labadii todobaad e u danbeeyay?	1. Haa 2. Maya		
602	Ilmuhu ma ka cawday xumad ladii todobaad e u danbeeyay	1. Haa 2. Maya		
603	Xanuun kale muxuu ka cawday ilmuhu?	1. Hunqaaco 2. Qufac 3. . wax kale		
604	Ilmuhu talaalka si joogta ah ma u qaata	1. ka yar intii horre 2. in isku mid ah 3. ka badan		

Mahadsanid in Badan !!!!!!!!!!!!!!!

Magaca xog qaadaha …….. Saxeexa …… waqtiga …….

Magaca kormeerka ……. Saxeexa ……. Waqtiag ……

qiyaasaha cabiraada jidhka

Cabir	Kowad	Labaad
Culays (Kiloo)		
dherar (santimeter)		

8. CURRICULUM VITAE (CV) OF PRINCIPAL INVESTIGATOR

1. Personal Information

Full Name: Abdirahman Hussein Mohamoud

Sex: Male

Place of birth: Allay Baday , Western Zone, Somaliland

Date of birth: March 29/1994

Marital status: Single

Nationality: Somalilander

Address: Call phone; +252634258155, E-mail: Shuuriye8155@gmail.com

1. Educational Background

1. Primary school(1-6)	Al-furqan schools
2. Intermediate (grade 7 to grade 8)	Al-furqan schools
3. Secondary School (form 1 form 4)	Al-furqan schools
4. Higher Education(BSC) degree	University Of Hargeisa
5. Higher Education(MSC)	Haramaya University

Languages proficiency

- Fluent in English, Arabic, Somali –Listening, speaking, reading and writing

2. Qualification

- BSC Degree in nutrition from University of Hargeisa with CGPA of 3.92
- Higher Diploma of medical laboratory from Al-kayzar college
- MSC Degree candidate in Haramaya University

3. **Training On**
    - Effective teaching skill
    - Refresher training on expanded program of immunization EPI, June 18-22 2015
4. **Work Experience**
    - ✓ 3 months experience in medical laboratory
    - ✓ 5 months in pharmacy
    - ✓ three year of teacher in iftin primary and intermediate school
5. **Hobbies**
    - ✓ Reading the holy Qur'an
    - ✓ Reading academic books and Fictions specially psychological books
    - ✓ Playing and watching football
6. **Reference**

- Mr Abdifatah mohamound dean of applied and natural science department in university of hargiesa

  Address: mobile number +252634423689
- Mr Hamze Adan lecturer in University of Hargeisa .

  Address: mobile number +252634429178,.