

**NUTRITIONAL STATUS OF CHILDREN UNDER FIVE YEARS AND ASSOCIATED RISK
FACTORS IN BANADIR HOSPITAL MOGADISHU, SOMALIA**

**By
SAID AHMED WABERI**

BSc. Public Health

**A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR
THE AWARD OF MASTER OF SCIENCE DEGREE IN APPLIED HUMAN NUTRITION**

**DEPARTMENT OF FOOD SCIENCE, NUTRITION AND
TECHNOLOGY FACULTY OF AGRICULTURE**

UNIVERSITY OF NAIROBI

2021

DECLARATION

This dissertation is my original work and has not been submitted for award of degree in any other university.

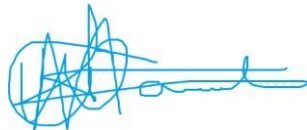


Signature: Date09/12/2021.....

NAME: SAID AHMED WABERI

Registration Number: A56/33319/2019

This dissertation has been submitted with our approval as university supervisors

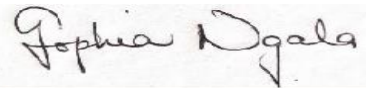


Signature

Date.....13/12/2021.....

Dr. Dasel Wambua Mulwa Kaindi

Department of Food Science, Nutrition and
Technology University of Nairobi



Signature: Date:10/12/2021.....

Dr. Sophia Ngala

Department of Food Science, Nutrition and
Technology University of Nairobi



UNIVERSITY OF NAIROBI
DECLARATION OF ORIGINALITY FORM

Name of Student: **Said Ahmed Waberi**
Registration Number: **A56/33319/2019**
College: **College of Agriculture and Veterinary Sciences**
Faculty/School/Institute: **Agriculture**
Department: **Food Science, Nutrition and Technology**
Course Name: **Masters of Science in Applied Human Nutrition**
Title of the work: **Nutritional status of children under five years and associated factors**
At Banadir Hospital, Mogadishu-Somalia

DECLARATION

1. I understand what Plagiarism is and I am aware of the University's policy in this regard.
2. I declare that this is my original dissertation proposal and has not been submitted elsewhere for examination, award of a degree or publication. Where other people's work or my own work has been used, this has properly been acknowledged and referenced in accordance with the University of Nairobi's requirements.
3. I have not sought or used the services of any professional agencies to produce this work.
4. I have not allowed and shall not allow anyone to copy my work with the intention of passing it off as his/her own work.
5. I understand that any false claim in respect of this work shall result in disciplinary action. In accordance with University of Nairobi Plagiarism Policy

A handwritten signature in black ink, appearing to read 'Said Ahmed Waberi'.

Signature _____ Date 2/11/2021 _____

OPERATIONAL DEFINITIONS

Nutrition:	Is the intake of food, considered in relation to the body's dietary need. Good nutrition – an adequate, well-balanced diet combined with regular physical activity – is a cornerstone of good health. Poor nutrition can lead to reduced immunity, increased susceptibility to disease, impaired physical and mental development, and reduced productivity.
Malnutrition	It refers to over or undernutrition, nutrient imbalances or deficiencies. This study will focus on under nutrition.
Nutrition Status	This is the body's status of nutrition that is expressed according to certain scientifically tested parameters including weight, height, age or a combination of them. This study will involve Anthropometry to measure the nutrition status.
Anthropometrics:	Anthropometry is widely used as a tool to estimate the nutritional status of populations and to monitor the growth and health of individuals. The three most frequently used anthropometric indices are weight-for-height, height-for-age, and weight-for-age
Chronic malnutrition	Also referred to as stunting, is form of growth failure, it is the relationship between observed height to the expected height for the specific age and sex of the child (H/A).
Slum	, According to the United Nations agency UN-HABITAT (2005), is a run-down area of a city characterized by substandard housing and squalor and lacking in tenure security.
Acute Malnutrition	(Wasting) is inadequate nutrition over a long period of time leading to failure of linear growth. This phrase refers to the relationship between body mass and body stature of the child (W/H).
Stunting	Height –for- age below -2 Z-score or below 80% of the median height for age for reference population (WHO, 2006)
Wasting	Weight-for-height below -2 Z- score or below 80% of median weight for height for reference population (WHO, 2006)

ACRONYMS AND ABBREVIATIONS

AE	Adult Equivalent
AIDS	Acquired Immune Deficiency Syndrome
ASAL	Arid and Semi-Arid Lands
BCG	Bacillus Calmette-Guerin
BMI	Body mass index
CI	Confidence Interval
DPT	Diphtheria, Pertussis, Tetanus
FSAU	Food Security Analysis Unit for Somalia
IDD	Iodine Deficiency Disease
MCH	Maternal Child Health
MUAC	Mid Upper Arm Circumference
PEM	Protein energy Malnutrition
UNICEF	United Nations Children's Fund
UNPD	United Nations Population Division
UNSD	United Nations 3 Statistics Division
WFP	World Food Program
WHO	World Health Organization
GAM	Global Acute Malnutrition
SAM	Severe Acute Malnutrition
KDHS	Kenya Demographic and Health Survey
SPSS	Statistical Packages for Social sciences
OPV	Oral Polio Vaccine

ACKNOWLEDGEMENTS

First and foremost, I am very grateful to God for his love and care that I can count on, all my life. I would also like to thank my parents, Ahmed Waberi and Aunt Ayanle Waberi, for providing me with the opportunity to engage in this project. Without their support I may not have found myself at University of Nairobi, nor had the courage to engage in this task and see it through. I would also like to sincerely thank all my siblings for their emotional support, intellectual stimulation and encouragement. So, thank you to dad and my siblings for being the most supportive family one could hope for.

I also extend my heartfelt gratitude to my supervisors, Dr. Dasel Mulwa Kaindi and Dr. Sophia Ngala. You were so wonderful to me. You made me believe that I had so much strength and courage to persevere even when I felt lost. You showed me light in a tunnel where everything was dark. You were very tolerant and determined even when things seemed tough for me. I aspire to emulate you. My deep appreciation goes to the Banadir Hospital in-charges and the staff for their cooperation and thanks also for allowing me to conduct my research in their Area. I am also deeply grateful to all women who participated in this study for their time and willingness.

Finally, I thank all those who assisted, encouraged and supported me during this research, be assured that the Allah will bless you all for the contributions you made.

ABSTRACT

Young children and newborns are especially more susceptible to malnutrition because of their high dietary demands for growth and development. Many child survival programs by the Somalia Government, bilateral agencies and non-governmental are working with communities to alleviate child malnutrition. However, the prevalence of child malnutrition continues to be high. This study was carried out to determine the nutritional status of children under the age of five years and associated risk factors at Banadir hospital, Mogadishu, Somalia.

The study was conducted at Banadir hospital which is located in Mogadishu, Somalia between January and February 2021. A cross sectional study design was utilized to assess the nutrition status of children under five years and its association with demographic and socio-economic characteristics, water availability, hygiene and sanitation. Caregivers who were present in the hospital provided answers to research interviewers on Open data kit (ODK). The targeted 236 respondents randomly sampled were recruited into the study. The respondents were mothers/caregivers of children between the age of 6-59 months. Anthropometry data from the survey was analyzed using Statistical Package for Social Sciences (SPSS) and Emergency Nutrition Assessment (ENA) software's. Analysis involved interpreting statistical software outputs to draw objective oriented conclusions.

Socio-demographic and socio-economic characteristics, morbidity, and immunization characteristics were analyzed using descriptive statistics such as frequencies. Chi-square tests were used to define the associations between variables. while the nutritional status was analyzed with the Emergency Nutrition Assessment (ENA) for SMART (version 2012). ANOVA was used to analyze the physical growth of the children.

Half of the respondents (52%) were females while men accounted for 48% of the responses with an average age of 27 years. Majority of the respondents (22%) had completed secondary school education with those who did not attend school accounting for the least percentage of 2.1%. The study established that self-employment was the main source of income for households with a prevalence of 34.1%. Salaried employment came second with 30.1% while farming was the least income generating activity with 3.2%. The average household size reported was six with the highest number being 12. The minimum number of occupants in a single household to be recorded was two. Majority of the study population depended on tap water (95.8%), while only a few households used rain water (0.4%). To purify water for consumption, 28% of the residents used chemicals to treat water, 7.6% used traditional herbs to make drinking water safe for consumption. About 11.9% boiled water while the remaining 5.1% attain safety of the drinking

water through sieving and filtering. A substantial percentage (70%) of the households in Banadir used flush toilets. Ventilated improved latrines was utilized by 21% of the residents while 9% used traditional pit latrines as their toilet facility.

The percentage of children aged 6-59 months with wasting were 13.3%, moderately wasted (9.7%) and 3.6 % were severely wasted. The prevalence of stunting in children was 30.8%. More than three-quarters (69.2%) of the children aged 6-59 months were normal while 13.8% were moderately and 4.6% were severely stunted. About 9.0% of children aged. 6-59 months old were underweight. The demographic characteristics of the mothers in the study (age, level of education, monthly income and health consultation seeking behaviors) played a role in their caregiving practices and overall nutritional status of the children under the age of 5 years. Most of the households have access to tap water. Some households did not treat their drinking water. All households have a toilet facility.

The government through the health ministry and health stakeholders need to increase awareness creation among not only mothers but also all primary caregivers (mothers and fathers) on the importance of exclusive breastfeeding, feeding the baby with colostrum and early first feeding, in prove the diet quality of the children. Women need to be highly encouraged and enticed to deliver their babies at health facilities, which will enable health workers give mothers/caregivers' nutrition education. The municipality or the government of Somalia should ensure that all the accompaniments for hand washing which include running water and soap so as to make handwashing an effective practice are provided.

TABLE OF CONTENTS

DECLARATION.....	ii
DECLARATION OF ORIGINALITY FORM.....	iii
OPERATIONAL DEFINITIONS.....	iv
ACKNOWLEDGEMENTS.....	vi
ABSTRACT.....	vii
LIST OF TABLES.....	xiv
LIST OF FIGURES.....	xv
CHAPTER ONE: INTRODUCTION.....	1
1.0 Background information.....	1
1.2 Statement of the problem.....	2
1.3 Justification.....	3
1.4 Study Aim.....	3
1.5. Study Purpose.....	3
1.6 Objectives.....	4
1.6.1 General Objectives.....	4
1.6.2 Specific objectives.....	4
1.7 Research hypotheses.....	4
CHAPTER TWO: LITERATURE REVIEW.....	5
2.2.Malnutrition.....	6
2.2.1 Global prevalence of Malnutrition.....	6
2.2.2 Africa prevalence of Malnutrition.....	6
2.2.2 prevalence of Malnutrition Somalia.....	7
2.3 Child malnutrition.....	7
2.3.1 Macronutrients.....	8
2.3.2 Micronutrients.....	9

2.3.3	Water	9
2.3.4	Breastfeeding	9
2.3.5	Breast-milk Composition	10
2.4	The Conceptual Framework	11
2.5	Causes of malnutrition	12
	In generally there are two main causes of malnutrition	12
2.5.1	Immediate causes of Malnourishment	12
2.5.2	Underlying causes of malnutrition	13
2.6	Malnutrition	13
2.6.1	Protein energy malnutrition	13
2.6.2	Nutritional Status of Children Under Five Years	14
2.6.3	Sign and symptoms of Malnutrition	15
2.6.4	Symptoms of malnutrition in children	15
2.7	Measurement of malnutrition Classification of malnutrition	15
2.7.1	Weight –for-height	15
2.7.2	Height-for-age	15
2.7.3	Weight-for-age	16
2.7.4	Mid Upper Arm Circumference (MUAC)	16
2.7.5	MUAC cut-off points for children 1-5year	16
2.8	Measurement of malnutrition Classification of malnutrition	16
2.8.2	Dietary assessment method	18
CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY		19
MAP OF MOGADISHU		20
3.2	Study Design Study Design used in the study of children attending in Banadir Hospital Mogadishu	20
3.2.1	Target population	20

3.2.2	Study period and duration	21
3.2.3	Study Population.....	21
3.2.4	Inclusion criteria	21
3.2.5	Exclusion criteria	21
3.3	Sample Size Determination	21
3.4	Sampling techniques	22
3.5	Data collection techniques	22
3.5.1	Socio-demographic data.....	22
3.5.2	Nutrition status of the index child.....	23
3.5.3	Dietary diversity	23
3.5.4	Water availability, hygiene and sanitation status of the households.....	23
3.1.1	Infant and young child feeding practices	24
3.1.2	Immunization and morbidity status of index child	24
3.2	Research Tools	24
3.2.1	Questionnaire.....	24
3.2.2	Equipment	24
3.3	Data Analysis.....	24
3.4	Data Quality Control.....	26
3.5	Ethics consideration.....	26
CHAPTER FOUR: RESULTS.....		27
4.1	The socio-demographic characteristics of primary caregivers of children below five yearsat Banadir hospital in Mogadishu Somalia	27
4.1.1	Gender	27
4.2	Socio-economic characteristics of households with under-five children attending Banadir, Mogadishu, Somalia.....	29
4.2.2	Assets owned by the mothers /caregivers of the children aged 0-59 Months attending Banadir Hospital Somalia.....	30

4.2.2	Monthly household income of household with under-fives attending Banadir hospital,Somalia.....	31
4.3	Places where the children attending Banadir Hospital were born	31
4.4	Child feeding characteristics of children attending Banadir Hospital	32
4.4.1	Time of breastfeeding	32
4.4.2	Giving colostrum to babies soon after birth the child children attending Banadir Hospital.....	32
4.4.3	Age of caregivers of breastfeeding in mother attending Banadir hospital	32
4.4.4	Time when breastfeeding was stopped	33
4.4.4.1	Duration of breastfeeding for children attending Banadir Hospital.....	33
4.4.5	Reasons for stopping breastfeeding of children attending Banadir hospital	33
4.4.6	Receiving counselling respondents with children attending Banadir Hospitals.....	34
4.4.7	Duration of breastfeeding for children attending Banadir Hospital.....	34
4.4.9	Children receiving Vitamin A supplements	36
4.4.10	Source of medical consultation for Households with children attending Banadir Hospital	36
4.1.1	Prevalence of underweight of children under-five years in Banadir hospital inMogadishu....	37
4.1.2	Stunting of children under-five years in Banadir hospital in Mogadishu	37
4.2	Child health status under-five in Banadir Hospital.....	39
4.7.1.	Immunization status of the children under-five in Banadir Hospital.....	39
4.3	Water availability, hygiene and sanitation status of the households at Banadir hospital inMogadishu.	40
4.1.2	Storage of portable water by households with children attending/admitted at BanadirHospital 41	
4.1.3	Frequency of washing hands households with children attending/admitted at Banadir Hospital 42	
4.2.1	Food given to children under five years in the last 24 hours at Banadir hospital in Mogadishu	43
4.2.3	Food intake frequency of study children under-five years in Banadir hospital in Mogadishu ...	44
4.3	Dietary diversity score and food consumption frequency of children under-five years inBanadir hospital in Mogadishu.....	44
4.10.2	Distribution of study children by their dietary diversity scores in Banadir Hospital inMogadishu.	47

4.4 Factors Associated with Nutritional Status of children under-five years in Banadir hospital in Mogadishu	47
4.4.2 Distribution of morbidity pattern by nutrition status of children under-five years in Banadir hospital in Mogadishu	48
CHAPTER FIVE: DISCUSSION	50
5.2 Water availability, hygiene, and sanitation status of households of under-fives attending Banadir Hospital, Mogadishu Somalia	51
5.3 Dietary intake of under- five children attending Banadir Hospital, Mogadishu Somalia	52
5.4 Nutritional status, of children aged 6-59 months in Banadir Hospital Mogadishu, Somalia	53
5.4.1 Wasting in children aged 6-59 months in Banadir Hospital Mogadishu, Somalia	53
5.4.2 Stunting in children aged 6-59 months in Banadir Hospital Mogadishu, Somalia	54
5.4.3 Underweight in children aged 6-59 months in Banadir Hospital Mogadishu, Somalia	55
5.5 Factor associated with nutritional status of under-fives attending Banadir Hospital, Mogadishu Somalia	55
CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS	56
6.1 Conclusions	56
6.2 Recommendations	56
REFERENCES	57
APPENDICES	65
Appendix 1: Questionnaire	65
Appendix 2: Introductory letter	77
Appendix: 3 Ethical Approval	78

LIST OF TABLES

Table 1: Cut Off Points for Malnutrition.....	18
Table 2: Highest level of education of mothers of children below five years Banadir hospital in Mogadishu Somalia.....	28
Table 3: Occupation of the mother with under-five at Banadir Hospital, Mogadishu Somalia.....	29
Table 4: Assets owned by the mothers/caregivers of the children aged 0-59 Months attending Banadir Hospital Somalia.....	30
Table 5: Source of medical consultation for Households with children attending Banadir Hospital.....	36
Table 6: Distribution of study children by age and gender attending Banadir Hospital.....	37
Table 7: Nutritional status of children aged 6-59 Months in Banadir Hospital.....	38
Table 8: Treatment of drinking water of the households at Banadir hospital in Mogadishu-Somalia.....	41
Table 9: Frequency of washing hands households with children attending/admitted at Banadir Hospital.....	42
Table 10: Presence of hand washing facilities in Banadir hospital in Mogadishu.....	42
Table 11: Food given to under five children in last 24 hours at Banadir hospital in Mogadishu.....	43
Table 12: Distribution of food by frequency of consumption by under five-year-old children in Banadir hospital in Mogadishu.....	46
Table 13: Association between study population characteristics and nutrition status of under-five attending Banadir hospital in Mogadishu.....	48
Table 14: Distribution of morbidity pattern by nutrition status of children under-five years in Banadir hospital in Mogadishu.....	49

LIST OF FIGURES

Figure 1: Conceptual framework for the study	11
Figure 2: Conceptual Framework Showing Causes of Malnutrition (Golden, M. H. 2002). Source (UNICEF)	12
Figure 3:Map of Mogadishu - showing the study area.....	20
Figure 4: Sampling scheme of the sampling method for a study Banadir Hospital, Somalia	22
Figure 5:Distribution of caregivers according to their gender.....	27
Figure 6: Place where the children attending Banadir Hospital were born.	32
Figure 7: Reasons for stopping breastfeeding of children attending Banadir hospital.	33
Figure 8: Receiving counselling respondents with children attending Banadir Hospitals	34
Figure 9: Duration of breastfeeding for children attending Banadir Hospital.....	35
Figure 10: Introduction of complementary feeding of children under five years in Banadirhospital in Mogadishu	35
Figure 11: Prevalence of Illness among Children Under Five Year in Banadir hospital.	39
Figure 12: Immunization of Children aged 0-59 Months Old	39
Figure 13: Main source of drinking water of the households at Banadir hospital in Mogadishu-Somalia.....	40
Figure 14: Type of toilet facility water by households with children attending/admitted atBanadir Hospital	41
Figure 15: Frequency of serving food in a day	44
Figure 16: Distribution of Children by Food Group Consumed.	45
Figure 17: Distribution of Study Children by their Dietary Diversity Scores	47

CHAPTER ONE: INTRODUCTION

1.0 Background information

Malnutrition normally influences on all groups in a community, but newborns and young offspring are the most susceptible because of their high dietary requirements for development and growth (Blössner et al., 2005). Globally, in 2020, globally, 149.2 million children under the age of 5 years of age were stunted, 45.4 million wasted, and 38.9 million overweight. The number of children with stunting is declining in all regions except Africa. More than half of all children affected by wasting live in Southern Asia and Asia as a whole is home to more than three-quarters of all children suffering from severe wasting. In terms of the targets, at country level, the greatest progress is being made towards the stunting target, with nearly two-thirds of countries seeing at least some progress. In contrast, for overweight, about half of all countries have experienced no progress or are worsening (UNICEF WHO-WB 2020). children below the age of five were stunted, or 26 percent, and 16% were underweight, 8% of the wasting were underweight, while 7% were overweight. Stunting is highly prevalence among children under the age of five in Africa (36%) and Asia (27%) remain a public health problem, one which often goes unrecognized. More than 90% of the world's stunted children live in Africa and Asia (UNICEF et.al, 2012). Children under 5 years and in Somalia, infant and under-five death rates are 77 and 115 per 1000 live births 15 355 (21%) and 22 739 (31%) observations were from wasted and stunted children, respectively. The conflict was associated with undernutrition independently of the individual, household and environmental factors, (FAO; FSNAU, 2018). floods and droughts and collapse of institutions/infrastructure (UNDP, 2017). This has resulted in interruptions in livelihood systems, restricted supply of basic services, and a breakdown in the social care network, all of which have had a severe impact on the region's nutrition status. Even in seasons of better food security, a meta-analysis of surveys undertaken in Somalia during the 1980s has consistently found significant levels of acute malnutrition and mortality rates (UNDP, 2017; Masese, 2016). According to WHO, malnutrition is associated with about half of all child deaths world-wide. Malnutrition among under-five children has serious consequences. Malnourished children have lowered resistance to infection; they are more likely to die from common childhood ailments like diarrheal diseases and respiratory infections, and for those who survive, frequent illness saps their nutritional status, locking them into a vicious cycle of recurring sickness, faltering growth and diminished learning

ability.

Somalia experiences a Malnutrition is a serious problem among the country's children under the age of five. The country's under-five wasting prevalence was 15% in 2009, higher than the 8.9% national prevalence of under-five in developing countries. Overweight was at 3%, which had reduced slightly from 4.7% in 2006. The countrywide prevalence of stunting in children under the age of five was 25.3%, slightly higher than the developing country average of 25% (UNICEF 2009). The GAM rate in Wadajir is critical at 19.9%, with the Somali national GAM level sitting at 17.4%, the situation in Wadajir is worse compared to the national average (UNICEF 2017). The MAM in Wadajir stands at 8.0% compared with the national MAM figure of 3.2% this shows that there was more MAM for the children in this area than the national data indicated (UNICEF 2017; UNHCR 2017).

Somalia, Terrorist attacks, famine, and hunger are all common occurrences in Somalia. This condition has made it impossible for new born to obtain adequate nutrition, resulting in undernutrition, necessitating the current study. During such periods, children suffer retarded growth and it has not been determined whether when the children finally get food they recover to a reasonable level (UNHCR, 2017).

1.2 Statement of the problem

Globally, half of the almost 10 million children who die annually under the age of five years do so from a mixture of malnutrition and easily avoidable disease. The World Health Organization approximates that almost 150 million children younger than 5 years are underweight in developing countries and an additional 200 million are stunted. Malnutrition is a prominent cause of death in children in low- and middle-income countries worldwide, with long-term effects on cognitive, physical, and metabolic development. The burden of malnutrition is usually greater in regions experiencing complex emergencies such as recurrent draughts and conflicts (Kinyoki et al., 2015).

Somalia has been without a stable government since 1991 leading to humanitarian crisis caused by armed conflicts, general insecurity, internal displacement, droughts and the situation is worsened by the emergence of international terrorism recently. The country is one of the poorest countries in the world with a poverty headcount rate of more than 51 percent (Somalia Nutrition Strategy, 2020). It is

estimated that undernutrition causes 45 percent of all deaths in children under 5 years of age in settings similar to Somalia. Malnutrition persists in Somalia due to years of conflict, the collapse of basic social services and the erosion of resilience over time. In 2018 alone, more than 1.2 million children suffered from malnutrition (UNICEF 2019).

1.3 Justification

Child malnutrition is a global problem leading to child mortality but higher in regions with complex emergencies such as conflict and those regions prone to recurrent draughts. Several studies have shown that several factors are associated with nutritional status of children under five years. Somalia has several special characteristics in terms of socio-economic, water and sanitation, food security and feeding practices but data on how these factors impact on nutrition status of children is scanty.

In Somalia malnutrition among under-five years old children is common caused the poor household status and lack of effective support system in the country. There seems increased awareness of child malnutrition among households with Somalia's National Breastfeeding policy suggesting that children be completely breastfed from birth to 6 Months and continue breastfeeding to 24 months and beyond for ideal survival, growth and development. Unfortunately, only 9% of babies under six months of age are completely Breastfed in Somalia. Nutritional problems are a major cause of mortality and morbidity in children aged less than five years of age. Several nutritional policies have been suggested to improve the nutritional status but unfortunately, they are either not well adopted, not accepted or not afforded by the community.

1.4 Study Aim

To contribute towards improvement of nutritional status of children under five years and associated risk factors at Banadir Hospital Mogadishu, Somalia.

1.5. Study Purpose

To generate data on risk factors associated with nutrition status of children under five years at Banadir Hospital Mogadishu –Somalia.

1.6 Objectives

1.6.1 General Objectives

To determine the nutritional status of children under five years and associated risk factors at Banadirhospital, Mogadishu Somalia.

1.6.2 Specific objectives

- i. To determine the socio-demographic characteristic of household of children below five years at Banadir hospital in Mogadishu Somalia
- ii. To determine water availability, hygiene and sanitation status of the households at Banadir hospital in Mogadishu
- iii. To determine the dietary intake of children under-five years in Banadir hospital in Mogadishu
- iv. To determine nutritional status of children under-five years and associated risk factors at Banadir hospital inMogadishu

1.7 Research hypotheses

- i. There is no significant association between the socio-demographic characteristic of factors and household of children below five years at Banadir hospital in Mogadishu Somalia
- ii. There is no significant association between water availability, hygiene and sanitation status of the households at Banadir hospital in Mogadishu.
- iii. There is no significant association between dietary pattern of under-five children and socio-economic status of their household at Banadir hospital in Mogadishu
- iv. There is no significant association between nutritional status and dietary intake of under-five of children at Banadir hospital in Mogadishu.

CHAPTER TWO: LITERATURE REVIEW

2.1 Overview of Malnutrition

Malnutrition, according to the World Health Organization (WHO), is the leading cause of child mortality worldwide, accounting for 45 percent of all cases. Around 2.2 million children die each year around the world due to being underweight at birth and intrauterine growth limitations. Zinc and vitamin A deficiencies result about a million deaths each year. Malnutrition throughout childhood is linked to a poorer level of well-being and academic achievement in adulthood, according to the WHO. Malnutrition is defined as "a state in which an individual's physical function has been reduced to the point where he or she is unable to maintain tolerable body performance developments such as nursing, growth, physical work, pregnancy, disease recovery, and resting" (MMS/MPHS, 2009).

The nutritional status of children is a predictor of the community's future potential and state of development. A well-fed people have the ability to be productive and raise their standard of living by working hard. Furthermore, hunger has a negative impact on children's cognitive and learning abilities. Adults who were malnourished as children have functional deficits, such as impaired intellectual performance and working ability (Ola *et al.*, 2011). Large family size, low income, inadequate access to food, poor education, water, maternal, sanitation, and child health care are just a few of the interrelated elements that contribute to poverty (Adeladza, 2009). To combat malnutrition, the type of malnutrition and sustenance-related risk factors must be identified, and evidence-based involvement and policies must be adopted.

Malnutrition affects people of all ages in a society, but newborn babies and young children are particularly vulnerable due to their high nutritional needs for growth and development (Blössner *et al.*, 2005). An estimated 165 million children under the age of five were stunted (26%), underweight (16%), wasted (8%), and overweight globally (7%). Stunting in children under the age of five remains a public health issue in Africa (36%) and Asia (27%) respectively and often goes unnoticed. Africa and Asia are home to more than 90% of the world's stunted children (UNICEF *et.al*, 2012). In Kenya, 35% of children under the age of five are stunted, with 14% being

severely stunted, 16 percent are underweight (low weight for age), and 4% extremely underweight (KNBS and ICF Macro 2010). Malnutrition is prevalent in children under the age of five in the Eastern area, where Mbeere South Sub County is located, with 7.3 percent wasting, 41.9 percent stunting, and 19.8 percent underweight estimated (KNBS and ICF Macro 2010).

2.2. Malnutrition

2.2.1 Global prevalence of Malnutrition

Early childhood malnutrition is a major cause of failure to flourish, and it has a number of severe repercussions, including stunted growth, reduced educational achievement, a detrimental impact on brain development, and dysfunctional marriages (Wang Abdalla, 2016). The number of children aged 54 months and under who are overweight is approaching that of children of comparable age who are wasting; away from Africa and Oceania, the number of children with stunted growth is decreasing; and the total number of overweight children has been fast increasing in Asia (IFPRI, 2016).

2.2.2 Africa prevalence of Malnutrition

The global condition of food insecurity has improved, while the situation in Africa has only worsened. In the last decade alone, there have been multiple instances of food insecurity that have resulted in the loss of lives and livelihoods. Food insecurity leads to malnutrition, and malnutrition leads to death. It is estimated that one out of every three deaths are caused by a lack of sufficient nutrition, with the impact being more evident in underdeveloped countries, particularly in Sub-Saharan Africa. Children who are malnourished do not have a fully developed brain, and as a result, they are unable to perform at their full mental potential. Their failure to operate efficiently intellectually later in life will render them economically unable to support themselves, resulting in a vicious cycle of poverty and starvation (Bain et al., 2013).

In Africa, the lowest progress has been made toward achieving the Millennium Development Goals MDGs, which call for a 50% reduction in hunger (Union, 2006). Nearly a third of the African population suffers from chronic hunger. East and West Africa have, for the most part, endured the worst food crises in recent history. In these regions alone, acute food insecurity affects eleven

countries and 23 million people, many of whom are at risk of malnutrition. The high population growth rate in certain regions, endemic poverty, climate change, and political conflicts have all contributed to and exacerbated this issue (Jones, 2017). There is a terrible prospect for food security on the African continent. If current demographic trends continue, Africa's population would likely reach around two billion people by 2050. The majority of this population expansion occurs in Sub-Saharan Africa, which has a population growth rate of 1.6-2.4 percent at the moment (Committee on Population, 2016).

2.2.2 prevalence of Malnutrition Somalia

Somalia is one of the countries with the highest rates of acute malnutrition due to its numerous circumstances, which include civil wars and drought. The long era of political instability and insecurity has had a negative impact on all aspects of human life and development, resulting in this country being ranked as the fifth poorest country in the world, with a high maternal and childhood death rate (UNHCR, 2012). Somalia is ranked last in the food security ranking. Furthermore, when compared to the rest of the globe, Somalia is considered to have the highest rate of acute malnutrition. According to 2011 statistics, 37 percent of the Somali population, or nearly 3 in every 10 people were facing food insecurity (Kamiokit et al., 2015). In Somalia, one out of every four children were severely malnourished. The acute food access issue primarily impacted poverty-stricken farmers who had no cereal reserves due to a previous harvest failure, and food prices had risen (FSNAU, 2011).

2.3 Child malnutrition

Approximately one in six of the world's industrialized population is malnourished, with over 200 million of them being children. Undernutrition is the leading cause of death in children under the age of five years, and it is connected to communicable infections. Underweight is the most common cause of illness and disability in the world. Over 3 million children die each year as a result of hunger (UNICEF 2017). In Somalia, the occurrence of stunting, wasting, and low mid-upper arm circumference in children aged 6–59 months was estimated to be 21%, 21%, and 36%, respectively (Kinyoki et al., 2015).

Nutritional Status of Children Aged (5) years in Wadajir District Mogadishu –Somalia

Malnutrition presents itself in two ways in children: under-nutrition and over-nutrition. In Somalia, under-nutrition is the most common, especially in ASAL areas. Malnutrition is defined as being underweight for your age (underweight), having too short forage (stunting), or being underweight for your height (wasting). Excessive fat build-up is referred to as over-nutrition, and it can have a negative impact on health, manifesting as overweight and/or obesity (WHO, 2012). immunity. Magnesium, sulfur, nitrogen, essential amino acids, phosphorus, zinc, potassium, sodium, and chloride are examples of Type II micronutrients, or growth nutrients. They are

Micronutrient deficiency can cause deficiency disorders such as Marasmus, Kwashiorkor, and Marasmic-kwashiorkor. While marasmus is characterized by low calorie and protein consumption, children with kwashiorkor may have some calorie intake, but protein intake is insufficient (Worthington et al., 2017).

Malnutrition is one of the biggest causes of child mortality rate in low- and middle-income nations, with long-term metabolic, physical, and mental repercussions (UNICEF, 2012). Acute malnutrition is common in areas affected by complex situations such as drought or violence (Burki, 2013). A study conducted in three livelihood zones in Somalia showed that the estimated national prevalence of stunting, wasting and low mid-upper arm circumference in children aged 6–59 months was 21%, 21% and 36%, respectively (Kinyoki et al., 2015).

2.3.1 Macronutrients

Protein, fat, and carbohydrates are the major macronutrients that provide the body with energy and make up the majority of a diet. Carbohydrates (i.e., starches and sugars) are often a substantial part of the diet (80%) and the main source of energy in resource-poor cultures. Fats play a role in cell growth as well. Proteins, which are largely obtained from animal sources such as milk, meat, and eggs, as well as cereals and pulses, are needed to build new tissue. Animal by-products include important amino acids, which the body cannot make and must be consumed in order to promote healthy growth and development (Cohen & Johnson (2019).

2.3.2 Micronutrients

There are around 40 micronutrients that are required for good health. From a formal functional standpoint, there are two types of micronutrients: type I and type II. Type I micronutrients, also known as functional nutrients, are essential for the body's hormonal, immunological, biochemical, and other activities. Iodine, Fe, and vitamins A and C are good example. Type I micronutrient deficiency have no direct impact on growth (i.e., the person can have the normal growth with appropriate weight and still be deficient in micronutrients) (Gombart, Maggini 2020). as a result, anthropometric measures cannot detect a deficiency in type I micronutrients. Type I micronutrient deficiencies can lead to serious illnesses such anemia, scurvy, and weakened required for growth and tissue repair. Type II micronutrients are only required in trace amounts by every cell and system, but maintaining the proper balance is critical for optimum health. A lack of any of the type II micronutrients can cause growth failure, which is manifested as stunting and/or wasting. Replacement of all of these nutrients in the proper proportions is critical for recovery from malnutrition and severe sickness (Soetan, Oyewole 2010).

2.3.3 Water

Water makes up the majority of the human body. Water is essential for both proper nourishment and staying hydrated. Only half of the water consumed by the body comes from liquids; the rest is absorbed from foods and created by the body. In order to ensure good dilution and absorption of nutrients, water is frequently required (Buzău, R. G. (2020).

2.3.4 Breastfeeding

Breast milk is a valuable, easily available resource that provides both the mother and the newborn with a variety of short- and long-term benefits. It is critical that health professionals understand the benefits of breastfeeding and how to manage it, and that this topic is covered in their training and education. Almost all children's health and development can thus be guaranteed by health professionals (Morrow& Chantry 2011).

2.3.5 Breast-milk Composition

Despite attempts to change formulae to make them more like breast milk, human milk is essentially different from cow's milk and even prepared baby formula. Breast milk has a very low protein concentration (around 0.9g/100 mL) as compared to raw cow's milk, which has about four times the protein concentration. Child formulae are weakened to provide a low protein concentration similar to human milk, but the protein structure (which is more difficult for a baby to digest) stays the same as cow's milk. During nursing, the structure of breast milk changes. Colostrum is the preliminary milk, which is higher in protein and lower in fat and lactose than mature milk. During nursing, the mother's concentration gradually decreases, allowing the infant's immune system to mature and become less reliant on the mother's supplies. The mother develops and secretes specific antibodies to the viruses and bacteria to which the newborn is exposed since they share the same environment. This is a quick response that just takes a few days.

2.4 The Conceptual Framework

Children's nutritional status is controlled by a number of factors, including dietary intake, which is regulated by food variety and frequency (**Figure 1**). The nutritional status is determined by food reserves, food access, and socioeconomic factors. Anthropometric measurements are used to determine a child's nutritional status.

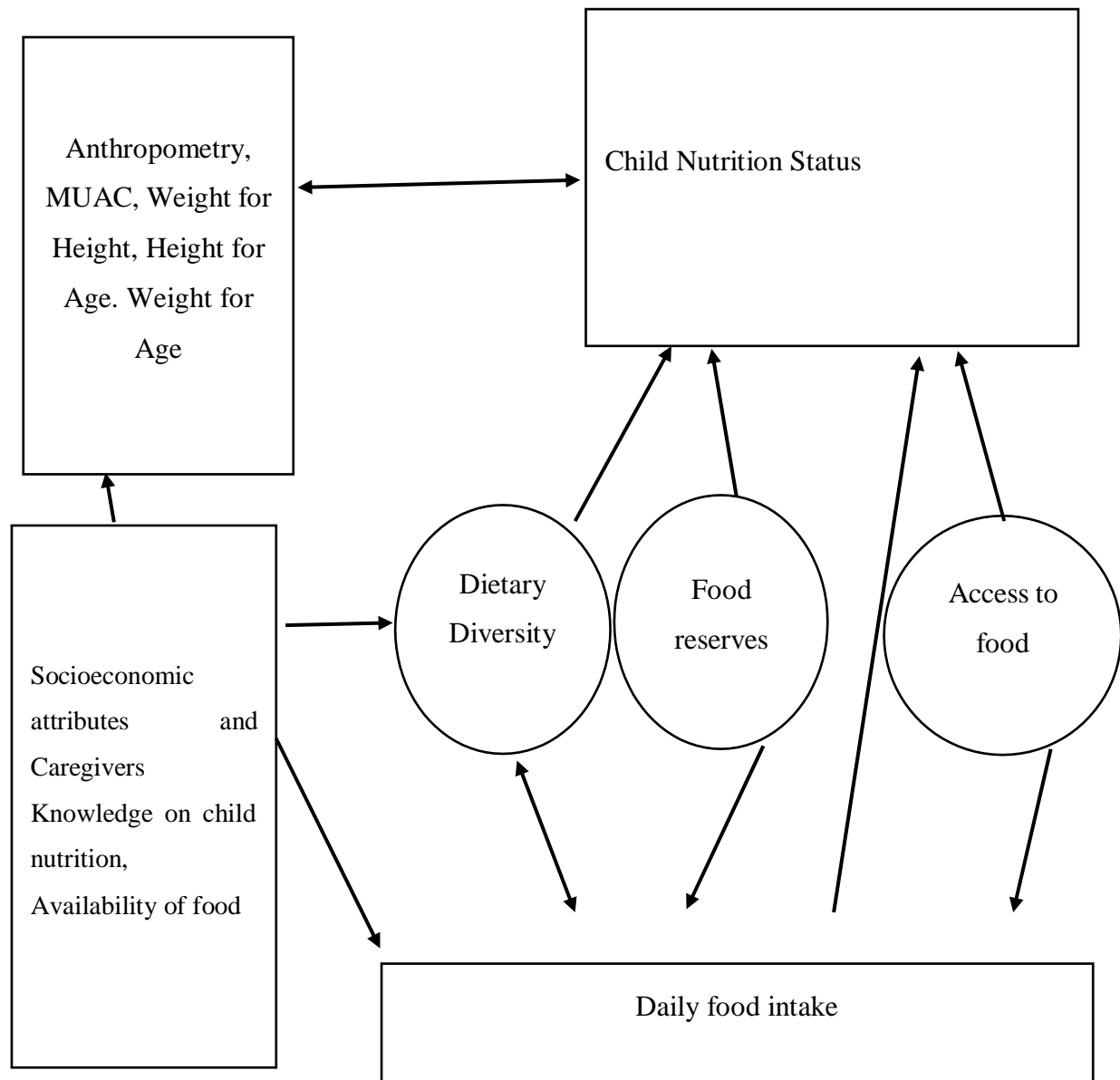


Figure 1: Conceptual framework for the study

2.5 Causes of malnutrition

The causes of malnutrition have been agreed upon by scientists. Many authors suggest that inadequate food intake, severe and recurring illnesses, or a mix of the two are the key drivers (UNICEF, 1998 and Rowland et al., 1988). The UNICEF Conceptual framework (Figure 2) of child survival depicts the interconnections of these factors with the nutritional status and overall health of the child and, by extension, the populations in which the child is raised (UNICEF, 1998).

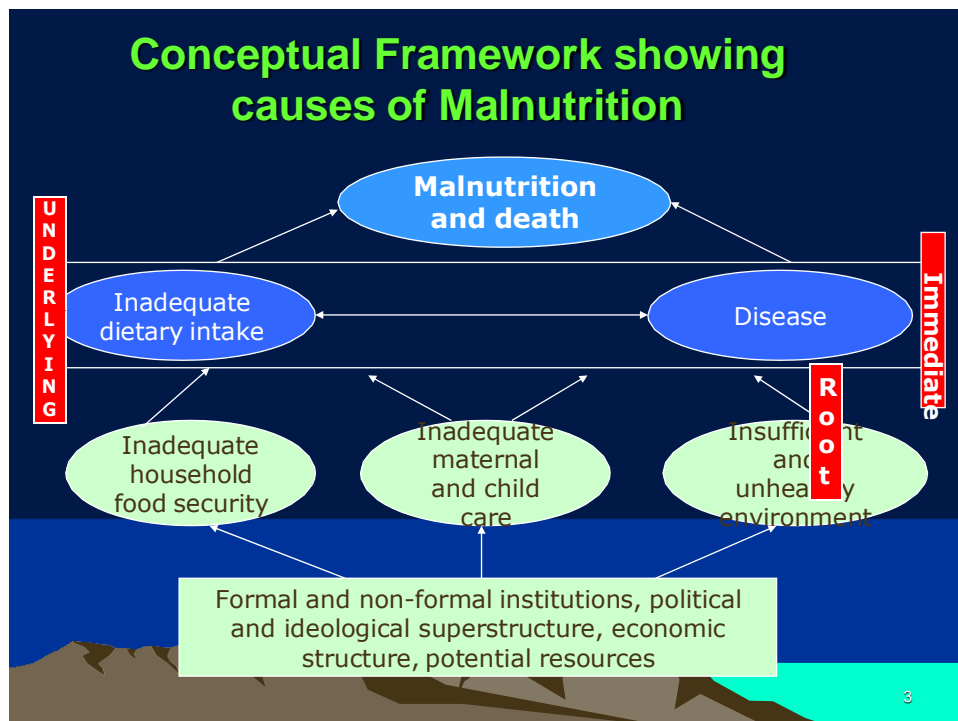


Figure 2: Conceptual Framework Showing Causes of Malnutrition (Golden, M. H. 2002). Source (UNICEF)

In generally there are two main causes of malnutrition

- A. Immediate causes of Malnourishment
- B. Underlying causes of malnourishment

2.5.1 Immediate causes of Malnourishment

Malnourishment is well-defined as a disparity in nutrient supply and the body demand of nutrients for maintenance, growth and specific functions in the body (WHO, 2018). In other words, satisfactory nourishment is requisite for physical maintenance and development, capacity to work and resistance to disease. Malnourishment is the outcome of unbalanced nourishment and/ or

disease (e.g., HIV/AIDS, tuberculosis) insufficient food intake (in quantity or quality) leads to augmented sensitivity for contagions. Infections frequently cause nutrient mal-absorption and reduced food intake such nausea and appetite that can lead to malnourishment (Pacey, A., & Payne, P. (2019).

2.5.2 Underlying causes of malnutrition

The UNICEF Framework of Underlying Causes of Malnutrition and Death emphasizes three underlying determinants that affect nutritional status at the family and communal levels: health and environment, household food security, and social and care environment. These factors are intertwined and must be assessed; solutions should address insufficient food access, poor water and sanitation, insufficient health services, and insufficient care for the vulnerable. Long-term (chronic) malnutrition is common in many developed countries, simply because individuals do not have enough food to eat (Black, M. M.& Trude, A. C. 2020).

2.6 Malnutrition

Malnutrition is a condition brought on by a lack of nutrient-dense meals combined with the interaction of pathogens. Food insecurity, poverty, a lack of proper resources, and a lack of understanding all contribute to micronutrient deficiencies. It is calculated by dividing the weight in kilograms (kg) by the height squared in meters (m), and is used to characterize the dietary status (WHO 2006).

2.6.1 Protein energy malnutrition

Protein energy malnourishment (PEM) is now recognized as a serious type of malnourishment characterized mostly by a lack of protein and energy. Kwashiorkor is a type of malnourishment caused by a lack of protein in the diet, whereas Marasmus is caused by a lack of energy and protein. Malnourishment affects 854 million people worldwide, with 820 million of them residing in non-industrialized nations. Poverty is linked to malnutrition, and the level of PEM is influenced by seasonal, political, educational, and sanitation levels, as well as economic, climatic, disease prevalence, and food production. PEM is linked to poor weight gain, slow linear growth, and behavioral changes such as anxiety, irritability, and attention deficit (Grover, Z., & Ee, L. C. 2009).

2.6.2 Nutritional Status of Children Under Five Years

Children's nutritional status is a measure of a community's development and future prospects. The nutritional condition of infants and children under the age of five is of particular importance, as these are important years for optimal growth and development (Preschulek et al., 1999). Long-term physical growth and development are affected by nutritional inadequacies, which can lead to high levels of sickness and impairment in adulthood. Furthermore, the high prevalence of malnutrition jeopardizes future economic growth by lowering the population's intellectual and physical capacity (Kabubo-Mariara, 2006).

In Kenya, children under the age of five make up a significant part of the population. According to a poll conducted by the Central Bureau of Statistics (KNBS and ICF Macro 2010), children under the age of five account for 15.7 percent of the national population. Data on this group's dietary status may thus be a good indication of nutrient circumstances in a larger culture.

Stunting is most common in the Eastern counties (42%), while it is least common in the Nairobi region (26%). Sixteen percent of children under the age of five are underweight, and four percent are severely underweight. Stunting and underweight were shown to be more common in rural areas than in urban areas (KNBS and ICF Macro 2010). Malnutrition rates differ from country to country. In a study of children aged below 5 years old in Nigeria, 35.7 percent were stunted, 14.9 percent were underweighted, and 5.5 percent were wasted (Lawal and Samuel, 2010). Stunting was prevalent (54.2%), underweight (40.2%), and wasting was prevalent in other parts of Ethiopia (10.6%) (Aweke et al., 2012).

Only 21.14 percent and 36.43 percent of preschool children in Butembo (DRC) and Gitega (Burundi), respectively, fell under the normal range in terms of stunting (-2 z-score) in comparative research on nutritional status of preschool children in Butembo (DRC) and Gitega (Burundi) (Ekesa et al., 2011). Despite the fact that the prevalence of malnutrition varies by region around the world, it is clear that malnutrition exists and that it must be successfully addressed.

2.6.3 Sign and symptoms of Malnutrition

Malnutrition symptoms are fairly distinct in both adults and children. They could be summarized as follows:

2.6.4 Symptoms of malnutrition in children

- Inability to grow. Failure to grow at a normal predicted rate in terms of weight, height, or both can be a sign of this.
- Irritability, sluggishness, and excessive weeping, as well as behavioral abnormalities such as anxiety and attention deficit, are typical in malnourished children.
- The skin becomes dry and flaky, and the hair may appear dry, lifeless, and straw-like. It's also possible that you'll lose your hair.
- Muscle loss and a lack of muscle strength. Limbs may seem to be sticks
- Swelling in the legs and abdomen. The abdomen is enlarged due to a lack of strength in the abdominal muscles. The contents of the abdomen expand out, resulting in a bloated abdomen. Due to edema, the legs are swollen. This is due to a shortage of essential nutrients. These two signs appear in youngsters who are severely malnourished (Khan, A., Khan. (2017).

2.7 Measurement of malnutrition

Classification of malnutrition

The weight-for-height index is a useful instrument to evaluate acute malnutrition in the population in emergency scenarios where acute forms of malnutrition are prevalent (along with the assessment of edema and MUAC). Furthermore, they do not necessitate the assessment of age, which is frequently difficult in these circumstances (Ghimire, Gupta, & Sapkota, 2020).

2.7.1 Weight –for-height

W/H does not require an age specification making it a valuable tool in emergency situations where obtaining an age can be problematic. Individual children's nutritional status can be identified by W/H for small deterioration or improvement (Gugelmin & Coimbra 2012).

2.7.2 Height-for-age

H/A is a measure of chronic malnutrition, which occurs when children's nutrition is insufficient

for an extended period of time. When compared to other infants of the same age, the height is shorter. This is known as "stunting" H/A is a measure of a person's nutritional condition over time. H/A should not be used as a criterion for admittance to feeding programs for children (Chakrabarty, & Bharati, P. 2007).

2.7.3 Weight-for-age

W/A can be used to diagnose both chronic and acute malnutrition (stunting) (wasting). W/A is used to monitor children's individual growth; in clinics, this is usually done using the "Road to Health Chart." Because W/A cannot distinguish between acute and chronic malnutrition, it should not be used as a criterion for admission to feeding programs for children who are truly malnourished (Wendy et al, 2003).

2.7.4 Mid Upper Arm Circumference (MUAC)

Because it represents the peripheral wasting of muscle and subcutaneous adipose tissue, MUAC is particularly susceptible to sudden weight loss. The results of the MUAC provide a quick indicator of mortality risk. People with a MUAC of less than 110mm are at risk of dying (only valid for older than 1 year). Between the ages of one and sixty months, MUAC is relatively consistent; hence only one cut-off point can be employed. Different cutout values are used by different agencies; the most regularly used cut off points are shown below (Ekesa et al., 2011).

2.7.5 MUAC cut-off points for children 1-5year

Acute malnutrition MUAC

Severe <110mm

Moderate \geq 110-125mm

Global <125mm

At risk of malnutrition \geq 125-135mm

2.8 Measurement of malnutrition Classification of malnutrition

The first step in treating malnutrition is to conduct a nutritional assessment. The goals of nutritional evaluation are to identify people who have or are at risk of malnutrition, measure the degree of malnutrition, and track how well nutrition therapy is working. The assessment methods are based

on a set of anthropometric, nutritional, laboratory, and clinical observations that are utilized either alone or in combination to provide the best results. Other aspects, such as socioeconomic position, cultural customs, and health and vital data, are frequently taken into account when interpreting the results (Gibson, 2005). Dietary approaches and anthropometric measurements were utilized in this study because they give adequate results within the constraints of available resources. 2.8.1 Anthropometric method.

Anthropometry is the study of changes in physical dimensions and gross composition of the human body as a function of age and nutritional status. Anthropometry is especially effective when there is a long-term mismatch between protein and calorie consumption (Gibson, 2005). Raw measurements are combined to create anthropometric indices. The height, weight, and age of the people whose nutritional status is being determined are among them. The data is then used to construct nutritional anthropometric markers such as height-for-age, weight-for-age, and weight-for-height. As stated in Table 1, the indicators are then utilized to classify and analyze the nutritional status of people. The advantages of anthropometric measurement methods are selected in most investigations. The equipment used is lightweight and low-cost. Measurements can be completed very quickly and easily and thus do not necessitate the use of highly qualified personnel. However, there are certain drawbacks to this strategy. Although the approach can sometimes detect moderate and severe malnutrition, it cannot distinguish particular nutritional shortage states (Gibson, 2005). Random imperfections in measurement tools or in the measuring and recording processes are the most common imprecision faults in anthropometrics (Arroyo et al., 2010). Examiners must be thoroughly trained in the processes of calibrating equipment and obtaining accurate measurements in order to control and reduce errors during the examination.

Length and height are measured lying flat and centrally on measuring boards placed on a hard flat surface on the ground for children aged 6 to 24 months. The length (head and feet against the base of the board and foot piece, respectively) was measured to the nearest 0.1 cm (WHO, 2006).

Children over the age of 24 months have their height measured by standing straight on a measuring board against a wall on a hard flat surface with a line-of-sight perpendicular to the horizontal surface. The height of the youngster was measured by gradually lowering the head piece on top of the head and measuring the distance between the head piece and the board's base to the nearest 0.1 cm (WHO, 2006).

Weight: the youngster was dressed in weighing pants and gently lowered on a standardized Salter scale with the pants' strap in front. The scale was hung in a safe location, and the child's weight was read to the nearest 0.1 kg once the scale needle had stabilized (WHO, 2006).

MUAC stands for "Middle Upper Arm Circumference." For a child aged 1 to 5, a typical MUAC is greater than 13.5 cm. The child has mild to moderate malnutrition if the MUAC is 12.5-13.5 cm, and severe malnutrition if it is less than 12.5 cm. This is useful for screening a large number of children, but not so much for tracking long-term growth (Gibson, 2005).

Table 1: Cut Off Points for Malnutrition

Indicators	Moderate (GAM)	Severe (SAM)
Wasting	WHZ; <-2 to \geq -3Z scores	WHZ; below -3Z
Underweight	WAZ; <-2 to \geq -3Z scores	WAZ; below -3Z
Stunting	HAZ; <-2 to \geq -3Z scores	HAZ; below -3Z

Source: WHO, 2006

2.8.2 Dietary assessment method

Diet is one of the most important factors in determining one's health and nutritional state. One of the causes of high levels of malnutrition in children is an inadequate diet, which is low in both quality and quantity. As a result, dietary surveys are an important part of nutritional assessment (Kulsum et al. 2008). The appropriate tool for dietary assessment will depend on the purpose for which it is needed. It could be used to track minerals, foods, or eating habits. For the objective of measuring dietary consumption, various approaches have been devised. These include meal frequency questionnaires, household survey methodologies, and simple food lists, as well as detailed individual weighted records collected over a period of 7 days or more. Each has advantages, drawbacks, and practical issues to consider when selecting one method over another (Wendy et al, 2003). Depending on the survey's goal, dietary evaluation might be done at the household or individual level.

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.1 Study Area

Somalia has a terrestrial surface area of 637,657 km² whereas the area of Mogadishu is 91 km². The country has a population of 15.8 million whereas that of Mogadishu is 2.5 million (UNICEF, 2016). The study was carried out at Banadir hospital in Mogadishu (Figure 3).

The Banadir Hospital: is the biggest child and maternal health hospital in Somalia. It was established in 1977 as part of Chinese government development projects to Somali people which included other infrastructures as well. It is Situated in the center of the Somali's capital Mogadishu. The Federal Government of Somalia recognized the hospital as the only 'National Referral Hospital' in the country. The hospital comprises three main departments: The maternity, pediatric and medical and surgical departments. The facility has a 400-bed capacity and receives an average of 2,000 patients per week. Nearly 400 women deliver every month in the facility.

Wadajir), also called Medina District is a district in the south-central Banadir region of Somalia. A few southwestern neighborhoods of Mogadishu are located in this district, as well as the University. The former region receives an average of 1228 mm of rain per year. and average temperature of 18.5°C. The estimated population of residents in Wajir District is 6,000 adults and children (Map layers: UNDP May, 2012). Cattle, sheep, and goats are the most common livestock kept (Masese, 2017).

MAP OF MOGADISHU

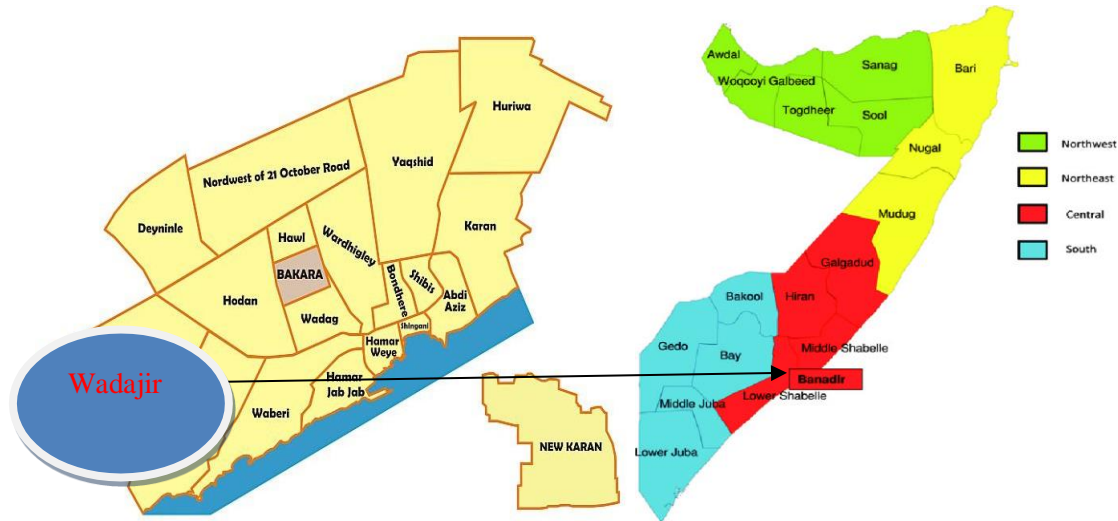


Figure 3: Map of Mogadishu - showing the study area

Source: Google Maps: MOGA-GUIDE is the City Guide of Mogadishu.

3.2 Study Design Study Design used in the study of children attending in Banadir Hospital Mogadishu

The design of this study was cross sectional study. It was designed to assess the nutritional status of children under under-five, as well as its relationship to demographic and socioeconomic characteristics, food security, water availability, hygiene and sanitation, infant and young child feeding practices (IYCF), and immunization and morbidity status of children under the age of five. Caregivers who were present in the hospital provided answers to research interviewers on Open data kit (ODK).

3.2.1 Target population

Children in Banadir Hospital in Mogadishu, Somalia, aged 6 to 59 months are the target population.

3.2.2 Study period and duration

The study was conducted during the period from January 2021 and April 2021 at Banadir hospital with 236 number of children recruited into the study.

3.2.3 Study Population

The sampling unit for this study was with children below five years attending or admitted to Banadir hospital Mogadishu and the respondent the principal caregiver of the index child.

3.2.4 Inclusion criteria

- a. Children under 5 years who are attending Banadir hospital those whose caregivers gave an informed consent.

3.2.5 Exclusion criteria

The exclusion criteria of the study children severely ill children.

3.3 Sample Size Determination

The sample size was calculated using Fischer's et al. (1991) formula as shown below;

$$n = \frac{Z^2 \times P \times Q}{d^2} =$$

Where;

n=required sample size form cross-sectional study.

Z= percentiles of the standard normal distribution corresponding to 95% confidence level which is equal to 1.96.

P = is the expected proportion or percentage of malnutrition children in Banadir region is 19 % (FSNAU technical series report, December 21, 2016):

q = population without the characteristics being measured (1-19%)

d = Degree/ proportion of error that was accepted in the study. This study adopted 5% degree of error (0.05).

$$n = \frac{1.96^2 \times 0.19 \times 0.81}{0.05^2} = \frac{3.8416 \times 0.19 \times 0.81}{0.05 \times 0.05} = 236$$

3.4 Sampling techniques

The sampling procedure which was used for the study area was the purposive sampling. This study was conducted at Banadir Hospital in Mogadishu. However, children Under five years attending in Banadir hospital were randomly selected.

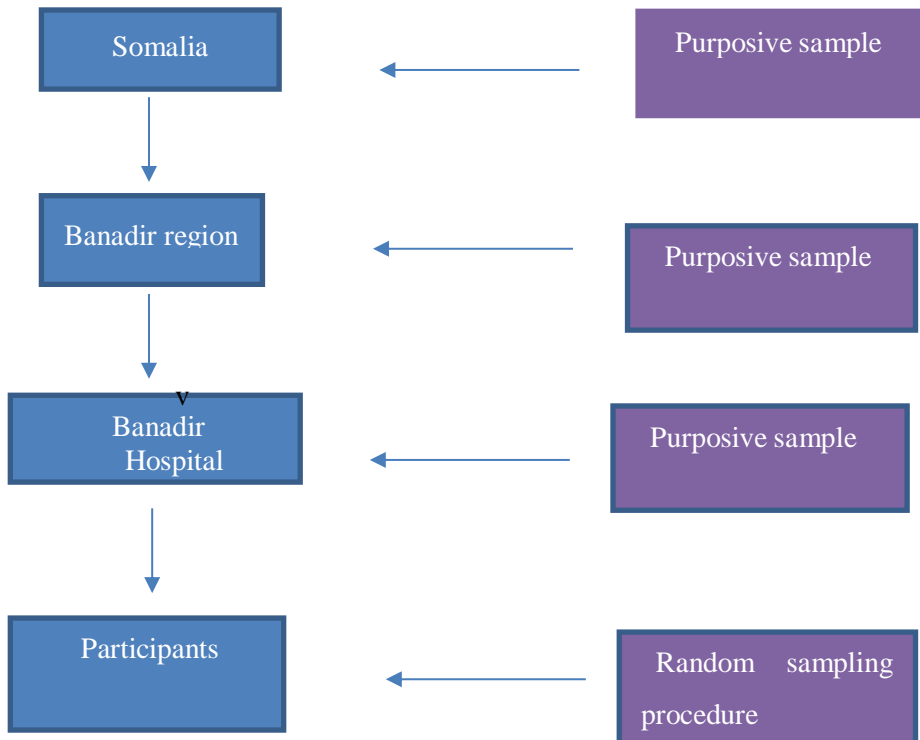


Figure 4: Sampling scheme of the sampling method for a study Banadir Hospital, Somalia

3.5 Data collection techniques

3.5.1 Socio-demographic data

Data was collected through questionnaires, face to face interviews with the mothers. And entered into a mobile phone. Data collected included: gender, age of child, number of children, income of family, education of level of mother and occupation.

Date of birth: Each child's date of birth was obtained from the caretaker/mother, cross-checked with immunization cards, and recorded in months.

3.5.2 Nutrition status of the index child

Anthropometric measurements for each child in the study were measured. These measurements included Weight, Height and mid-arm circumference. Anthropometric measurements were taken for children aged (6-59) months to determine their nutritional status as follows.

MUAC (Mid Upper Arm Circumference) anthropometry for specific demographic groups, which are defined as follows: Children from birth to five years of age (Module 2) aligns with the ages covered by the World Health Organization (WHO) Child Growth Standards and refers to children from birth–60 completed months of age. At age 5 years and 1 month, they are no longer compared to the WHO Child Growth Standards. Children and adolescents 5–19 years of age (Module 3) aligns with the WHO Growth Reference and refers to children age 61 months to 19 years (228 completed months). At age 19 years and 1 month, they are no longer compared to the WHO Growth Reference. Pregnant and postpartum women and girls (Module 4) refers to women and girls of any age from the start of pregnancy until 6 months after delivery. Adults (Module 5) refers to individuals 18 years of age (i.e., reached their 18th birthday) and older who are not pregnant or less than 6 months postpartum. Older adults refer to individuals 60 years of age (i.e., have reached their 60th birthday) and older (Gibson, 2005).

3.5.3 Dietary diversity

Dietary diversity in individuals (index children) was assessed using a 24-hour recall dietary intake questionnaire with the mother/care giver. For this study, the FAO (2011) recommended eight food groups for individual dietary diversity (IDD). Cereals, legumes/nuts/seeds, milk and milk products, fruits, dark green leafy vegetables, eggs, white tuber/roots, and meat were among the food groups (FAO, 2011; FSAU, 2005).

3.5.4 Water availability, hygiene and sanitation status of the households

Vital information on water sources, distance to water sources, and daily average amount of water for home usage were determined through interviews with respondents. Furthermore, whether or not the household treats their drinking water, as well as the type of treatment used, was recorded. Interviews with respondents and, where possible, observations will be used to gather information on the presence of toilet facilities, hand washing facilities, and the mode of waste disposal by households.

3.1.1 Infant and young child feeding practices

The mother/caretaker of the index child (0-24 months) was interviewed to get information on initiation of breastfeeding, frequency of breast feeding and complementary feeding practices.

3.1.2 Immunization and morbidity status of index child

The data on the index child's morbidity, immunization, and deworming practices was gathered through interviews with the mother or the primary caregiver, with the help of health cards where possible.

3.2 Research Tools

3.2.1 Questionnaire

A structured questionnaire was used to obtain demographic and socio-economic characteristics. The questionnaire was also designed to incorporate collection of data on questions about food production and utilization, dietary diversity, anthropometry and child immunization, and infant and young child feeding practices.

3.2.2 Equipment

Children under the age of five had their anthropometric measures measured. The following tools are used: Salter scale with 0.1 kg accuracy for weight, height/length board with 0.1 cm accuracy for height and length measurement, and MUAC. And the clinic card to check the age.

3.3 Data Analysis

The collected digital raw data were exported from ODK server to ONA to an excel file. The collected data was quantitative in nature. It was analyzed using the Statistical Package for Social Sciences (SPSS). “The analysis of the findings was done using descriptive and inferential statistics.

SPSS version 20, Emergency Nutrition Assessment for Standardized Monitoring and Assessment of Relief and Transition (ENA for SMART), and Nutrition survey, 2007 tools were used for data entry and analysis.

All variable frequencies were run and tabulated in SPSS to clean the data. In descriptive demographic and socioeconomic analysis, frequencies, means, and standard deviation are calculated using frequencies and cross tabulation.

To define the connections between variables, descriptive statistics such as frequencies and chi-square tests were used to analyze sociodemographic and socioeconomic features. While the ENA for SMART (version 2012) was used to analyze the nutritional status, morbidity, and immunizations characteristics, chi-square was employed to analyze the children's physical growth. Respondents' socio-demographic characteristics, knowledge of feeding patterns, and illness experiences were described using descriptive statistics such as mean, standard deviations, frequencies, and inter-quartile ranges. At the same time, different tests were used to derive inferential statistics. The independent variables and dependent variables were tested for association and strength of association using Pearson's Chi-square t-test and regression.

The difference between the mean of the study participants were tested using ANOVA With a P-value of 0.05, the confidence interval (CI) was established at 95%. In bivariate analyses, Poisson regression was used to calculate odds ratios (OR) and 95 percent confidence intervals (CI) for the relationship between nutritional outcomes and socio-demographic, household cultural, and economic status, as well as dietary intake. A manual backward elimination approach was used in multivariate analyses to reach at the most parsimonious model including factors associated with nutritional outcome among children aged 6-59 months. from Mogadishu at the significance level of $P \leq 0.05$.

The categorization of recurrent data collected under thematic areas was part of this approach. The extraction of themes in summary was the next critical step after the notes were arranged (Phillips and Dudley, 2005). The analysis was done manually using Microsoft Word (La Pelle, 2004).

3.4 Data Quality Control

Pre-testing was used to validate the questionnaire. During pre-testing and the survey period, the research assistants were closely supervised by the researchers. After entering the data into the computer, frequencies were calculated for each variable to look for outliers that could have occurred due to data entry errors, as well as to ensure that responses were consistent between questions.

3.5 Ethics consideration

Ethical clearance was obtained from the ethics committee of Banadir Hospital and the University of Nairobi, Permission was also be obtained from the Ministry of Health Office and the Hospital Administration.

No one was forced to participate in the study, and the identities of those who did were never mentioned in the questionnaire. The participants were advised that they could leave the study at any moment.

CHAPTER FOUR: RESULTS

4.1 The socio-demographic characteristics of primary caregivers of children below five years at Banadir hospital in Mogadishu Somalia

4.1.1 Gender

Slightly more than half (52%) of the caregivers were females. while 48% of the respondents were male (Figure 5).

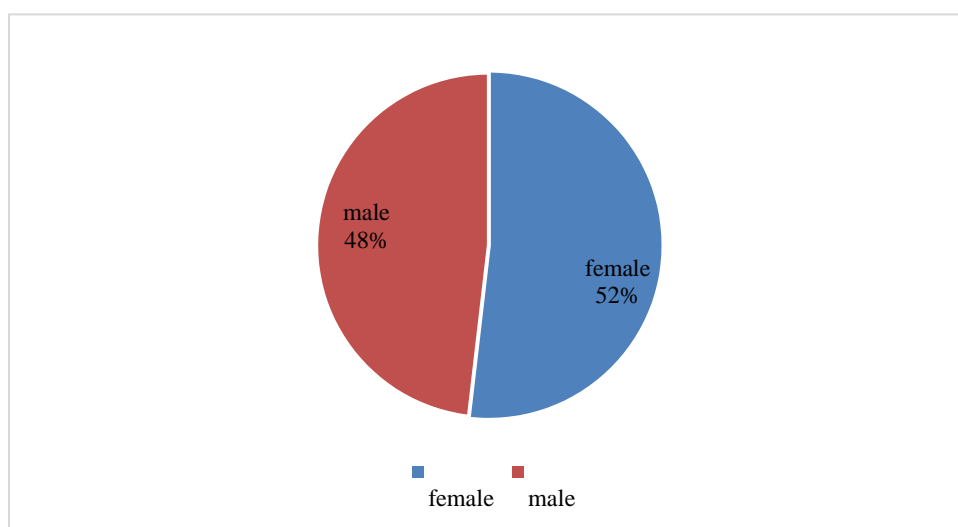


Figure 5: Distribution of caregivers according to their gender

4.1.3 Mother's education level

Those who had adult education were 19.9%, those who had attained university education were 17.4%, and those who had dropped out of primary school were 16.5%, while those who had completed primary school were 11.9% (Table 2). Further, those who had dropped out of secondary school were 10.2%. It was noted that a huge number of caregivers had low levels of education which was seen to have a negative impact on their capability and knowledge to give adequate care to their babies. Of keen interest was the number of mothers who were still in primary and secondary school.

Table 2: Highest level of education of mothers of children below five years Banadir hospitalin Mogadishu Somalia

	Percent
Primary drop out	16.5
Completed Primary	11.9
Secondary drop out	10.2
Completed Secondary	22.0
University	17.4
Adult education	19.9
None education	2.1

1.1.3 Occupation of the mother with under-fives at Banadir Hospital, Mogadishu Somalia

Self-employment was the most common occupation at 34.3% followed by salaried employment at 30.1%, casual labor at 7.6%, unemployment at 13.1%, farming at 3.0%, students at 7.2% and others 4.7% (Table 3). The number of unemployed mothers which, can in essence, be tied to inadequate dietary provisions in case the mother does not have any other alternative support of source of income was 13.1%.

Table 3: Occupation of the mother with under-five at Banadir Hospital, Mogadishu Somalia

	Number	Percent
	N=236	%
Salaried employee	71	30.1
Unemployed	31	13.1
Casual laborer	18	7.6
Self employed	81	34.3
Student	17	7.2
Others	11	4.7
Famer	7	3.1
Total	236	100

1.1.4 Total number of household members with under-five at Banadir Hospital, Mogadishu Somalia

The average household size was 6 members with the highest number of members in a household being 12 and lowest being 2.5 ± 2.144 years (Mean \pm SD).

4.2 Socio-economic characteristics of households with under-five children attending Banadir, Mogadishu, Somalia

4.2.1 Ownership of household assets by households with under-fives attending at Banadir Hospital

It can be noted that technology assets were owned by most household as well as fixed assets of land and plots Television, radio and cell phones were the assets that had higher proportion of ownership distribution of household assets.

4.2.2 Assets owned by the mothers /caregivers of the children aged 0-59 Months attending Banadir Hospital Somalia

The cellphone was the most commonly owned asset among the households in the study at 88.1%. This was followed by television at 79.7%, car at 41.5%, plot at 45.5%, radio at 16.1%, land at 14.8% and motorbike at 13.6%. From the results, it can be noted that technology assets were owned by most households as well as fixed assets of land and plots.

Television (79.7), motorbike (86.4%), and cellphones (88.1%) were the assets that had higher proportion of ownership (Table 4).

Table 4: Assets owned by the mothers/caregivers of the children aged 0-59 Months attending Banadir Hospital Somalia

	Number	Percent
	(N=236)	
Television	188	79.7
Radio	38	16.1
Cellphone	208	88.1
DVD player	16	6.8
Land	35	14.8
Plot	108	45.5
Car	98	41.5
Motorbike	204	86.4

Footnote: all numbers in parenthesis are frequencies

4.2.2 Monthly household income of household with under-fives attending Banadir hospital, Somalia

About 11.4% had a monthly income of between 100 and 150 dollars while 24.6% had a monthly income of 50 to 100 dollars. Most households 16.9% had a monthly income of between 200 and 250 dollars. Those who had a monthly income of between 150 and 200 dollars (25.4% + 19.6%) 45% while 11.4% of the households had a monthly income of 250 dollars and above, 11.4% had a monthly income of between 100 and 150 dollars while 24.6% had a monthly income of 50 to 100 dollars (Figure 5).

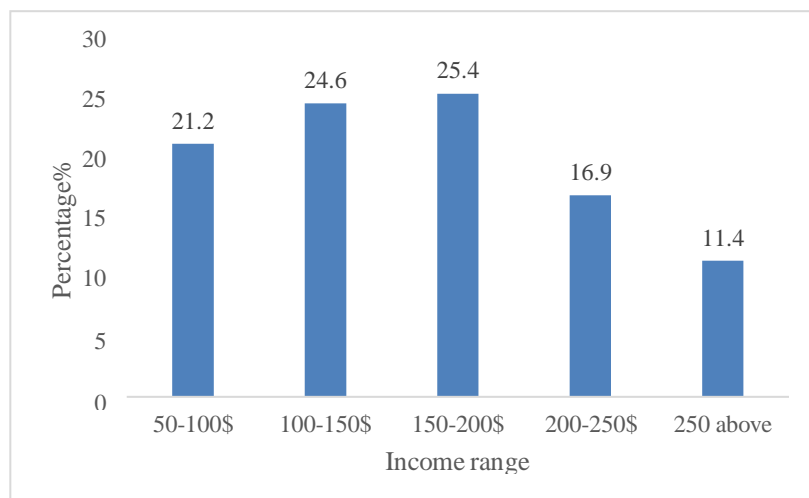


Figure 5: Monthly household income of households with children attending Banadir hospital.

4.3 Places where the children attending Banadir Hospital were born

Slightly more than half of the children were born in hospitals (54%) (Figure 6). About 12% at home while 2% were born at a midwife's place.

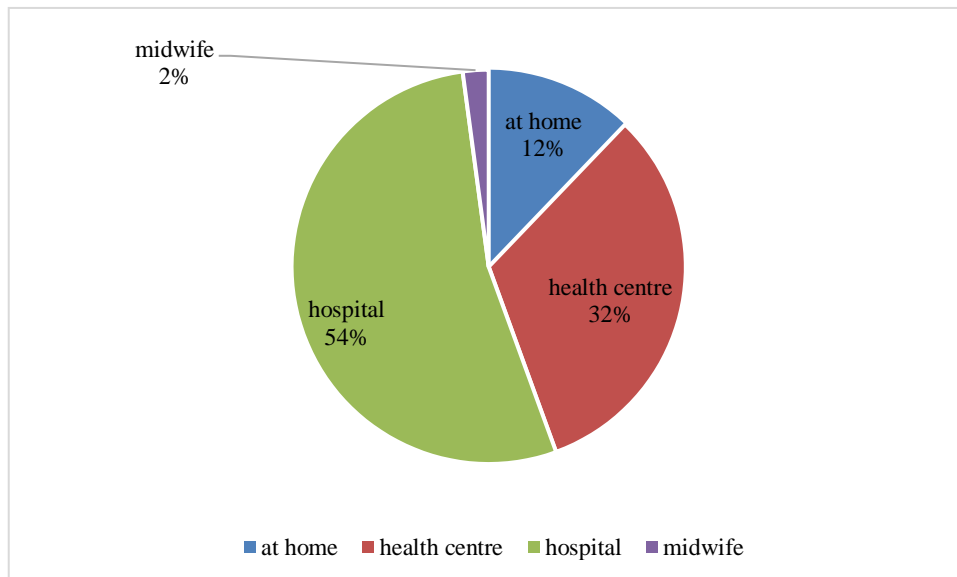


Figure 6: Place where the children attending Banadir Hospital were born.

4.4 Child feeding characteristics of children attending Banadir Hospital

4.4.1 Time of breastfeeding

In most cases (57%) children were breastfed immediately after birth. In 32% of the cases, children were breastfed within the first 30 minutes after birth while in 11%, the children were breastfed after some hours.

4.4.2 Giving colostrum to babies soon after birth the child children attending Banadir Hospital

Nearly all babies (98%) were fed colostrum while only 2% were not fed on colostrum.

4.4.3 Age of caregivers of breastfeeding in mother attending Banadir hospital

The youngest caregiver was aged 18 years while the oldest caregiver was aged 59 years with an average age of 27.7 ± 25.2 years (Mean \pm SD). This shows that there are many young caregivers which might be an indication that there are many young mothers within the Banadir region in Somalia.

4.4.4 Time when breastfeeding was stopped

It was important also to understand the time when breastfeeding was stopped and the reasons for stoppage of breastfeeding among the study participants.

4.4.4.1 Duration of breastfeeding for children attending Banadir Hospital.

On average, breastfeeding was stopped at 9.7 ± 3.4 months with a minimum of 3 month and maximum of 24 months.

4.4.5 Reasons for stopping breastfeeding of children attending Banadir hospital

The babies not getting enough breast milk was the most common reason for stoppage of breastfeeding by 49% of the respondents with 40% noting that the baby having grown up led to the stoppage of breastfeeding. Finally, cultural beliefs contributed to stoppage of breastfeeding as cited by 11% of the respondents (Figure 7). It was worth noting that a considerable percentage of the mothers stopped breastfeeding due to insufficient breast milk, which could have resulted from poor or lackof proper dietary intake by the mothers. This had an effect on the dietary intakes of the children.

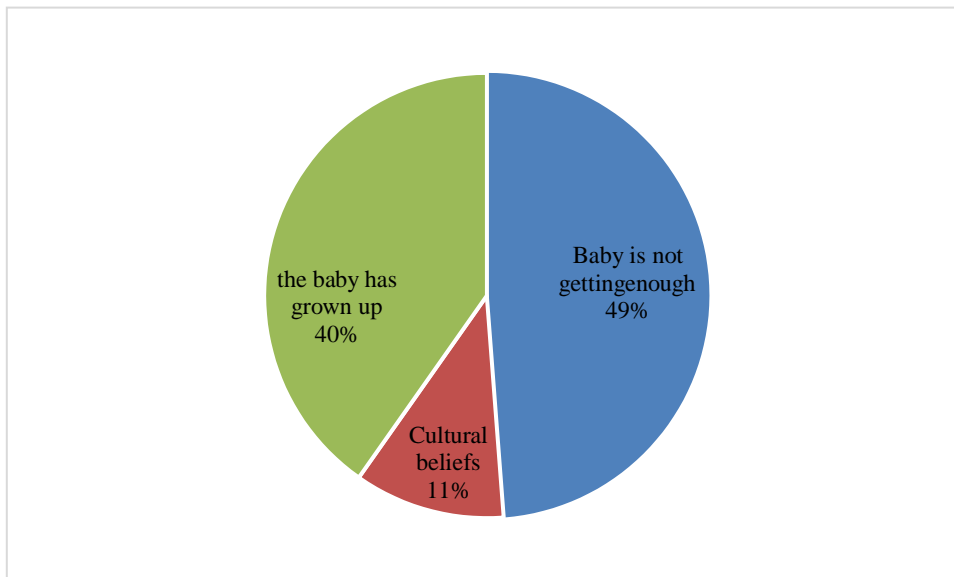


Figure 8: Reasons for stopping breastfeeding of children attending Banadir hospital.

4.4.6 Receiving counselling respondents with children attending Banadir Hospitals

The analysis indicated that most of the participants received consultation about baby care. This was noted among 89% of the respondents with 11% noting that they did not receive consultation about baby care. Further, the study sought to understand the source of consultation received by the participants (Figure 8).

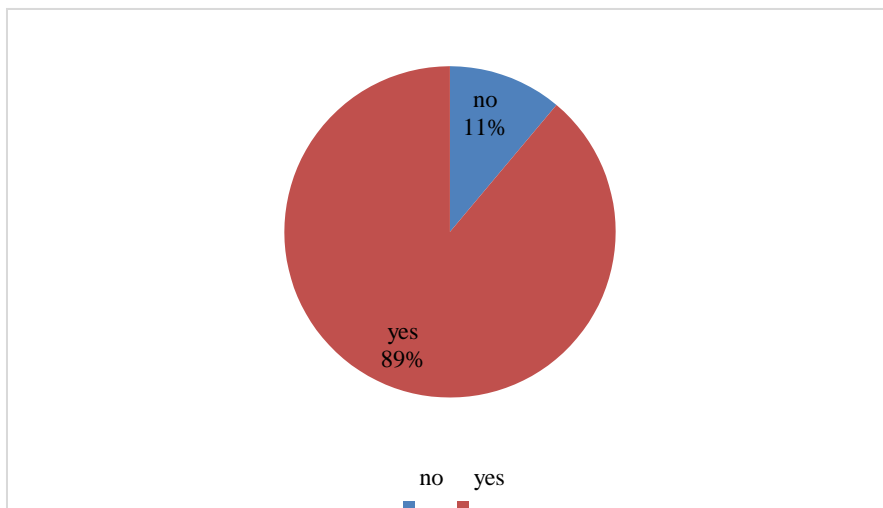


Figure 9: Receiving counselling respondents with children attending Banadir Hospitals

4.4.7 Duration of breastfeeding for children attending Banadir Hospital.

About 5.5% of the children were breastfed for 0 to 6 months. Slightly over a quarter of the children (27.1%) were breastfed for a maximum of 11 to 14 Months. About a fifth of the children (19.9%) were breastfed for 6 to 9 months. and in 6.4%, children were breastfed for a 9 to 11 months. while 7.4% of the children were breastfed for of 14 to 24 months (Figure 9).

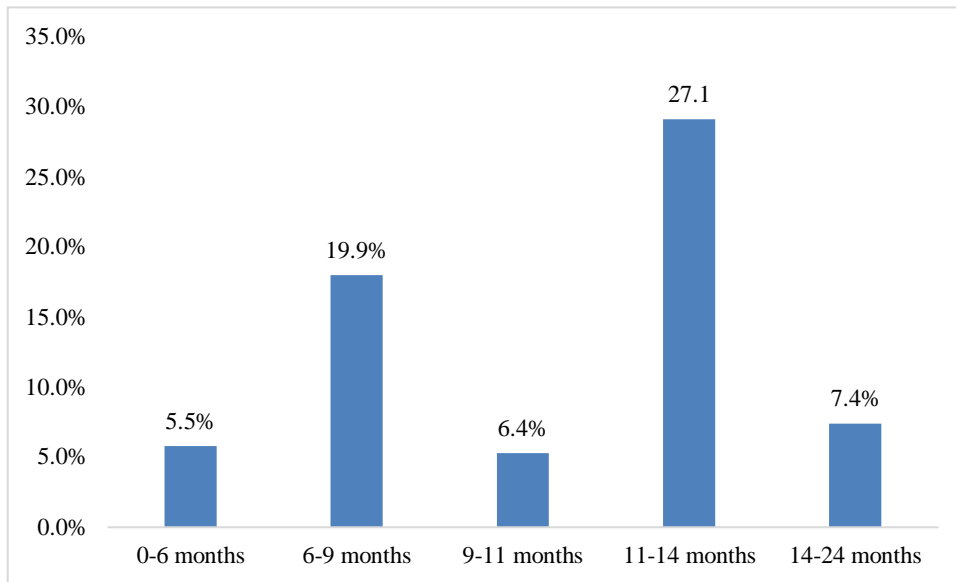


Figure 10: Duration of breastfeeding for children attending Banadir Hospital

4.4.8 Complementary feeding of children under five years in Banadir hospital in Mogadishu

Complementary feeding was introduced mostly between 5 and 6 months. This was noted among 29.1% of the participants who said that they did introduce complementary feeding. Further, as noted by 18%, complementary feeding was introduced between 1 and 2 months, as noted by 7.4%, complementary feeding was introduced at 6 months and more while 5.8% introduced complementary feeding at 4 to 4 months. Those who introduced complementary feeding between one and 30 days were 5.8% (Figure10).

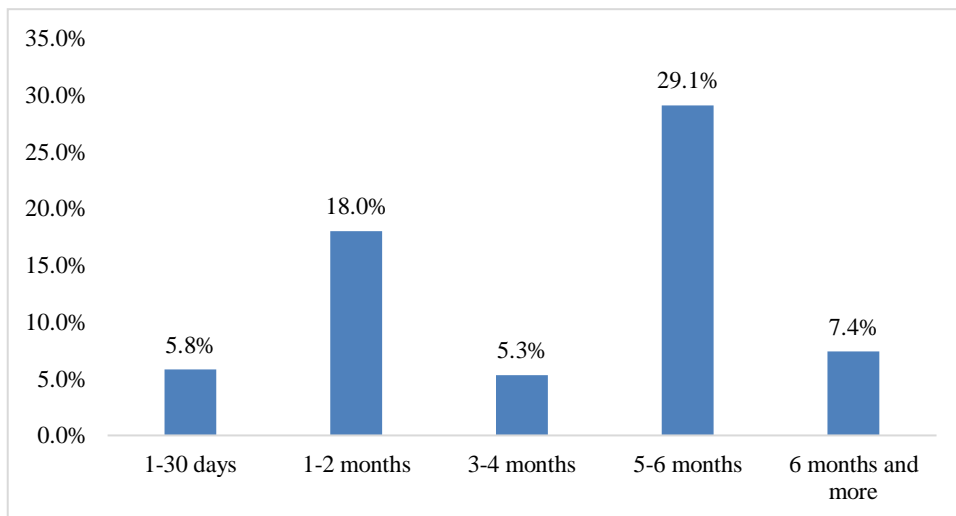


Figure 11: Introduction of complementary feeding of children under five years in Banadirhospital in Mogadishu

4.4.9 Children receiving Vitamin A supplements

The proportion of children who had received Vitamin A supplements was 75.4%, which is significant ($p=0.00$) using Binomial test.

4.4.10 Source of medical consultation for Households with children attending Banadir Hospital

Hospitals were the most prominent sources of consultation about baby care among the participants at 59.7%. This was followed by health centers at 56.4%, community health workers at 26.3%, relatives and friends at 9.3%, private clinics at 7.6%, traditional healers at 2.1 %, local healers at 1.3% and NGOs at 0.4% (Table 5). Most of the caregivers received consultation from recommended sources which are hospitals, clinics, health centers and from community health workers.

Table 5: Source of medical consultation for Households with children attending BanadirHospital

Sources of Medical care	Percent
Health center	56.4
Traditional healer	2.1
Private clinic	7.6
Hospital	59.7
Relatives/friends	9.3
Community health workers	26.3
Local healers	1.3
NGO	0.4

4.5 The nutritional status of children below five years at Banadir hospital in Mogadishu

The other major objective of the study was to determine the nutritional status of children below the age of five years. In doing this analysis, the study used standard measures of Anthropometric index for children which makes use of height, weight and MUAC. The study further used dietary scores obtained from computation of means of intake of different food groups and relating them to a standard scale (Table 6).

Table 6: Distribution of study children by age and gender attending Banadir Hospital

Age in months	Gender of the child					
	Male		Female		Total	
	n	%	no.	%	no.	%
6-17	56	60.2	52	53.6	108	56.8
18-29	14	15	22	22.7	36	18.9
30-41	9	9.6	15	15.5	24	12.6
42-53	7	7.5	6	6.2	13	6.8
54-59	7	7.5	2	2	9	4.7
Total	93	100	97	100	190	100

4.1 Acute Malnutrition of children under-five years in Banadir hospital in Mogadishu

The prevalence of acute malnutrition by gender of the children in Banadir hospital of children 6-59 Months. The prevalence of acute malnutrition was assessed using weight-for-height z-scores and presence of oedema. The prevalence of GAM was 13.3% and 9.7% of the children were moderately malnourished while 3.6% severely malnourished. There was no a significant difference in prevalence of wasting between boys 14.4% and girls 12.2% ($p=0.278$) (Table 7).

4.1.1 Prevalence of underweight of children under-five years in Banadir hospital in Mogadishu

The total percentage of children in Banadir hospital aged 6-59 months old category underweight was 26.1% (20.8 - 32.2 95% C.I.). The children aged 6-59 months old 13.70% (9.8 - 18.8 95% C.I.) were moderately while 4.1 % (2.1 - 7.8 95% C.I.) severe underweight (Table 7).

4.1.2 Stunting of children under-five years in Banadir hospital in Mogadishu

The total percentage of stunted children in the age of children in Banadir hospital aged 6- 59 months old was 30.8 % (25.0 - 37.3 95% C.I.) In the same age category, more than three-quarters (79.4%) of the children aged 6-59 months were normal while 21.8 % (16.8 - 27.8 95% C.I.) were moderately and 9.0 % (5.8 - 13.6 95% C.I.) were severely stunted (Table 7).

Table 7: Nutritional status of children aged 6-59 Months in Banadir Hospital

Indicators of nutritional status	Prevalence %	95% Confidence interval (CI)
Weight-for-length/height (Wasting)		
Wasting	13.3	9.3 - 18.8
Moderate (<-2 z-score and >=-3 z-score)	9.7	6.3 - 14.7
Sever (<-3 z-score)	3.6	1.7 - 7.2
Length-for-Age (Stunting)		
Stunting	30.8	25.0 - 37.3
Moderate (<-2 z-score and >=-3 z-score)	21.8	16.8 - 27.8
Sever (<-3 z-score)	9.0	5.8 - 13.6
Weight-for-age(underweight)		
Underweight	26.1	20.8 - 32.2
Moderate (<-2 z-score and >=-3 z-score)	13.7	9.8 - 18.8
Sever (<-3 z-score)	12.4	8.7 - 17.3

4.1.1 Morbidity experience of children under-five in Banadir Hospital

About 37.5% of in the seven days leading up to the poll, respondents said their children had been sick with one or more illnesses. The majority of respondents said it was followed by diarrhea. (37.5%), vomiting (25.0%), cough (20.8%), pneumonia (16.6%), fever (16.6%), constipation (16.6%), lack of appetite (8.3%), nausea (4.2%) and bronchitis (4.2%) (Figure 11).

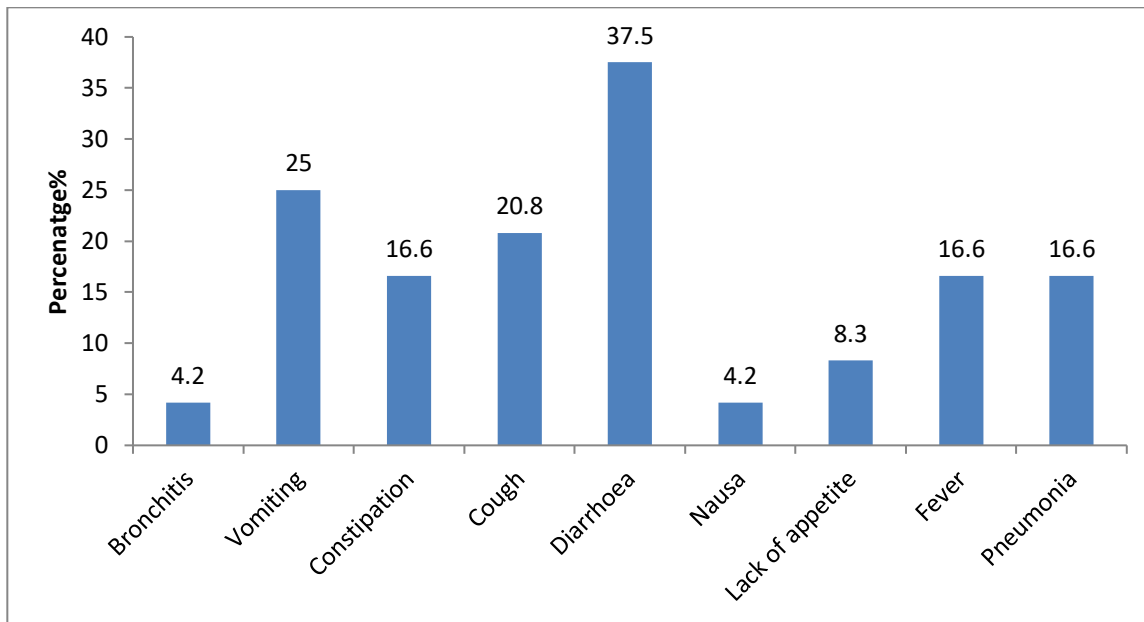


Figure 12: Prevalence of Illness among Children Under Five Year in Banadir hospital.

4.2 Child health status under-five in Banadir Hospital

4.7.1. Immunization status of the children under-five in Banadir Hospital

About 58.5% of the children were fully immunized while the rest (41.5%) had not received all the recommended vaccines (Figure 12). All the children had received the OPV0, OPV1 and DPT1 vaccines. Seventy-Six point four (76.4%) received the BCG vaccine.

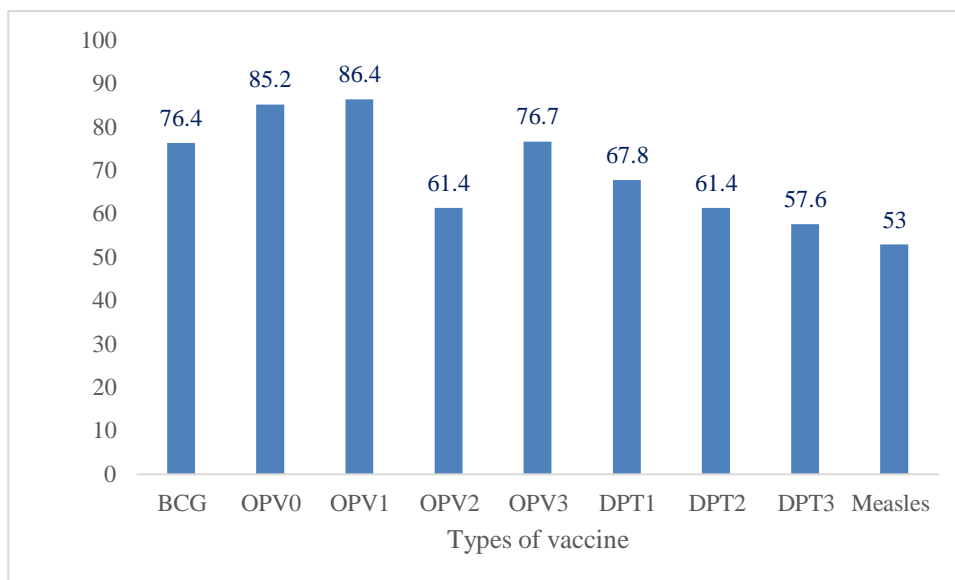


Figure 13: Immunization of Children aged 0-59 Months Old

4.3 Water availability, hygiene and sanitation status of the households at Banadir hospital in Mogadishu.

To establish the availability of water, hygiene and sanitation status among the households studied.

4.3.1 Main source of drinking water of the households at Banadir hospital in Mogadishu

Tap water was the main source of drinking water for 95.8% of the respondents (Figure 13). Boreholes were used as main source of water by 3.8% of the respondents while 0.4% used rain water.

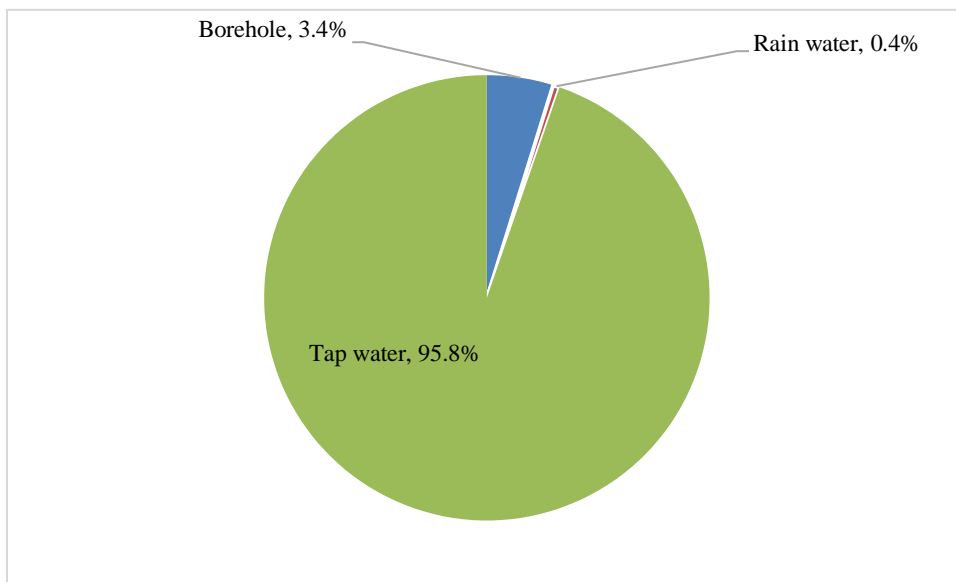


Figure 14: Main source of drinking water of the households at Banadir hospital in Mogadishu-Somalia.

4.1.1 Treating drinking water of the households at Banadir hospital in Mogadishu-Somalia

The half of the households did not treat drinking water. Among those who treated drinking water, 28.4% used chemicals, 7.6% used traditional herbs, 11.9% boiled the water while 5.1% filtered or sieved the water (Table 8).

Table 8: Treatment of drinking water of the households at Banadir hospital in Mogadishu-Somalia

Methods	percent
Boiling	11.9
Filter/sieving	5.1
Traditional herbs	7.6
Chemicals	28.4

4.1.2 Storage of portable water by households with children attending/admitted at Banadir Hospital

In most of the household’s portable water was covered among 96% of the respondents with 4% noting that water was not covered when stored.

4.1.2 Storage of portable water by households with children attending/admitted at Banadir Hospital

4.1.2.1 Type of toilet facility water by households with children attending/admitted at Banadir Hospital

About 70% of the study participants had flush toilet facilities. Households with ventilated improved toilets were 21% while 9% used traditional pit latrine (Figure 14).

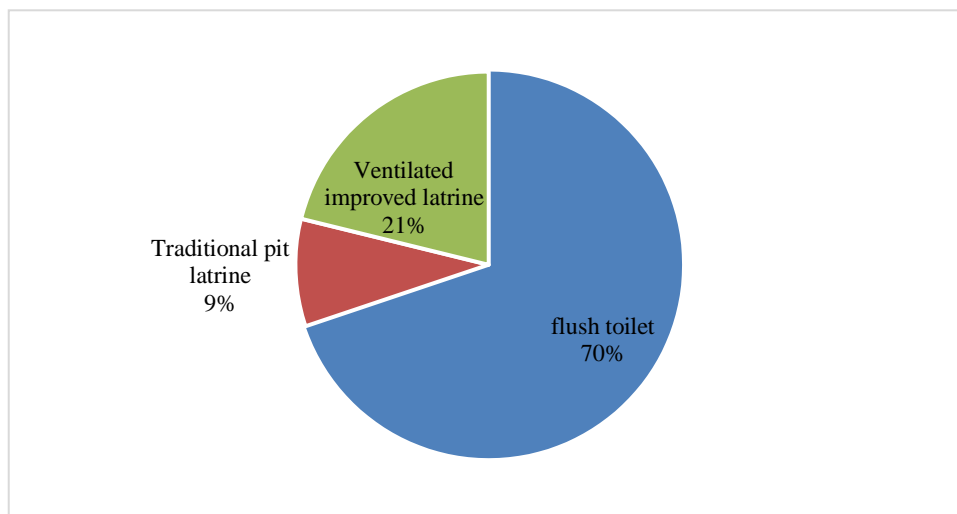


Figure 15: Type of toilet facility water by households with children attending/admitted at Banadir Hospital.

4.1.3 Frequency of washing hands households with children attending/admitted at Banadir Hospital

The most of the caregivers (63.3%) washed their hands before feeding their children. This was observed among participants. About 21.2% of the respondent washed their hands before eating, 8.1% washed their hands after visiting the toilet. Only 7.6% washed their hands before preparing food (Table 9).

Table 9: Frequency of washing hands households with children attending/admitted at Banadir Hospital

	Frequency	Percent
After defecation visiting toilet	19	8.1
Before eating	50	21.2
Before feeding the child	149	63.1
Before preparing food	18	7.6
Total	236	100.0

4.1.4 Presence of hand washing facilities in Banadir hospital in Mogadishu

About 87.7% participants had hand washing facilities with soap (Table 10). Further, 12.3% participants had hand washing facilities but without soap.

Table 10: Presence of hand washing facilities in Banadir hospital in Mogadishu

Use of soap	Frequency	Percent
Washing hands without soap	29	12.3
Washing hands with soap	207	87.7
Total	236	100.0

4.2 The dietary intake of children under-five years in Banadir hospital in Mogadishu

Being the second objective of the study, it was important to understand the dietary intake of children below the age of five years as a result of various factors which include among others, their caregivers' socio-economic characteristics.

4.2.1 Food given to children under five years in the last 24 hours at Banadir hospital in Mogadishu

Water (26%), was the most frequently item given to under-five children at Banadir in the previous 24 hours. This was followed by milk at 20.8%, breastmilk at 20.5%, while porridge given to about 12.1%, of the children. Solid or semi solid foods and vegetables or fruits were given to 11.3% and 9.3% respectively (Table 11).

Table 11: Food given to under five children in last 24 hours at Banadir hospital in Mogadishu

Warning-food Respondent's	percent (%)
Breast milk	20.5
Water	26.0
Milk	20.8
Porridge	12.1
Vegetables or fruits	9.3
Solid or semi foods	11.3

4.2.2 Frequency of serving food in a day of children under-five years in Banadir hospital in Mogadishu

Food was served four or more times in a day. This was as noted by 69% respondents. Those who mentioned three times observing food were 64%, 26% mentioned serving food two times while 13 mentioned serving food once (Figure 15). It was noted with concern the situation where food was served to children once.

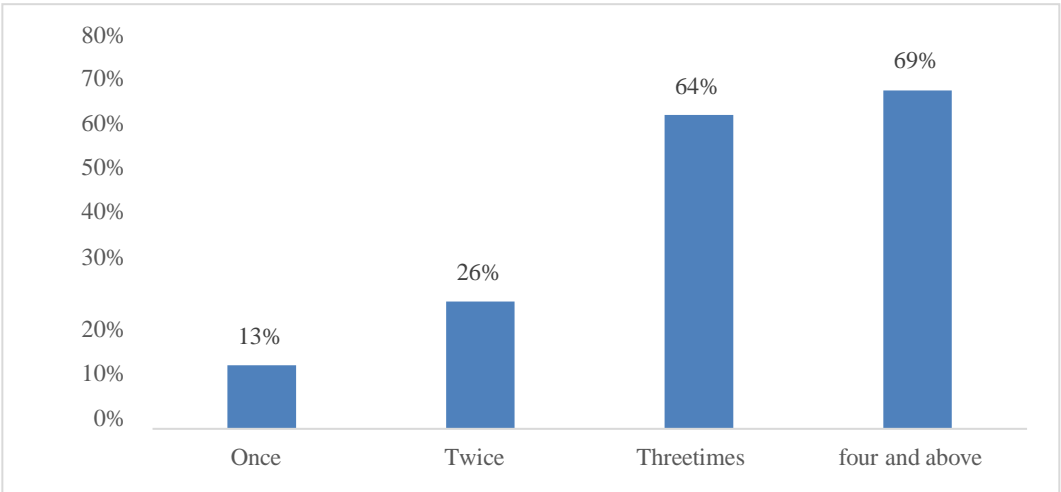


Figure 16: Frequency of serving food in a day

4.2.3 Food intake frequency of study children under-five years in Banadir hospital in Mogadishu

4.2.3.1 Food intake by consumption rate of study children frequency of under five-year-old children intake in Banadir hospital in Mogadishu

Dairy products, are the most regularly consumed foods as they are consumed daily by over half of the respondents. Rice, pasta and the milk power are the least consumed products as more than three in every ten of the respondents consume them after a long time.

The food consumption frequency is as summarized.

4.3 Dietary diversity score and food consumption frequency of children under-five years in Banadir hospital in Mogadishu

The mean DDS was 2.9 ± 0.68 , minimum was 1.0 and maximum was 5.0. Majority of the children (83.2%) had eaten food prepared from dairy products. The intakes of vitamin A rich fruits and vegetables were 52%, meats were 58.1% while the consumption of starchy food (79.7%) was from grains, tubers and roots (41.1%), and lower in eggs (45.3%) and least for legumes and other fruits vegetables (59.6%) and (52%) (Figure 16).

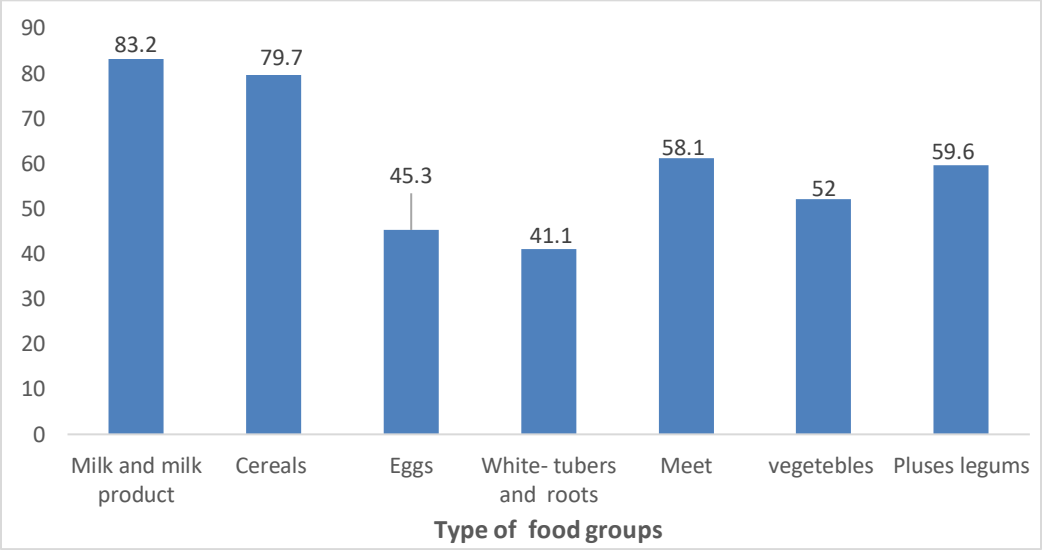


Figure 17: Distribution of Children by Food Group Consumed.

Table 12: Distribution of food by frequency of consumption by under five-year-old children in Banadir hospital in Mogadishu

Food item	Daily	3-6 times per week	Once or twice per	Once per month	After a long time
Rice	11.0	39.4	11.4	3.4	7.6
Sorghum	8.0	25.8	20.3	13.1	1.0
Maize	22.0	38.0	14.0	5.0	4.0
Pasta	4.7	30.0	28.0	3.4	11.0
Liver	3.0	8.5	24.6	23.3	18.8
Kidney	2.0	36.5	45.0	7.0	3.0
Heart	2.0	3.8	16.5	31.8	18.6
Meat	0.1	17.5	54.0	12.5	16.0
Chicken	2.0	32.0	45.0	11.0	12.0
Egg	5.1	34.3	22.9	8.9	7.6
Fish	2.0	29.0	53.0	9.0	7.0
Peas	0.4	8.9	15.0	7.2	46.2
Milk powder	79.0	12.5	4.0	2.0	2.5
Cow's milk	12.7	20.5	45.9	16.2	4.7
Butter	2.1	11.9	15.3	17.8	3.8
Honey	4.2	21.2	33.9	9.3	11.0
Cake-tea-with milk	14.4	18.2	18.6	8.1.0	16.5
Tea without milk	8.9	17.8	24.2	8.9	16.5
Sugar	3.0	35.5	22.9	11.9	1.0
Watermelon	33.5	17.8	35.2	6.8	11.4
Fats	4.7	8.5	19.1	16.5	28.8
Oils	11.4	9.3	16.1	13.1	28.8

Footnote: the numbers are percentages (%).

4.10.2 Distribution of study children by their dietary diversity scores in Banadir Hospital in Mogadishu

Out the seven consumed food groups, the mean DDS was 5.2 ± 2.3 . Majority had a high DDS comprising of 78.2%, minority 4.2% had a moderate DDS and 17.6 had a low DDS respectively (Figure 17).

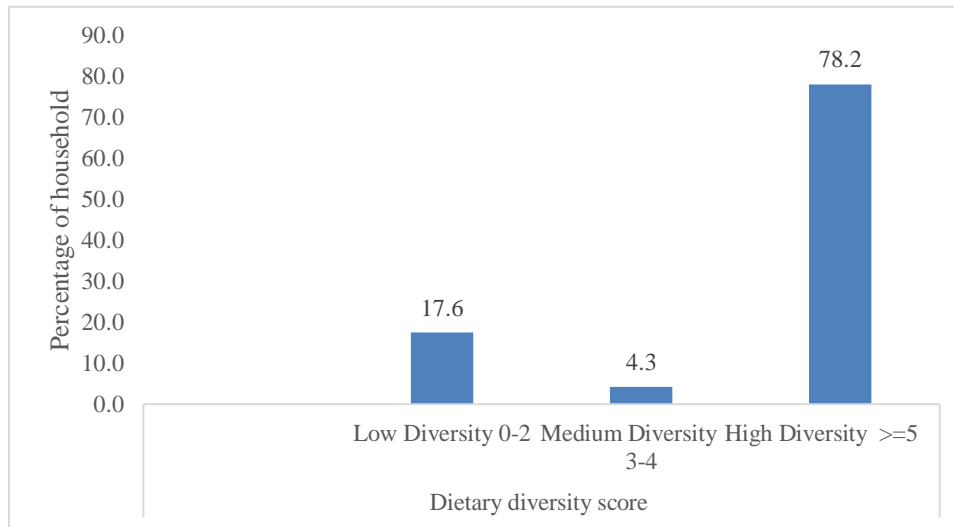


Figure 18: Distribution of Study Children by their Dietary Diversity Scores

4.4 Factors Associated with Nutritional Status of children under-five years in Banadir hospital in Mogadishu

4.4.1 Socio-demographic factors and nutritional status of the children in Banadir hospital in Mogadishu

Bi-variate analysis was performed on various selected variables with nutritional indices of the children to determine possible associations. A linear relationship was not found to exist between underweight, stunting and wasting among the children under five years after an inter-variable Pearson correlation analysis. Positive correlation was only found for stunting but not significant correlation was observed between children's age and nutritional status based on wasting and underweight ($r = -0.039$ and $r = -0.005$ respectively). Household size was positively and significantly correlated to stunting and wasting ($r = 0.151$, $r = -0.136$ respectively). There was no significant relationship between the three indicators of nutritional status (HAZ, WAZ and WHZ) and gender and education level of the household head. Similarly, there were no direct significant associations

between household income and nutritional indicators (HAZ, WAZ and WHZ). However, there was a significant association ($p < 0.05$) (Table 13).

Table 13: Association between study population characteristics and nutrition status of under-five attending Banadir hospital in Mogadishu

Characteristics	WAZ		HAZ		WHZ	
	R	P-Value	R	P-Value	r	P-Value
Age in months	-0.005	0.942	0.34	0.638	-0.039	0.598
Sex of the child	0.042	0.52	-0.034	0.602	0.06	0.36
household heads education level	-0.045	0.242	0.036	0.109	-0.052	0.542
Education level of the mother	0.078	0.325	0.126	0.159	0.018	0.845
Household size	0.003	0.958	0.151	0.02	-0.136	0.038
Morbidity status	0.159	0.073	0.036	0.684	.173*	-.040
Water treatment	0.042	0.525	-0.193	0.321	0.182	0.421
Exclusively breastfed	-0.06	0.726	-0.95	0.33	0.236	0.132
Introduction to complementary feeding	-0.042	0.54	-0.057	0.652	0.441	0.069

** Correlation significant at 0.01 levels (2 tailed). *Correlation significant at 0.05 levels (2 tailed); WAZ- weight-for-age z-score, HAZ-height-for-age z-score, WHZ-weight-for-height z-score.

4.4.2 Distribution of morbidity pattern by nutrition status of children under-five years in Banadir hospital in Mogadishu

A child who was sick last 7 days prior to the survey were not more likely to be wasted than a healthy child (Odds Ratio; 0.937, 95% C. I = 0.369-2.37). stunted – indicated if the child is sick is more likely to be stunted (Odds Ratio; 1.24, 95% CI = 0.519-2.960). Under-weight- be sick if a child is under weight (Odds Ratio; Also, there was likeliness there was no direct relationship between water treatment, use of source of drinking water and nutritional status ($p > 0.05$) (Table 14).

Table 14: Distribution of morbidity pattern by nutrition status of children under-five years in Banadir hospital in Mogadishu

	Child sick in the last 7 days		P-value	OR	95% C. I
	Yes %	No %			
Underweight					
Yes	10.6	89.4	0.529	0.937	0.937-2.37
No	10	90			
Stunting			1.24	0.519	0.519-2.960
Yes	13.3	86.7			
No	11	89			
Wasted			0.684	0.255	0.255-1.836
Yes	10.6	89.4			
No	9.5	90.5			

CHAPTER FIVE: DISCUSSION

5.1 Socio-demographic characteristics of children below five years at Banadir Hospital Mogadishu, Somalia

Majority of the primary caregivers of children under the age of five were females. A finding similar to a study done by (Omer et al. 2020) in Mogadishu, Somalia where women comprised of over 60 % of the population who were mothers/caregivers. The average age of the primary caregivers was 27years. A similar study in observed a mean age of the mothers/caregivers was 28.70 (\pm 7.88) years (Guled, R. A.2016). There is also a researcher who observed a slightly older study population (36- 50 years) of caregivers possibly contributed by the location of the hospital relative the surroundingtown development (Abdisalam A, 2020). This finding indicates that there is a high prevalence of young parents in Banadir area which is relatively less advance than where the other researcher worked. A high percentage of caregivers had low levels of literacy.

Slightly less than a fifth had of the respondents had completed university education (Ismail, M. B, 2020). A study in Shabelle zone, Somalia region, observed that 87.5% of the mothers/caregiver, were illiterate (Guled, R. A.2016). Although the literacy levels are generally low, it might also be region or area of study specific. According to other researchers this might have contributed negatively totheir caregiving capability and knowledge (Abdisalam A, 2020). which might have contributed negatively to their caregiving capability and knowledge (Abdisalam A, 2020).

Nutrition knowledge correlated with inadequate nutritional status their children which probably in this case led to different forms of nutritional deficiencies. A study by (Khalid, M. 2015). Carried out in Somalia, found that nutrition knowledge of the correlated with child feeding practices which in turn impacted on the nutritional status of the under-fives.

Nutrition knowledge correlated with inadequate nutritional status their children which probably in this case led to different forms of nutritional deficiencies.

The study observed that, less than a fifth of the mothers were unemployed mother's/care givers which is slightly more than another similar study where the researcher observed that 8.6% (Ismail 2020). A third of the caregivers are self-employed while a researcher in the same country found slightly more than a quarter self-employed (Ismail 2020). The occupation of the mother plays a

significant role in determining her availability for caregiving as well as income for purchase of the required dietary requirements for the child (FAO, 2011).

The average household size was large. This finding is similar to a study in Shinille Woreda, Ethiopia Somalia where 71.8% of the households had more than 5 members and the family size was A significant risk factor of childhood malnutrition as measured by stunning (Ma'alin, A. et. al., 2016).

This finding also agrees with the country's index at 6.2% (UNFPA 2014) and Somalia Demographic Health survey, (2020). At household size of 5.3 – 6.2. Large household sizes are negative indicators of under-five nutritional status in a community (Rather, 2004). The household assets owned by the highest proportion of the respondents were television, motorbike, and cell phones. Mohamed, I. I., (2019) found that Television, radio and cell phones were the assets that had higher proportion of ownership. These same researcher on to find that more than twice the proportion of children from the low wealth index households were malnourished as compared to the high wealth index households Our study results also agree with. The Somali Demographic Survey (2020). Had almost similar findings with cellphone ownership (74.4%) but the television and motorbike were significantly lower at 20.5% and 0.7% respectively. This could mean that if the Somali community is stratified by ownership of assets the Banadir Somalia region is significantly economically more empowered.

5.2 Water availability, hygiene, and sanitation status of households of under-fives attending Banadir Hospital, Mogadishu Somalia

Majority of the residents of Banadir depended on tap water with the least proportion of respondent's dependent on rain water. The Somali Household Demographic Survey (2020), reported a similar pattern with the majority of the population at 43% had access to piped water coming into their dwellings, yard or plot. The Somalia National Development Plan (2018). emphasizes water availability as a top priority as a public health concern Half of the population do not treat drinking water and waterborne diseases were also observed to be high, in the study households. Cheraghi (2014), in a similar study observed that many illnesses especially waterborne and food borne correlated with level of water treatment by the population. In the study community,

low number of the community using any form of water treatment is a reflection of the low level of literacy and could be confounded by poor hygiene practices besides poverty. Although the majority covered water storage containers, the cleanliness of the storage containers was not assessed. Slightly less than three quarters of the study households in Banadir use flush toilets. Waste disposal is a major determinant in the development of diarrheal diseases among other public health complications. These statistical findings concur with a report by (Cairncross et al., 2020) which indicated an increased toilet facility of 57% from 49% in 2019 Somalia countrywide. A relatively lower percentage of the caregivers washed their hands before eating, while very few (less than ten percent) washed their hands after visiting the toilet. This is a contrary find from an observational study conducted during the survey stipulated that majority of the caregivers washed their hands before feeding their children (The Directorate of National Statistics, Ministry of Planning, Investment and Economic Development & Somalia., 2020).

5.3 Dietary intake of under- five children attending Banadir Hospital, Mogadishu Somalia

Most of the children were not breastfed for the specified 24 months but for slightly over half that period meaning that the breastfeeding practices were suboptimal. Water was the item most frequently commonly given to under-fives in the study population followed by breast milk. Of the several types of foods. Some studies show that often food in form of potatoes and biscuits or porridge (in all live hood zone) are introduced to most children after the 3rd month of life. In households where have difficulties accessing milk. the milk is often replaced with tea or porridge after the third month (FSAU/FAO, 2007).

water was the most common type that was given while cow's milk comes second. A close type of food consumed is breast milk. Fruits and vegetables are the least consumed foods.

The breastfeeding regime of children under the age of five however, does not show consistency with the national findings that reported a breastfeeding rate of 45% for children in the same age bracket (Mohamud A. M 2018). These national breastfeeding rates are however, below the World Health Organization reported rates of 74% on the global report. The study established that complimentary feeding was introduced earlier for majority of the children. the study found that there was inappropriate or lack knowledge on proper feeding practices in all livelihood zones (FSAU/FAO, 2007).

Although the World Health Organization's recommended age for introduction of complementary feeding after 6 months (WHO, 2008), This practice is attributed to the new trend of unexclusive breastfeeding (UNICEF, 2018). Children between 6-59 months were fed twice a day or less. These results concur with a similar study which was conducted in Somalia and reported the same findings (Masese, 2016). This practice can be related to the lack of food as a result of low-income levels among caregivers. Breast milk, water and other types of milk were the most common food types fed to children within the last 24 hours prior to the study. Other food types included porridge, vegetables and fruits and other solid and semi-solid foods. The key issue that was noted here was that complementary food besides playing key role in the dietary status of the children was being given to the children much more in comparison to breast milk.

The study observed that majority of the households feed their children inadequate times a day, that is less than 5 times (3 meals and 2 snacks). The frequency of feeding plays a key role in ensuring that they have access to the recommended dietary intake (*Abdisalam, 2020*). The majority of the under-fives in this study had an adequate dietary diversity score which was a determinant of access to a variety of foods. The same findings were reported in a similar study conducted in Somalia (Kennedy et al., 2015). The frequency of feeding was related to availability of food and a spectrum of feeding difficulties characterized by fussy eating. Low food frequency to children was a predictor in the nutritional status of children. Whereas children require nutrients from food for their growth and development, deprived dietary intake has a negative effect on their dietary status and nutritional status (Kennedy et al., 2015). The study established that most of the study children received Vitamin A supplements as part of enriching their dietary intake. However, the frequency at which the children received Vitamin A supplements was quite low in comparison to the required standards (Jason J et al., 2017).

5.4 Nutritional status, of children aged 6-59 months in Banadir Hospital Mogadishu, Somalia

5.4.1 Wasting in children aged 6-59 months in Banadir Hospital Mogadishu, Somalia

According to the current study, the percentage of severely and moderately wasted children aged 6-59 months was quite high. Abdullah (2018). Found a significant frequency of wasting (14.3%) in Mogadishu youngsters in his study. The study's results were also higher than global levels (6.7%),

indicating a population at danger of long-term malnutrition (Omer et al., 2020; Gebre et al., 2019). The global percentage of prevalence of wasting as reported by WHO was 7.3% in children under 5 years (UNICEF WHO). The World Bank, 2019). The Somalia Demographic Health Survey (2020) and According to the Federal Government of Somalia's Directorate of National Statistics (2020), wasting in Somali children might be as high as 28%, particularly among children under the age of six months. Wasting is a symptom of children's poor feeding habits, which can be linked to malnutrition (Fekadu et al., 2015). The region's poor supplemental feeding habits are directly responsible for severe wasting (Mihretie, 2017; UN, 2011). The high rate of malnutrition could be a reflection of the study area's feeding practices.

5.4.2 Stunting in children aged 6-59 months in Banadir Hospital Mogadishu, Somalia

The study found low stunting levels in children of the respondent. The figures were lower than those published by the Somalia Demographic Health Survey, which found that 28% of Somali children under the age of five are stunted, with 17% severely stunted (Directorate of National Statistics Federal Government of Somalia, 2020). A study in Bangladesh, observed that stunting level in children were significantly higher in rural (38.1%) areas than urban (31.2%) areas which usually observed in most studies (Akram, R. et.al, 2018). Other factors, like as unpredictable rainfall and seasonal vegetation, could explain the stunting levels in Somalia, confounding the prediction models for stunting (Kinyoki et al., 2016). Stunting in children is influenced by the child's sex and age, the mother's age and level of education, wealth status, source of drinking water, breastfeeding length, and domicile, according to Mzumara et al. (2018). Consumption of inadequate food categories exposes children to the danger of stunting due to low nutritional intake, according to studies (Mwaniki et al., 2014; Sanin et al., 2018). Stunting in children is also caused by improper food supplementing during the weaning stage, when infants should shift from exclusive nursing to incorporating supplementary meals in their diet (Nshimyiryo et al., 2019). The relationship between household income and stunting is inverse because household income is utilized to buy food for the children (Nshimyiryo et al., 2019).

5.4.3 Underweight in children aged 6-59 months in Banadir Hospital Mogadishu, Somalia

The percentage of children aged 6 to 59 months who were underweight was high, indicating that they were malnourished. in Banadir. Other studies, have also found high underweight levels (27%) in Daynile, Somalia (Abdi, A. I, 2020). Underweight in children could be linked to poor complimentary feeding habits and low-quality foods which lack enough nutrients to meet the child's dietary requirements and this could be due to famine and food insecurity in Mogadishu (ARC, 2018). According to research conducted by the Food Security and Nutrition Analysis Unit, malnutrition is widespread in Mogadishu, with high rates of acute and severe malnutrition worldwide (FSNAU, 2016). Malnutrition in children is dangerous because it can cause physical repercussions such as growth retardation.

5.5 Factor associated with nutritional status of under-fives attending Banadir Hospital, Mogadishu Somalia

Stunting was positively correlated with and the income status of the study household head A similar study by Ma'alin, A. et. al., 2016). observed that stunting in children was 3.5 times higher in households having monthly income of less than 750 birr than those households having Monthly income of greater than 750 birrs (AOR=3.48,95%CI:1.99 to 6.06.

However, there was a significant association between household size with stunting and wasting. This finding concurs with a study by two researchers (Pape, U.J. and Wollburg, P.R., 2019) which attribute this status to the food insecurity in the country and the impact of drought on food insecurity. This score thus supposes that children under five years in Banadir region eat different food items on a regular basis and this thus, contributes to a higher dietary diversity. In turn, this is expected to have a positive effect on their health and nutritional status (Kennedy et al., 2015). The high prevalence at slightly less than a third stunting compared to the national (14.3%) and Africa tally (6.4%) but higher than the global at 16% (UN-FAO-FSNAU 2018).

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The demographic characteristics of the mothers (age, level of education, monthly income and consultation seeking behaviours) play a positive role in their caregiving practices and overall nutritional status of the children under the age of 5 years. Caregivers with high academic achievement than primary level make informed choices on young child feeding. The study concluded that most of the households have access to tap water which is considered clean and safe for drinking and household use. However, some households do not treat their drinking water before using it. The study also concluded that all the households use a toilet facility rather than open defecation, an indication that safe hygienic practices of safe and proper disposal of human waste is practiced. Furthermore, hand washing as a hygienic practice is highly observed by the caregivers as a way of controlling and eliminating spread of diseases and infections, thus ensuring healthy caregiving. The study children are not exclusively breastfeeding and the complementary feeding practices are inadequate which might have contributed to poor nutrition status of children. The study children are malnourished and have a low dietary diversity of the diet contributing to malnutrition, which manifests in hospital admissions for under-five in the study area.

6.2 Recommendations

There is need to have all the accompaniments for hand washing which include running water and soap so as to handwashing an effective practice as it was observed that some households lacked these important accompaniments, this should be provided by the municipality or the government of Somalia.

The government through the health ministry and health stakeholders need to increase awareness creation among not only mothers but also all primary caregivers (mothers and fathers) on the importance of exclusive breastfeeding, feeding the baby with colostrum and early first feeding, in prove the diet quality of the children.

Women need to be highly encouraged and enticed to deliver their babies at health facilities, which will enable health workers give mothers/caregivers' nutrition education.

REFERENCES

- Abdisalam, I. A. (2020). Recovery Rate and Child Growth After Supplementary Feeding in Daynile District Hospital, Mogadishu–somalia (Doctoral dissertation, University of Nairobi).
- Adeladza, A. (2009) the influence of socio-economic and nutritional characteristics on child growth in Kwale District of Kenya. *African Journal of Food, A agriculture, Nutrition and Development*, 9(7)
- Ajao, K. O., Ojofeitimi, E. O., Adebayo, A. A., Fatusi, A. O., & Afolabi, O. T. (2011). Influence of family size, household food security status, and child care practices on the nutritional status of under-five children in Ile-Ife, Nigeria. *African journal of reproductive health*, 14(4).
- Akinlosotu, R. A., & Hussain, M. A. (1985) The usefulness of height at first year of schooling as an index of nutritional status of a community, *Nigerian Journal of Nutritional Sciences*, 6(1), 29-35.
- Alshareef, M, Mobaireek, Mohamud, M., Alrajhi, Z., Alhamdan, A., & Hamad, B. (2018). Decision Makers' perspectives on the language of instruction in medicine in Saudi Arabia: A qualitative study. *Health Professions Education*, 4(4), 308-316.
- Ambuchi, J. J. (2011). Flood Disaster Preparedness and Management in Schools: A Case Study of Budalangi Area in Busia County.
- Amos, O. (2009). The Urban and peri-urban dairy industry: Research and Policy. International Livestock Research Institute (ILRI).
- ARC, (2018). Short-term disuse promotes fatty acid infiltration into skeletal muscle. *Journal of cachexia, sarcopenia and muscle*, 9(2), 335-347.
- Arroyo, M. T., & Lanas, A. (2010). Adverse effects of non-steroidal anti-inflammatory drugs (NSAIDs, aspirin and coxibs) on upper gastrointestinal tract. *Best practice & research Clinical gastroenterology*, 24(2), 121-132.
- Arroyo, M., Freire, M. Anzoátegui, L., & Rocandio, A. M, (2010) Interobserver error associated with anthropometric measurements made by dietitians. *Nutr Hosp*, 25(6), 1053-1056.
- Bain et al., (2013). *Barriers to new competition*. Harvard University Press.
- Bellamy, C. (1998). The State of the World's Children 1998: Focus on Nutrition. UNICEF, UNICEF House, 3 UN Plaza, New York, NY 10017; World Wide Web: [http://www. UNICEF. Org](http://www.UNICEF.Org),
- Black Trude,(2020) The Impact of Funding on Quality of Early Childhood Education Service Provision in Zambia from 2015-2018.
- Blossner, M., De Onis, M., & Prüss-Üstün, A. (2005). *Malnutrition: quantifying the health impact at*

national and local levels. World Health Organization.

- Bunjun, R., Riou, C., Soares, A. P., Thawer, N., Müller, T. L., Kiravu, A., ... & Burgers, W. A. (2017). Effect of HIV on the frequency and number of mycobacterium tuberculosis-specific CD4+ T cells in blood and airways during latent m. Tuberculosis infection. *The Journal of infectious diseases*, 216(12), 1550-1560.
- Burki, N. K., Mani, R. K., Herth, F. J., Schmidt, W., Teschler, H., Bonin, F., ... & Moerer, O. (2013). A novel extracorporeal CO2 removal system: results of a pilot study of hypercapnic respiratory failure in patients with COPD. *Chest*, 143(3), 678-686.
- Cairncross, M., & Miller, C. J. (2020). The effectiveness of mindfulness-based therapies for ADHD: a meta-analytic review. *Journal of attention disorders*, 24(5), 627-643.
- Chakrabarty, S., & Bharati, P, Mitra, M., Kumar, (2007). Nutritional status of Kamar tribal children in Chhattisgarh. *The Indian Journal of Pediatrics*, 74(4), 381-384.
- Committee on Population, Engineering & Medicine, (2016). National Academies of Sciences, *The integration of immigrants into American society*. National Academies Press.
- Directorate of National Statistics, Ministry of Planning, Investment and Economic Development & Somalia., (2020).
- Ekesa, B. N., Blomme, G., & Garming, H. (2011). Enhanced prophylaxis plus antiretroviral therapy for advanced HIV infection in Africa, *New England Journal of Medicine*, 377(3), 233-245.
- Eveleth, P. B. (1986). Population difference in growth. *Human growth, a comprehensive treatise*, 221-239.
- FAO (2008) Guideline for measuring households and individual dietary diversity, version 4. Nutrition and consumer protection division, Food and Agricultural Organization (FAO). Rome Italy
- FAO (2011) Guidelines for measuring household and individual dietary diversity, Food and Agriculture Organization of the United Nations, Rome, Italy
- FAO. (2011). Guidelines for measuring household and individual dietary diversity. Rome.
- FAO/ESA (2011) The role of women in Agriculture. Prepared by SOFA team and Cheryl Doss.
- Fekadu, Y., Mesfin, A., Haile, D., & Stoecker, B. J. (2015). Factors associated with nutritional status of infants and young children in Somali Region, Ethiopia: a cross-sectional study. *BMC Public health*, 15(1), 1-9.
- Ferreira, F. H., & Walton, M. (Eds.) (2005) world development report 2006: equity and development (Vol. 28). World Bank Publications
- Fisher, R. A. (1991). Statistical methods, experimental design, and scientific inference.

- FSNAU (2003) Assessing comorbidity and correlates of wasting and stunting among children in Somalia using cross-sectional household surveys: 2007 to 2010. *Bmj Open*, 6(3), e009854.
- FSNAU (2005) Nutritional status of children under five years, and associated factors, in Mbeere south sub county, Kenya (Doctoral dissertation, University of Nairobi).
- FSNAU, (2016). Assessing comorbidity and correlates of wasting and stunting among children in Somalia using cross-sectional household surveys: 2007 to 2010. *Bmj Open*, 6(3), e009854.
- FSNAU, F. N. (2011). Expanding Famine Across Southern Somalia. FSNAU, FEWS NET, Nairobi, Press release.
- FSNAU, Puma, M. J., Chon, S. Y., Kakinuma, K., Kummu, M., Mutarak, R., Seager, R., & Wada, Y. (2018). A developing food crisis and potential refugee movements. *Nature Sustainability*, 1(8), 380-382.
- FSNAU. (2019). Somalia Food Security and Nutrition Analysis: Post Deyr 2015/16. Tech.
- Gartner, L. M., & Newton, E. R. (1998). Breastfeeding: Role of the obstetrician. *ACOG clinical*
- Gebre et al., (2019). Global, regional, and national burden of epilepsy, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *The Lancet Neurology*, 18(4), 357-375.
- Gernand, A. D., Schulze, K. J., Stewart, C. P., West Jr, K. P., & Christian, P. (2016). Micronutrient deficiencies in pregnancy worldwide: health effects and prevention. *Nature Reviews Endocrinology*, 12(5), 274
- Ghimire, U., Aryal, B. K., Gupta, A. K., & Sapkota, S. (2020). Severe acute malnutrition and its associated factors among children under-five years: a facility-based cross-sectional study. *BMC pediatrics*, 20, 1-9.
- Gibson, R. (2005) Principles of nutrition assessment. 2nd ed. Oxford University Press, New York
- Golden, M. H. (2002). Source (UNICEF) Daily consumption of growing-up milk is associated with less stunting among Indonesian toddlers. *Medical Journal of Indonesia*, 28(1), 70-6.
- Grover & Ee (2009) Functional analysis of the binding model of microbial inulinases using docking and molecular dynamics simulation. *Journal of molecular modeling*, 22(4), 69.
- Gugelmin & Coimbra, Ferreira, A. A., Welch, J. R., Santos. (2012) Nutritional status and growth of indigenous Xavante children, Central Brazil. *Nutrition journal*, 11(1), 1-9.
- Guled, R. A. & Yoshihara, M., Hayashizaki, Y., & Murakawa (2016). Genomic instability of iPSCs: challenges towards their clinical applications. *Stem Cell Reviews and Reports*, 13(1), 7-16.
- Haan, N. (2006). Integrated food security and humanitarian phase classification: technical manual, version

1. FSAU Technical Series (Kenya)

- Hadden, R. L. & Minson, S. G. (2010) the geology of Haiti: An annotated bibliography of Haiti's geology, geography and earth science. CORPS OF ENGINEERS ALEXANDRIA
- Hakim, J., Musiime, V., Szubert, A. J., Mallewa, J., Siika, A., Agutu, C., ... & Gibb, D. M. (2017). Enhanced prophylaxis plus antiretroviral therapy for advanced HIV infection in Africa. *New England Journal of Medicine*, 377(3), 233-245.
- IFPRI, & Ecker, O., Al-Riffai, P., Breisinger, C., & El-Batrawy, R. (2016). *Nutrition and economic development: Exploring Egypt's exceptionalism and the role of food subsidies*. Intl Food Policy Res Inst.
- Jones, (2017). Surviving sepsis campaign: international guidelines for management of sepsis and septic shock: . *Intensive care medicine*, 43(3), 304-377.
- Kabubo-Mariara, J., Mwabu, G., & Kimuyu, P. (2006). Farm productivity and poverty in Kenya: The effect of soil conservation. *Journal of Food Agriculture and Environment*, 4(2), 291.
- Kennedy, Stewart, I., Facchini, A., Cersosimo, I., Mele, R., Chen, B., ... & Sahin, (2015). Energy and material flows of megacities. *Proceedings of the National Academy of Sciences*, 112(19), 5985-5990.
- Khalid, M. S. B., & Shafiai, S. B. (2015). Flood disaster management in Malaysia: An evaluation of the effectiveness flood delivery system. *International Journal of Social Science and Humanity*, 5(4), 398.
- Khan, A., Khan. Rehman, E., Sher, M., Naqvi, S. H. A., Badar Khan, K., & Ullah, (2017). Energy efficient secure trust based clustering algorithm for mobile wireless sensor network. *Journal of Computer Networks and Communications*, 2017.
- Kinyoki, D. K., Berkley, J. A., Moloney, G. M., Kandala, N. B., and Noor, A. M. (2015). Predictors of the risk of malnutrition among children under the age of 5 years in Somalia. *Public health nutrition*, 18(17),
- KNBS and ICF Macro (2010) Influence of distance to health facilities on the use of skilled attendants at birth in Kenya. *Health care for women international*, 37(2), 237-249.
- Kulsum, A., Lakshmi, J. A., & Prakash, J. (2008). Food intake and energy protein adequacy of children from an urban slum in Mysore, India—a qualitative analysis. *Mal J Nutr*, 14(2), 163-172.
- La Pelle, N. (2004). Simplifying qualitative data analysis using general purpose software tools. *Field methods*, 16(1), 85-108.
- Laditan A. A. (1983) Nutrition and physical growth in children Nigeria. *Journal on Nutrition Science*, 4, 5-

- Ma'alín, A., Birhanu, D., Melaku, S., Tolossa, D., Mohammed, Y., & Gebremicheal, K. (2016). Magnitude and factors associated with malnutrition in children 6–59 months of age in Shinille Woreda, Ethiopian Somali regional state: a cross-sectional study. *BMC Nutrition*, 2(1), 1-12.
- Map layers: UNDP May, (2012) integrating population dynamics into mapping human exposure to seismic hazard. *Natural Hazards and Earth System Sciences*, 12(11), 3533-3543.
- Masese, L. M. (2017). Factors that influence the nutritional status of children in wet and dry seasons among the pastoralists in West Golis-Guban, Somalia (Doctoral dissertation, University of Nairobi).
- Maternal-nutrition-knowledge, -infant-feeding-practices-and young child nutrition: a case of Bosaso district, Somalia, Miriam Ismail (2020)
- Mehriban, N. (2017). Assessment of nutritional status of under five years old children in Banadir Hospital Mogadishu Somalia (Doctoral dissertation, Daffodil International University)
- Mihretie, A., Gebrehiwot, T., Awoke, W., Bayabil, E., ... & Wimberly, M. C. (2017). Integrating malaria surveillance with climate data for outbreak detection and forecasting: the EPIDEMIA system. *Malaria journal*, 16(1), 1-15.
- MMS/MPHS, (2009) Household knowledge and perceptions on disposal practices of unused medicines in Kenya. *J Anthropol Archaeol*, 4(2), 1-20.
- Mohamud, M., Alrajhi, Z., Alhamdan, A., & Hamad, B. (2018). Decision Makers' perspectives on the language of instruction in medicine in Saudi Arabia: A qualitative study. *Health Professions Education*, 4(4), 308-316.
- Mwaniki, S. M., Kiama, S. G., Muchemi, G. M., & Njuguna, A. (2014). Effect of supplementation of *Moringa oleifera* (lam) leaf meal in layer chicken feed. *International journal of poultry science*, 13(7), 379.
- Mzumara, B., Bwembya, P., Halwiindi, H., Mugode, R., & Banda, J. (2018). Factors associated with stunting among children below five years of age in Zambia: evidence from the 2014 Zambia demographic and health survey. *BMC nutrition*, 4(1), 1-8.
- Nshimiyiryo, A., Hedt-Gauthier, B., Mutaganzwa, C., Kirk, C. M., Beck, K., Ndayisaba, A., ... & El-Khatib, Z. (2019). Risk factors for stunting among children under five years: a cross-sectional population-based study in Rwanda using the 2015 Demographic and Health Survey. *BMC public health*, 19(1), 1-10.
- Ola *et al.*, (2011) family proteins and caspases in the regulation of apoptosis. *Molecular and cellular biochemistry*, 351(1), 41-58.

- Omar, A. A., & Mehriban, N. (2019) Assessment of nutritional status of under 5-year-old children in Banadir Hospital, Mogadishu, Somalia Matrix Science Pharma, 3(2), 32
- Pacey, A., & Payne, P. (2019). *Agricultural development and nutrition*. Routledge.
- Pape, U. J., & Wollburg, P. R. (2019). Estimation of poverty in Somalia using innovative methodologies. World Bank Policy Research Working Paper, (8735).
- Phillips, N. A., Dudley, & Batchelor, K., Freeman, A. C., Robbins, (2005). Bridging data and decision making: development of techniques for improving the HIV prevention community planning process. *AIDS and Behavior*, 9(2), S41-S53.
- Raisul Akram 1 , Marufa Sultana 1 , Nausad Ali 1 , Nurnabi Sheikh 1 , Abdur Razzaque Sarkerz Sachdev, H. P. S. (1995) Prevalence and determinants of stunting among preschool children and its urban–rural disparities in Bangladesh. *Food and nutrition bulletin*, 39(4), 521-535.
- Saad, M. A., Mustafa, S. T., Ali, M. H., Hashim, M. M., Ismail, M. B., & Ali, A. H. (2020). Saad, M. A., Mustafa, S. T., Ali, M. H., Hashim, M. M., Ismail, M. B., & Ali, A. H. (2020). Spectrum sensing and energy detection in cognitive networks. *Indonesian Journal of Electrical Engineering and Computer Science*, 17(1), 465-472.
- Sobo, R. A., & Oguntona, C. R. (2006) Nutritional assessment of children of market women in Abeokuta, Nigeria. *Nig. J. Nutr. Sci.* 1and, 2, 62-66.
- Soetan, K. O., Olaiya, C. O., & Oyewole, O. E. (2010). The importance of mineral elements for humans, domestic animals and plants-A review. *African journal of food science*, 4(5), 200-222.
- Somalia Demographic Health survey, (2020), Assessing comorbidity and correlates of wasting and stunting among children in Somalia using cross-sectional household surveys: 2007 to 2010. *Bmj Open*, 6(3),
- Somalia Nutrition Strategy, (2020). Understanding the factors affecting the humanitarian health and nutrition response for women and children in Somalia since 2000: a case study. *Conflict and Health*, 14, 1-15.
- Stoll, B. J., & Measham, A. R. (2001) Children can't wait: improving the future for the world's poorest infants. *The Journal of pediatrics*, 139(5), 729-733
- Svedberg P. (2010) An End to World Hunger "Poverty and under nutrition" p. 298 American Journal of public health. USA.
- Tanner, J. M., & Whitehouse, R. H. (1962) Standards for subcutaneous fat in British children. *British Medical Journal*, 1(5276), 446
- The Directorate of National Statistics, Ministry of Planning, Investment and Economic Development &

- Somalia., 2020).
- Tuffley., & Hall, A. (2016) Methods of nutrition surveillance in low-income countries. *Emerging themes in epidemiology*, 13(1), 4.
- Turkabad, D. B. of under-five year's old children in Banadir Hospital Mogadishu Somalia. Was (Doctoral dissertation, Daffodil International University).
- Un, K., & So, S. (2011). Land rights in Cambodia: How neopatrimonial politics restricts land policy reform. *Pacific Affairs*, 84(2), 289-308.
- UNDP ; Cammack (2017). The the world bank and human development through the world market. *Development Policy Review*, 35(1), 3-21.
- UNHCR, 2017. Somalia: an overview of 2016 poverty , vulnerability and financing 1–36.
- UNICEF (2008). Nutrition Section, UNICEF. Programme Division, & UNICEF. Division of Communications. Sustainable elimination of iodine deficiency: Progress since the 1990 World Summit for Children. UNICEF
- UNICEF (2019) annual report. Unicef Somalia. Accessed 14 July 2019. Unicef (2019), Manu, A., Ewerling, F., Barros, A. J., & Victora.
- UNICEF Somalia Reproductive Health National Strategy and Action Plan 2009 UNICEF, World Health Organization and World Bank (2012)
- UNICEF, & WHO, W. (2020). Levels and trends in child malnutrition: key findings of the 2019 Edition of the Joint Child Malnutrition Estimates. Geneva: World Health Organization.
- UNICEF, WHO and World Bank (2012). Joint Child Malnutrition Estimates. (UNICEF, New York; WHO, Geneva; the World Bank, Washington, DC
- UNICEF. (1998). The state of the World's children. Oxford University Press, Oxford; 13-18 Uzma, I. and Muhammad S. (2006). "Understanding the health and nutritional status of children
- UNICEF. (2002) The state of the world's children. Oxford University Press for UNICEF.
- Unicef. (2012). The state of the world's children 2012: children in an urban world. Esocial sciences. Unicef. Somalia Humanitarian Situation Report #13 16-31August 2017.
- UNICEF. WHO (World Health Organization), and World Bank. 2014. 2013 Joint Child Malnutrition Estimates: Levels and Trends. In the Global Database on Child Growth and Malnutrition. New York; Geneva; Washington, DC.
- Union, A. (2006). African Common Position on the Review of the Millennium Declaration and the Millennium Development Goals.

- Vaswani, A., Shazeer, N., Parmar, N., Uszkoreit, J., Jones, L., Gomez, A. N., ... & Polosukhin, I. (2017). Vulnerability Analysis Guidelines. United Nations World Food
- Wang, B., Abdalla, E., Atrio-Barandela, F., & Pavon, D. (2016). Dark matter and dark energy interactions: theoretical challenges, cosmological implications and observational signatures. *Reports on Progress in Physics*, 79(9), 096901.
- WHO (2001). Water-related diseases in World Water Day. www.who.int/water_sanitation./en/World
- Bank. (2007). *From Agriculture to Nutrition: Pathways, Synergies and Outcomes*.
- WHO (2006). Multicenter Growth Reference Study group. WHO child growth standards: Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age. *Methods and development*. Geneva.
- WHO, (2008) an executable survey of advances in biomedical named entity recognition? In *Biocomputing 2008* (pp. 652-663).
- World Bank (2009). *Agriculture and Rural Development Department: Washington, DC, USA World Food Programme. Comprehensive Food Security & Intl Food Policy Res Inst.*
- Worthington et al., (2017). Knee osteoarthritis has doubled in prevalence since the mid-20th century. *Proceedings of the National Academy of Sciences*, 114(35), 9332-9336.

APPENDICES

Appendix 1: Questionnaire

Part one: Demographic and socioeconomic characteristics

1 Gender of child?

Boy () Girl ()

2 Age of child?

1) 0-6 2) 1-2 3) 2-3 4) 3-4 4) 4-5

(3) Mother age?

1) 15-30 2) 31-40 3) 41 above

Mother education level Occupations

1= In Primary

1= salaried

employee

2=farmer

2=Primary

3=Self

drop-out

employment

3=Completed

4=Casual

primary

laborer 5=Student

4=Secondary

6=Unemployed

drop-out

7=Others (specify)

5=In secondary

6=Completed

secondary

7=Tertiary level

8=University

9=Adult education

(5) Total number of Household members _____ individuals

Elderly 65 yrs. and above _____

Adults above 18 – 64 yrs. _____

Adolescents 12-17 yrs. _____

Children 6-11 yrs. _____

Children 6 months to 5 years _____

Below 6 months _____

1) What are your sources of income?

1. Salaried job
2. Shop Owner
3. Help from children
4. Casual waged labor
5. Small own
business/petty trade

Others specify _____

4. Which of the following are owned by your family?

1. Television 1= Yes. 2=No
2. Radio 1= Yes. 2=No
3. Cellphone 1= Yes. 2=No
4. DVD Player 1= Yes. 2=No
5. Bicycle 1= Yes. 2=No
6. Land 1= Yes. 2=No
7. Plot 1= Yes. 2=No
8. Car 1= Yes. 2=No
9. Motorcycle 1= Yes. 2=No

7) Family income per month in (USD)?

- 1) 0-50 2) 50-100 3) 100-150 4) 150-200 5) 250 above

Part II: Where child was born

2) When did you stop breastfeeding? (Age in months)

3) Why did you stop breastfeeding?

0= Baby is not getting enough

1= Cultural beliefs (Specify).....

2= the baby has grown up

1) Where was the child born?

1 Hospital

2 At home

3= Health Centre

4= Mid wife

5= TBA home

6= Others Specify

9) Did you attend antenatal care during the pregnancy of this child? 1) Yes 2) No

10) How many times did you attend ANC?_____Times

Part III: Breastfeeding and Complementary feeding pattern of the?

(1) When was the (NAME) child first put on the breast?

1= immediately after birth -----
few hours after birth-----
days after birth. 5= cannot remember-----

2=within the first 30 minutes-----
4= One to two

6= others (specify) -----

4) Should a baby be given the very first milk (colostrum) from the breast at birth or soon after? 1) Yes 2) No

5) Food or drink given to infants before breast milk flow?

a. Community health workers

8. Local healers.....

9. NGO

10. Other.....

During the past 2 weeks, did the child suffer from any Illness/ injury?

1 yes 2 No

17) After birth the baby was given other food/fluid apart from breast milk?

1) 1-30 days 2) 1-2 month 3) 3-4 month 4) 5-6 month 5- above 6- months

18 Duration of breastfeeding of the mothers?

1 0-6 month 2 6-9 month 3 9-11month 4 11-14 month 5 14-24 month

19) What age did you start giving other foods (complementary feeding)?

20) How many times is food served in a day?

1. Once

2. Twice

3. Three times

4. Others (specify)

Has the child received vitamin A supplement in the past 6 months?

1=Yes 2=No

11) How many times did the child receive vitamin A capsules from the facility or outreach?

12) If Vitamin A received how many times in the past one year did the child receive verified by Card?

[If the card is available, fill in the information as per table below]

15) Did you get consultation about care baby? 1 yes 2 No

Where did you go for consultation?

- a. Health Center
- b. Traditional Healer
- c. Private clinic/ Pharmacy
- d. Hospital
- e. Shop
- f. Relatives/friends

If yes, how many days was the child sick?

Can you describe the illness? (You can tick more than one)

Specify other

Was any one consulted for that illness?

If No, what is the reason?

Specify other

If yes, where did you go for consultation?

Specify other

Did {child name} the child sleep under a mosquito net last night? 1

yes 2 No

2. =Before feeding the child

3. =Before eating

4. =Before preparing food

5. =When I think they are dirty

6. =When water is available

7. =Other (Specify).....

(7) Is there a hand washing facility with soap near the toilet?

1) Yes, with soap 2) No 3) yes but no soap 4) yes but no water 5) yes but no water and soap

(8) What health care facilities/services do you have access to?

1) Public hospitals/health Centre 2) Private hospitals/health Centre 3) None 4= others

INFANT AND YOUNG CHILD FEEDING PRACTICE

1. Did you give colostrum's to (NAME)? _____ 1=Yes; 2=No

2. Is [NAME] still being breastfed? _____ 1=Yes; 2=No

3. If No, at what age did the child stop breastfeeding?

4. If YES, how often do you breast feed [NAME]?

1= on demand;

2= Own (mothers) choice;

3= others (specify)

5. Did you give the following to [NAME] in the last 24 hours (Multiple choices allowed?)

1= Breast milk 2= Water 3= Milks (cow/goat/camel/pkt of milk) 4= Porridge

5= Vegetables/fruits 6= other solid/ semi- solid foods 7= other (specify)

Food frequency questionnaire

Please indicate; how many times in the last 7days did ____ (ref

child) eat each of the food in the list

Numbers	Food	Frequency	Source of food
		1-Daily, 2- 3-6 times per week, 3-Once or twice per week, 4-Once per month 5- After long time or never	1. Own production, 2. Purchases 3, Gift 4, Food aid 5. Traded 6. Borrowed 7. Gathering, 9. others(explain)

1	Maize		
2	Rice		
3	Sorghum		
4	Peas		
4	Pasta		
5	Porridge		
6	Sugar		
7	Water melon		
8	Liver		
10	Kidney		
11	Heart		
12	Meat		
14	Chicken		
15	Egg		
16	Milk powder		
17	Cow's milk		
18	Camel milk		
19	Butter		
20	Oils		
21	Fats		
22	Honey		
23	Cake		
24	Tea with milk		

25	Tea without milk		
----	------------------	--	--

DIVERSITY OF FOOD FOR THE INDEX CHILD

Food groups with examples

- 1) Ask the mother or caregiver if the child has eaten food from any of the list below during the day and night? 1= Yes 2= No

- 1) Is exclusive breast feeding for the first 6 months used to prevent diarrheal and respiratory diseases for the infant? 1= Yes 2= No 3= I do not know

- 2) Cereals: Millet/Sorghum/Maize porridge? 1= yes 2= No
- 3) Cereal products: Spaghetti, pasta, rice, bread, mandazi, posho, chapati or other foods made from grain like: Sorghum, Millet, Wheat? 1= yes 2= No
- 4) Vitamin A rich vegetables and tubers: Pumpkins, carrots, orange or yellow fleshy sweet potatoes? 1= yes 2= No
- 5) White tubers and roots: Sweet Potato (white), white Yams, Cassava, Irish Potato or any other foods made from roots? 1= yes 2= No
- 6) Other vegetables: Cabbage, Eggplants, Tomatoes, Onions, Green Pepper, Mushroom, Okra, celery? 1= yes 2= No
- 7) Vitamin A rich fruits, ripe mangoes, papayas + other locally available vitamin A rich fruits? 1= yes 2= No
- 8) Other fruits: Bananas, Oranges, Lemons, Tangerines, Pineapples, coconut? 1= yes 2= No
- 9) Organ meat (iron rich: Liver, Kidney, heart, gizzard or other organ meats? 1=yes 2=No
- 10) Fresh meats and offal's: Meat, poultry, offal (e.g., chicken/poultry, goat meat, beef) 1=yes 2= No
- 11) Eggs: Chicken, Ducks, Guinea fowls, Turkey, Pigeon, or other eggs from any kind of birds? 1=yes 2= No
- 12) EGGS chicken, duck, a hen or any other egg? 1= yes 2= No

Mothers Knowledge of breastfeeding

- 1) Right time to give breast milk after the child is born? 1= After giving some butter 2= Within an hour 3= After one hour 4= After 24 hours
- 2) What do you do with the first milk or colostrum? 1= discard 2= breastfeed the child
- 3) What is the right time to start feeding the child with solid foods and water/drinks from time of birth? 1,2,3,4,5,6,7,8 9 months and above
- 4) Is breast milk alone being enough for an infant during the first 6 months of life? 1=yes 2= No 3= I don't know
- 5) Is feeding the newborn with honey, dates, water needed before introducing breast milk for the first time? 1= Yes 2= No 3= I do not know
- 6) What are the foods and/or fluids recommended to give a child under 6 months? 1= only breast milk 2= Breast milk and/or plain water 3= Infant formula food or animal milk? 4= Others (specify)
- 7) What should be the food for a baby before 6 months? 1= Water 2= Breastmilk only 3=Formula Milk 4= Solid food 5= All the above
- 8) Immunization of children is the best way to protect the child against infectious diseases? 1=yes 2=No
- 9) Imbalanced diet is the cause of malnutrition? 1=yes 2=No
- 10) Colostrum is a mother's early milk which contains antibodies to protect the newborn against disease? 1=yes 2=No
- 11) Breastfeeding is beneficial to a mother's health? 1=yes 2=No
- 12) Breastfeeding provides health benefits for infants that cannot be provided by formula? 1=yes 2=No
- 13) Is formula feeding better than breastfeeding? 1=yes 2=No
- 14) Can exclusive breastfeeding prevent child from diarrhea? 1=yes 2=No
- 15) Breastfeeding protects the women by the breast cancer? 1=yes 2=No

Attitude Questions about Nutrition

- 1) Is breastfeeding the baby on demand good or not good? 1= Good 2) Not Good 3) Not sure
- 2) What is you're feeling about expressing breast milk and leaving it behind for someone to feed your child? 1) Good 2) Not Good 3) Not sure
- 3) How likely do you think your child will become malnourished if only fed once in a day?
1= Likely 2) Less Likely 3) Not sure
- 4) In your own opinion, do you think malnutrition is a serious issue for the child's health?
1) Serious 2) Not serious 3) Not sure
- 5) Do you think it is good thing to give different types of food for the child throughout the day? 1) Good 2) Not Good 3) Not sure
- 6) How difficult was it for you to breastfeed your child exclusively for the first six months?
1) difficult 2) Not difficult 3) Not sure
- 7) Giving breast milk for a newborn immediately within an hour after birth is important?
1=Strongly agree 2= Agree 3= Disagree 4= Strongly disagree
- 8) Discarding the first milk or colostrum is important before giving breast milk to a newborn?
1= Agree 3= Disagree 4= strongly disagree
- 9) Feeding the child with water or other foods or drinks before six months age is important?)
1= Strongly agree 2= Agree 3= Disagree 4= strongly disagree
- 10) Breastfeeding can increase the mother's weight: 1= Strongly agree 2= Agree 3= Disagree
4= strongly disagree
- 11) One of the causes of hair loss is breastfeeding: 1= Strongly agree 2= Agree 3= Disagree
4= strongly disagree
- 12) Mothers should stop breastfeeding if they take any type of medication: 1= Strongly agree
2= Agree 3= Disagree 4= strongly disagree
- 13) Are you happy with breast feeding your baby? 1=Yes 2= No
- 14) After the birth of your baby, did you have the confidence to breastfeed? 1=Yes 2= No

Immunization

21) Does the child have a vaccination card? 1= Yes. 2=No

22) Immunization status for children?

1) Immunized 2) Partially immunized 3) Never

Immunization/ Growth Monitoring

23) Is there an immunization record or card for your last child?

1. Yes, seen the card 2. Yes, not seen the card 3. No

Please check for the completeness of the immunizations listed below on the card and tick Accordingly. If the card or book is not available, ask the mother whether the child was

Appendix 2: Introductory letter



UNIVERSITY OF NAIROBI
COLLEGE OF AGRICULTURE AND VETERINARY SCIENCES
Faculty of Agriculture
DEPARTMENT OF FOOD SCIENCE NUTRITION AND TECHNOLOGY
Tel: 3592734-9 Extn: 27093: 020-4916023 E-mail:dfn@uonbi.ac.ke Website: www.foodtech.uonbi.ac.ke

Our Ref: A56/33319/2019

Date: August 5, 2020

TO WHOM IT MAY CONCERN

RE: **SAID AHMED -A56/33319/2019**

Mr. Said Ahmed is an MSc. student, in the Department of Food Science Nutrition and Technology, University of Nairobi, pursuing Master's degree in Applied Human Nutrition. As part of his degree, he is required to conduct research on a topic of his choice.

Mr. Ahmed is currently doing research on "Nutritional status of children under five years and associated factors in Banadir Hospital Mogadishu, Somalia".

Kindly accept him in the research area for successful undertaking of this research which will aid in providing information to form policy.

Any assistance extended to him in light of this information will be highly appreciated. Thank you,

DR. G.O. ABONG'

A handwritten signature in blue ink, appearing to read 'G.O. Abong'.

Chairman,

Department of Food Science, Nutrition and Technology

Appendix: 3 Ethical Approval



Somali Federal Republic
Ministry of Health & Human Services

ETHICAL APPROVAL

This is to certify that the proposal submitted by:
Principal Investigator

Name of Researcher responsible for project: SAID AHMED

Reference No:
MOH&HS/DGO/1526/Dec /2020

Full project Title:
Nutrition status of children under five years and associated factors in Banadir Hospital
Mogadishu, Somalia.

Starting: Date 1/ /1/2021

Finishing Date: 15/02, 2021

For the proposed period of research

Has been approved by the Research & ethics committee at the Ministry of Health
On the 05-Dec- 2020

Director of Policy & Planning

Secretary

Chairman



Ministry of health, Somalia Email: dg@moh.gov.so/P.O BOX 22