RISK FACTORS FOR MALNUTRITION AMONG CHILDREN AGED 6-59 MONTHS ATTENDING SOS HOSPITAL IN MOGADISHU, SOMALIA

BY

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A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF SCIENCE DEGREE IN APPLIED HUMAN NUTRITION, DEPARTMENT OF FOOD SCIENCE, NUTRITION AND TECHNOLOGY, UNIVERSITY OF NAIROBI

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DECLARATION

This dissertation is my original work and has not been submitted for the award of a degree in any other University

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DEDICATION

This dissertation is dedicated to God, my mother and father, and my brother who supported me both morally and financially during my study period

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GLOSSORY AND ABBREVIATIONS

AF	Artificially Fed
BF	Breast Fed
CBDs	Community Based Distributors of family planning devices
DANIDA	Danish International Development Agency
DHMT	District Health Management Team
HSE	High Socio Economic
KAP	Knowledge, Attitude and Practices
KVIP	Kumasi Ventilated Improved Pit latrine
LSE	Low Socio Economic
MOH	Ministry of Health
MUAC	Mid Upper Arm Circumference
NGO	Non-Governmental Organization
ORS	Oral Rehydration Solution
PEM	Protein Energy Malnutrition
RKPC	Rapid Knowledge Practice and Coverage
RN	Random Number
SS	Sample Size
SOS	Societassocialis
UHC	Urban High Class
UMC	Urban Middle Class
UNICEF	United Nations International Children and Education Fund
UPC	Urban Upper Class
WHO	World Health Organization
WIAD	Women in Agricultural Development

OPERATIONAL DEFINITIONS

Malnutrition; It refers to over or under nutrition, nutrient imbalances or deficiencies

Dietary diversity: The number of different food groups consumed over a given period of time (FSAU 2005)

Maternal knowledge: Mother's understanding, information and perception about complementary feeding based on the guiding principles of complementary feeding for a breastfed child

Nutrition status: Refers to whether or not the child is underweight, wasted and stunted

Food frequency: In this study food frequency will be used to assess individual dietary intake of foods and nutrients

Stunted Height –for- age below -2 Z-score or below 80% of the median height for age for reference population (WHO, 2006)

Wasted Weight-for-height below -2 Z- score or below 80% of median weight for height for reference population (WHO, 2006)

Underweight- for age below -2 Z-score 0r below 80% of medium weight for age forreference population

Household: Household refers to people who live together in the same homestead /compound and operate as a unit, including unrelated servants and relatives who share food from the same pot and share other resources of livelihood and are answerable toothsome household head.

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ABSTRACT

Malnutrition is a condition that arises from an inadequate or excessive intake of nutrients, an imbalanced consumption of essential nutrients, or a malfunction in nutrient utilization. It encompasses both under-nutrition and over-nutrition, which together constitute the dual burden of malnutrition. This burden includes non-communicable diseases that are associated with dietary factors.

Fears of a repetition of the 2011 famine, which claimed 260,000 lives, roughly half of them were children under the age of five. Over 385,000 children in Somalia are at risk of dying without immediate care, and at least 1.5 million children under the age of five are critically malnourished nationwide. This study was carried out to determine risk factors associated with malnutritionamong children aged 6-59 months attending SOS hospital in Mogadishu.

A cross-sectional study was carried out at the SOS Hospital, in which 180 mother-child pairs were chosen through systematic random sampling. Data was entered into SPSS (version 20) and analyzed accordingly. The anthropometric measurements were analyzed using ENA for SMART, while the associations were estimated by means of the chi-square test ($p<0.05$).

Majority (62%) of the study population were married while (32%) had no formal education, and nearly half of the households (44%) had more than five members in their households. Majority (58%) of the children had low dietary diversity that included less than 4 food groups in 24 hours before the date of interview. The prevalence of wasting, stunting and underweight was 48.3%, 41.6% and 28.3%, respectively. Study findings shows that poor breastfeeding practices and lack dietary diversity are the risk factors for stunting of children (p-value=0.015), p-value=0.009, respectively).

General nutrition status of children is poor with half in the study area wasted. Exclusively breastfeeding is not practiced in the study households and infection were the main cause of malnutrition in children. Inadequate diets in terms of quantity, quality and small amounts of

vegetables are also common among the households. Most of the children admitted in hospital suffered fever and diarrhea.

The study recommends educating mothers on child feeding practices, sanitation and importance of first milk to the child. The study suggests that stakeholders should focus on the above mentioned factors to fight against malnutrition and the study also recommends nutrition education programs should be initiated in the community.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Malnutrition is characterized by inadequate or excessive nutritional intake, an imbalance of essential nutrients, or impaired nutrient consumption, according to the World Health Organization (WHO). Under-nutrition, overweight, and obesity, as well as non-communicable diseases linked to diet, make up the double burden of malnutrition. In 2020 globally, 149.2 million children under the age of five years were stunted 45.5 million were wasted and 38.9 million were overweight (WHO 2021). According to the 2015 MDG report,

Sub-Saharan Africa (SSA) is home to one-third of the world's undernourished children. The prevalence of stunting, wasting, and underweight among children under five years old is 39%, 10%, and 25%, respectively. These statistics indicate that the issue of undernutrition in SSA remains a significant challenge, despite global progress, and is far from being resolved (Doctor, H.V et al 2017). The prevalence of chronic malnutrition among under-five children in Africa stands at 33% and East Africa was ranging from 21.9% in Kenya to 53% in Burundi which is higher than the global of 22%.

Although the malnutrition affects almost the entire population but children are more vulnerableto be affected because of how unique their body is developed and socioeconomic characteristics. It is therefore important for children to get proper nutrition for effective growth curve from the period of birth (Ali, Z.,et al2017. Nutrition is important in this period because this is the period that the child is growing mentally and physically. This period in most cases is affected by limitedintake of proteins and micronutrients that are more important for growth (Aguayo, &Menon 2016).

The consequences of malnutrition extend beyond the individual and impact society as a whole. They include impaired cognitive ability and academic performance, reduced adult earnings, decreased productivity, and a heightened risk of chronic diseases linked to nutrition in adulthood, particularly when accompanied by excessive weight gain in later childhood (Soliman, A., et al, 2021).

In Somalia, the nutritional status of Somali children is relatively poor due to prolonged violence, terrible economic conditions, and severe drought that have affected the country in recent years (UNICEF 2018). According to most recent study that was conducted in Somalia, the prevalence of stunting 28% and 17% are severely stunted while 12% are wasted and 23% are underweight and that figures remains high (SHDS 2020).

This study was conducted risk factors of malnutrition among children age 6-59 months attending SOS Hospital health facility in Mogadishu Somalia, therefore, sought to determine the risk factors of malnutrition.

1.2 Statement of the problem

Numerous studies have been conducted in an effort to understand the factors that contribute to malnutrition in children under the age of five. From the studies that have been conducted, sex, maternal level of education, poor sanitation and limited health access to health facility services are some of the risk factors of malnutrition. According to a previous study, severe household food insecurity and lower socioeconomic level significantly increased the risk of stunting in Tanzania. (Chirande, et al, 2015) In addition; another study in Nepal showed that low family income and poor breastfeeding practices were the main risk factors for malnutrition.

According to UNICEF, it is estimated that malnutrition causes 45% of all deaths in children under five years of age. Malnutrition persists in Somalia due to years of conflicts and collapses

of basic social services (UNICEF 2019). This study, therefore, will seek to establish risk factorsof stunting among children age 6-59 months in Mogadishu Somalia.

1.3 Justification of the study

The consequence of malnutrition is increased risk of illness and lowered level of cognitive development. This reduces education attainment. Malnutrition can be a problem to adult work force by reducing their productivity and can also be responsible for increasing work absenteeism. According to several studies, a number of factors are linked to malnutrition in children under the age of five. Despite Somalia's distinctive socioeconomic conditions, food security, feeding practices, and water sanitation, there is insufficient data on how these factors influence child malnutrition.

Globally, malnutrition and preventable diseases account for half of the nearly 10 million children under the age of five who die each year in the world. The world health organization approximates that almost 150 million children under five are underweight in developing countries and 200million are stunted (WHO-UNICEF-WB, 2012).

In Mogadishu, numbers of malnutrition children under five years attending in hospitals were increasing so that it is crucial to assess risk factors for malnutrition among children less than five years. Therefore, this study will provide relevant conclusion that will be used by the public health officers to formulate policies to control this problem. The study finding will also be significant to other scholars that are carrying a study on a related topic

1.4 Purpose of the study

The purpose of this study is to generate data on risk factors of stunting at Societassocialis (SOS) Hospital in Mogadishu. The results of this study will provide useful information which could be used for addressing stunting and its risk factors among children aged 6-59 months in Mogadishu Somalia.

1.5 Objectives

1.5.1 General objective

To determine risk factors for malnutrition among children aged 6-59 months attending at SOS hospital in Mogadishu.

1.5.2 Specific objectives

1. To determine the socio-economic and demographic factors of mothers with children aged 6-59 months SOS hospital in Mogadishu-Somalia
2. To determine nutritional status among children aged 6-59 months attending SOS hospital in Mogadishu-Somalia.
3. To assess the caregiver's' knowledge and feeding practices among children aged 6-59 months attending SOS hospital in Mogadishu-Somalia.
4. To determine the factors associated with malnutrition among children aged 6-59 months attending SOS hospital in Mogadishu-Somalia

1.6 Research questions

1. What are the demographic and socio-economic characteristics of mothers with children aged 6-59 months SOS hospital in Mogadishu-Somalia?

2. What is the nutritional status of the children aged 6-59 months attending SOS hospital in Mogadishu-Somalia?
3. What are the caregiver's' knowledge and feeding practices among children aged 6-59 months attending SOS hospital in Mogadishu-Somalia.
4. Which factors are associated with malnutrition among children aged 6-59 months attending SOS hospital in Mogadishu-Somalia?

1.7 Limitations

Uncooperativeness of respondents, in filling the questionnaires and return on time were some of the problems faced conducting this study. The study was also being limited to the households that will give consent.

CHAPTER TWO: LITERATURE REVIEW

2.1 Malnutrition

According to the World Health Organization (WHO), malnutrition is the result of an individual's intake of energy and/or nutrients being deficient, excessive, or unbalanced. Globally, approximately 10.9 million children under the age of five die each year, and out of these deaths, 2.4 million occur in India alone. Over 50% of deaths among young children are attributed to undernutrition (Khan, et al, 2012). Fears of a repetition of the 2011 famine, which claimed 260,000 lives, roughly half of them were children under the age of five. Over 385,000 children in Somalia are at risk of dying without immediate care, and at least 1.5 million children under the age of five are critically malnourished nationwide (Majid, et al, 2022).

Malnutrition encompasses two distinct conditions, namely undernutrition, which comprises stunting, wasting, underweight, and insufficient micronutrient intake (i.e., a deficiency of essential vitamins and minerals) (WHO 2020). In 2017, estimated 22.2% or 150.8 million children under the age of five were affected by stunting globally, while estimated 75% or 50.5 million children under the age of five were at risk of death due to wasting. Furthermore, approximately 38.3 million children under the age of five were overweight (WHO 2018).

2.2 Over-nutrition

Obesity is characterized by an abnormal or excessive buildup of fat in adipose tissue to the point where it may negatively impact health, according to the World Health (Schetz, M, et al, 2019). Excess adipose tissue is usually the result of a chronic positive energy balance. A range of physiological and environmental factors, including low physical activity and diets high in fat, are thought to influence this positive energy balance. All socioeconomic classes are at greater risk of becoming obese as the economies of developing countries continue to grow due to easier access to food and a decline in physical activity (Hoffman, 2001).

Global public health issues include childhood obesity. One in ten children (155 million) between the ages of 5 and 17 are overweight, according to the international obesity task force. According to the World Health Organization, at least 20 million children under the age of five were overweight in 2005. To an estimated 42 million people in 2010, that prevalence had doubled in 2010 (Rooney, and Ozanne, 2011). Obesity, along with the increased risk of non-communicable diseases including ischemic heart disease, diabetes, stroke, and hypertension have long been considered developed countries challenges (Adogu, et al,2015).

Studies conducted in the United States revealed that nearly a quarter of adults are obese, and obesity rates have increased significantly in Australia, Canada, and Europe. For instance, between 1980 and 1990, the prevalence of obesity in England doubled to 16 percent, and it is still rising (Gallus, et al, 2015). Reduced social status, lower educational attainment, and fewer employment opportunities are just a few of the negative effects that the epidemic of overweight and obesity has on both the individual and society (Chopra, et al, 2002).

2.3 Malnutrition in East Africa

Around the world, an estimated 25% of the infants below the age of 5 years' experience delays in growth and development (stunting). Of this stunted population around the world, 90% is from the sub-Saharan Africa (UNICEF, 2012). Stunting is a form of malnutrition and it starts in uterus and it increases reaching peak at the age of 2 years. Stunted infants have greater susceptibility to infections especially diarrhea and respiratory infections and diseases besides malaria. These infections strengthen under nutrition resulting into a cycle of infection hence adversely affecting growth of infants (Geresomo,, et al, 2017).

In a country like Tanzanian for instance, 42% of infants aged less below 5 years are stunted. This ranks Tanzania among the ten worst affected countries with stunting problems among infants. Although there has generally been a drop-in stunting in Tanzania from 48% in the year 1996 to 42% in 2010, this rate of stunting especially in 2010 in Tanzania is still on a higher side. The key factors that may have direct influence malnutrition among infants from developing countries include the level of education of mothers and caregivers, occupation of households, the level of income of household and the level of expenditure on health (Chirande,, et al, 2015). In Kenya, the key form of malnutrition is the protein energy one. This form of malnutrition affects mostly the infants, preschool and school going children. Kiambu records the low level of malnutrition (22.6%) while Kwale (Kenya) record the highest rate (56.5%) (Ngare DK,, et al, 1999). In Tanzania, a total number of 2.7 million infants aged less than 5 years were stunted in 2017 with over 600,000 families facing acute cases of malnutrition (Tshiya,, et al, 2020).

In Somalia, infants are the most affected group with malnutrition because they are dependent on parents to feed them. The worst affected group are infants aged 5 years and below as they are at the stage of rapid growth and development with poor immunity system to fight diseases and infections. In Mogadishu, an estimated number of 230,000 persons have been displaced increasing their vulnerability to malnutrition. Most health facilities in Mogadishu continue recording higher rates of malnutrition (39%) among infants. Although there are plenty of imported foods in most supermarkets, the higher level of poverty especially among IDPs living within Mogadishu limits their ability to access these foods and thus increased malnutrition (Hussien,, et al, 2015).

A study did in Somalia, assessed how conflicts have affected under nutrition among infants. From the findings, 21% and 31% of the infants in Somalia are wasted and stunted respectively.

Conflicts in Somalia contribute to malnutrition and thus leading to wasting and stunted growth. The study concludes that conflicts and internal displacements have large influence on under nutrition which leads to wasting and stunted growth especially among infants (Stuart,, et al, 2017).

2.4 Causes of malnutrition among Infants

In 2011, 165 million (26%) children less than 5 years of age worldwide were stunted (Black, et al, 2013). Stunting in children has been linked to both acute and long-term health issues, such as increased morbidity in children, an adult's increased risk of non-communicable diseases and obesity, and early mortality (Dewey,, et al, 2011). Stunting rates among children in developing countries may be indirectly influenced by socioeconomic status, including the education and occupation of the mother, household income, and health care costs. Stunting may also be caused directly by conditions like infections, protein intake issues, and micronutrient deficiencies (Chirande,, et al, 2015). Ali,, et al, (2017) investigated how maternal and child factors influence stunting and wasting. The finding showed that male as compared to female infants' recorded higher incidents of stunting. It was also shown that maternal height is negatively related with stunting rather than wasting.

Briend, et al, (2015) studied stunting and wasting to determine differences and similarities between the two. The key finding was that stunting is strongly associated with wasting among infants. However, stunting can occur in absence of wasting. Bwalya, et al, (2015) used a case of Zambia to look at factors linked to stunting among 6-23 months aged infants. Data was sought from Zambia Demographic and Health Survey carried out in 2007. The finding was that age of the mother, the birth way of infants, ability of mothers to take iron tablet during pregnancy and breastfeeding are strongly associated with stunting.

2.5 Stunting among Infants

Stunting is also defined as linear retardation in growth among infants due to malnutrition(Leroy,, et al, 2019). Stunted infants have gone through chronic malnutrition in their early stages of life due to insufficient nutrition, repeated infections and poor practices of feeding. And these practices limit the intake of nutrients in the bodies of infants that are required for survival. An approximated 20% of all the stunting reported starts in the womb, with the mother beingmalnourished with insufficient intake of nutrients needed for the boom and improvement of the baby (Grillo,, et al, 2016).

Nearly 50% of the death among children across the world is explained by stunting. Stunting is strongly associated with underdevelopment in brains, low mental ability and capacity to learn, poor performance at the school level and an increase in chronic diseases related with nutrition including obesity, hypertension and diabetes (Andersen,, et al, 2016).

Stunting arises at pre-conception when an adolescent girl who latter turns into a mother is anemic and undernourished and it becomes worse when there is poor diet of the infant with inadequate hygiene and sanitation status (Savanur & Ghugre, 2016). Stunting arises from chronicrestriction in growth of the infants due to insufficient intake of food and poor conditions of health associated with poverty. Stunting is further seen as being too short for one's age. It is also failure to attain linear potential in growth in the early stages of life (WHO, 2015). Stunting can begin before birth and it is highly correlated with poor intake of quality food and persistent infections at the early stages of life (Nurdin R,, et al, 2017). The infections develop into recurrentcycles of illness, low nutrition and low state of immunity. The energy used in fighting recurrent infections can't be enough for supporting physical growth resulting into low-height-for age among infants (WHO, 2015).

2.6 Effect of Stunting on Infants

Stunting has an influence on development of the brain, low IQ, poor immunity system and increased risk of infections including cancer and diabetes. Woldehanna, et al, (2017) analyzed early childhood stunting and its influence on cognitive realization. The study was done in Ethiopia among infants. The study used longitudinal data. The study found negative and significant association between early child stunting and cognitive performance.

Visser (2016) carried out an assessment of stunting among infants and its influence on adult life. The study used data from Global Data Lab and the key finding was that shorter women undergoa number of limitations from their short statue because of stunting. The findings showed that the level of wealth among households and the poverty conditions all are correlated with stunting among infants. Hanson, et al, (2018) argues that stunted infants undergo diminished cognitive growth and development and permanent problems of health including diabetes. Tanner, et al, (2014) analyzed the consequences of stunting among infants in Bolivia. The study specifically analyzed the link between stunting and growth among infants. The finding showed that stunting has adverse influence on growth of infants.

2.7 Child feeding practices

The initial two years of a child's life represent a critical period to establish optimal infant and young child feeding (IYCF) practices, which are essential for ensuring their survival, growth, and development (Khan,, et al, 2017). The manner in which children are fed is believed to be shaped by household food security, hygiene and health environment, as well as caregiving behaviors. Across all cultures, mothers are primarily responsible for meeting the nutritional requirements of their children (Ickes, et al, 2015). Currently, over 95% of newborns in Africa are breastfed; however, feeding practices are often inadequate, with breastfed infants frequently given water and other drinks.

Thus, only a small percentage of mothers exclusively breastfeed their children, especially in West Africa. (Dop MC,, et al, 2002). In South Africa, rural areas have a higher prevalence of breastfeeding than urban areas. However, inappropriate infant feeding practices may be a factor in the rise in the prevalence of stunting in children during the first two years (Mushaph, 2008). According to a study conducted in the United States, good child feeding habits were positively correlated with height for age in seven Latin American countries, with a stronger effect for children from lower socioeconomic backgrounds (Ruel,, et al, 2002). According Somali Health Demographic Survey 90% of Somali children had been breastfed and 60% of them were breastfed within the first hour of their birth (SHDS 2020). In Mogadishu, Somalia, 38.3% of infants ages 0 to 6 months were exclusively breastfed. Rates of exclusive breastfeeding fell as infants got older (Sodal, AM 2019).

2.8 Maternal education

Primary caregivers for children are primarily mothers. Their knowledge of basic nutrition and health measures has a significant impact on the care they provide. Household socioeconomic factors have a significant impact on the nutritional status of children, and it has been found that socioeconomic status positively correlates with mothers' ability to offer appropriate nutrition and primary care. One part of nutrition knowledge is the mother's impression of her own children's nutritional status. Other aspects of nutrition knowledge include the frequency of child feeding, the diet during diarrhea, and the age at which to introduce solid foods into a child's diet. The practical nutrition knowledge of mothers has a significant impact on the outcome of their children (Appoh,, et al, 2005).

During the initial six years of a child's life, their mother serves as their primary caregiver, and the quality of care she provides is significantly influenced by her knowledge and comprehension of fundamental principles in basic nutrition and healthcare.

It is understandable that the mother's educational background would have an impact on her child-care practices (Christian, et al, 1998). Education and child care practices goes hand in hand. Children whose mothers have received an education are significantly more likely to survive and experience healthy growth and development compared to those whose mothers have not received an education (Augustine, et al, 2009).

A mother's knowledge of child care practices, including the appropriate length of breastfeeding, the timing of weaning, the types of foods to introduce initially, the best methods for cooking food for a child, the need for boiling or treating water for drinking, and the importance of hand washing, is contingent upon her level of education and access to information. How a child gets diseases like diarrhea, how to cure diarrhea at home, and when a child will be weighed, inoculated, and taken to a doctor for care when unwell or to check growth (Augustine, et al, 2009). The level of care given to the children is reportedly associated with maternal education. Amother's ability to earn more income and her understanding of the value of child caregiving both increase with education (Bwalya, et al, 2015). Studies have shown that maternal education is associated with increased utilization of prenatal and postnatal care, and that mothers with higher levels of education tend to have better skills in interacting with their children compared to mothers with limited or no education (Augustine, et al, 2009). Research has found that women with lower levels of education are less likely to engage in family planning and schedule the spacing between childbirths, while more educated mothers tend to plan their pregnancies (Augustine, et al, 2009).

2.9 Water Sanitation and Hygiene Practices

A key component of healthy communities is having access to services for sanitation, hygiene, and drinking safe water, which has a significant positive effect on nutrition.

Throughout the world, under-nutrition remains a primary contributor to illness and mortality, especially among women and children living in impoverished communities. Malnutrition can result

from a suboptimal diet or illness, and is also often linked to other factors such as consumption of contaminated water and insufficient sanitation and hygiene practices (World Health Organization. (2015).

The primary link between poor WASH (Water, Sanitation and Hygiene) conditions and malnutrition is through the frequent occurrence of diarrhea (brown et al 2013). There is a widespread acknowledgement that diarrhea can both cause and result from malnutrition. Diarrhea can decrease nutrient absorption and lower dietary intake, while malnutrition can compromise barrier protection and immune function, leading to more frequent occurrences of diarrhea diseases. (Marshak et al 2016). UNICEF estimates suggest that 884 million people worldwide lack access to safe drinking water, which is a crucial component for maintaining good nutrition. Moreover, only 18% of individuals residing in rural areas have access to adequate sanitation facilities, while approximately 2.5 billion people lack appropriate access to such amenities (WHO/UNICEF 2014).

2.10 Measurement of malnutrition

2.10.1 MUAC

A child between the ages of 1 and 5 should have a mid-upper arm circumference (MUAC) that is greater than 13.5 cm. The MUAC indicates mild to moderate malnutrition in children if it is between 12.5 and 13.5 cm, and severe malnutrition if it is less than 12.5 cm. This is helpful for mass child screening, but less so for long-term growth monitoring. Accurate tape measurements and a straightforward bangle test are two methods for determining the mid arm circumference. (Briend, et al, 2012).

2.10.2. Weight –for-height

Weight for Height (W/H) is a valuable tool in emergency situations where age identification is often challenging, as it does not necessitate age specification. W/H can help identify even slight changes in the nutritional status of individual children, allowing for timely interventions to address any deterioration or improvement (WHO 2006).

2.10.3. Height-for-age

When inadequate nutrition persists over an extended period, it can result in slow growth among children, with height for age (H/A) serving as a measure of chronic malnutrition. This often leads to stunted growth, with affected children being shorter in height than others of the same age. H/A is indicative of an individual's nutritional status over a period of time and should not be a prerequisite for enrolling children in food programs (WHO 2006).

2.10.4. Weight-for-age

Weight for age (W/A) is a useful indicator for identifying both acute malnutrition (wasting) and chronic malnutrition (stunting). In healthcare settings, W/A is commonly employed to track individual children's growth utilizing the Road to Health Chart. However, since W/A cannot differentiate between acute and chronic malnutrition, it should not serve as the sole criterion for determining admission into feeding programs intended for genuinely malnourished children (WHO 2006).

2.11 Food Security in Somalia

Most of the population in Somalia relies on pastoralism and subsistence farming to sustain their livelihoods. However, the unpredictable rainfall patterns experienced in Somalia has greatly contributed to food insecurity and thus increased incidences of malnutrition. For instance, in 2004, there was a 4-year peak of drought that drove many pastoralist communities to bur

charcoal for raising income. Somali has also been characterized by prevalence of drought that has resulted into famine affecting an estimated 6.7 million people. The persistent draught in Somali has resulted into famine that has significantly resulted into widespread displacements especially among those people living in rural areas (Colletta, 2015). These displacements have doubled up attributed to persistent violence among the terror group, Al-Shabaab and security agencies.

The government of Somali in collaboration with the United Nations raised the alarm in November 2016 of an anticipated famine. This witnessed the influx of humanitarian aid and donor support as a response strategy (Pain, 2014). Somalia ranks among the countries with the most severe chronic food insecurity. Over 80% of the population in Somalia relies on activities that depend on the natural resources for survival. This increases its vulnerability to shocks and other environmental conditions and factors. Even in good times, Somalia can only account 40% of the requirement of cereals. Local production in a ten year review from 2016 has averaged at 30% of the food needed.

2.12. Gaps in knowledge

Literature review shows that stunting among under- five children is determined by several factors. However, among the studies that has been conducted so far, the risk factors for malnutrition vary across countries. The high rates of stunting in Mogadishu can be associated dietary diversity, hygiene, socio-economic and feeding practices. The risk factor for malnutrition among children below five years in Mogadishu has not been fully investigated.

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.1. Study Area

The research was conducted in Mogadishu, the capital city of Somalia. Somalia, with a land area of 637,657 square kilometers, shares borders with Ethiopia to the west, Djibouti to the northwest, the Gulf of Aden to the north, the Indian Ocean to the east, and Kenya to the southwest. Additionally, Somalia boasts the longest coastline of any African country

The study was conducted at the SOS Hospital in Mogadishu, Somalia. Established in 1989, SOS Hospital is the largest healthcare facility for children and mothers in Somalia. It is for the mother and child center with the admission of 200 children per day. TheSOS hospital is supported by the European commission (Dahir et al 2020).

Figure 3. 1 map of Mogadishu

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

3.2 Study population

The study population includes children aged 6-59 months attending SOS hospital llocated in Mogadishu, Somalia.

3.3 Study Design

The study used facility based analytical cross-sectional study design.

3.4 Eligibility of Respondents

3.4.1 Inclusion Criteria

Children aged 6-59 months attending SOS hospital and live with their mothers/caretakers were selected to participate in this research

3.4.2 Exclusion Criteria

Eligible participants were excluded to participate in this study if they were critically ill or caregivers failed to give consent.

3.5 Sample size Calculation

The sample size was 180. This was determined using the formula of Fisher, et al, (1991)

$n = z^2pq/d^2$

Where

n - The desired sample size (if target population is more than 10,000).z - The standard normal deviation at the required confidence level of 1.96

P Expected prevalence of stunting among the populationd -

Degree of accuracy

q = 1-P, expressed proportion of the stunting children

P = 12% (FSNAU 2015)

q = 100-12/100

z = 1.96

d = 5%

By substitution, we have $n = \left\lfloor \frac{\lceil Z^2 PQ \rceil}{\delta^2} \right\rfloor = \left\lfloor \frac{\lceil 1.96^2 * 0.12 * 0.88 \rceil}{0.05^2} \right\rfloor = 162.$

Therefore n = 162children and their caretakers and the possible non-response rate will be 10% after factoring attrition sample size =162/0.9), hence, the calculated sample size equals to **180.**

3.6 Sampling procedure

Purposive sampling was the method adopted in the study region. The study was carried out at an SOS hospital in Mogadishu. However, children under five years attending in SOS hospital were randomly chosen.

3.7 Data collection method and tools

The study was used a quantitative method of data collection to investigate the risk factors of malnutrition among children aged 6-59 months in Mogadishu hospitals. Data was collected from participants with outpatient children during the months of June to August 2019. Prior to data collection, the data collection tools were pretested for validity at the SOS Hospital in May 2019.

3.7.1 Questionnaire

A semi-structured questionnaire was used to collect data on various aspects such as the child's age, sex, date of birth, weight, and height, as well as the parents' marital status, maternal and paternal education and occupation, the child's immunization history, morbidity, and caregiver’s knowledge of complementary feeding and occupation. The questionnaire also included information on economic and social factors, as well as the family's assets. Additionally, feeding practices data was collected using a food frequency questionnaire, 24-hour dietary recall, and 24-hour dietary diversity score questionnaire.

3.7.2 Food Frequency Questionnaires

A Food Frequency Questionnaire (FFQ) is a tool that provides a brief list of foods and beverages, and asks subjects to indicate how often they consumed each item over a predetermined time period. Semi-quantitative FFQs may also collect portion size information using standardized portions or a choice of portion sizes.

3.7.3 24-Hour recall and dietary diversity

24 hour recall was used to determine nutrient intake and adequacy while dietary diversity sore was used to determine the dietary diversity. Each participant was required to provide a detailed

account of the meals they had in the previous 24 hours. This information was gathered through the use of a structured questionnaire for the two standard tools.

3.7.4 Nutritional status

Anthropometric assessment tools, including digital weighing scales, measuring boards, and height boards, were utilized to measure the weight and height of the children to determine their nutritional status.

3.8 Anthropometric assessment procedure

3.8.1 Height

The child was carefully positioned by two research assistants, who also made sure that the height measurement was precise. The averages of two readings that were not off by 0.5 centimeters were calculated. Children under 24 months old had their length measured while they were lying down or recumbent, and children between 24 and 59 months old had their height measured while standing. While measuring their height, study participants were barefoot.

3.8.2 Weight

Each research assistant used a Salter scale with a maximum capacity of 25 kilograms and demarcations at every 100 grams to weigh the children. The children were weighed without clothes while suspended in plastic pants with their feet off the ground. Two readings were taken, and if they did not differ by more than 0.1 kilograms, the average of the two readings was computed.

3.8.3 Age

Mothers' responses as well as birth certificates or immunization records were used to determine the age of the child.

3.9 Pre-test

The questionnaire underwent a validation process through pre-testing. The research team provided close supervision to the research assistants during both the pre-testing and survey period. Once the data was entered into the computer, frequencies were calculated for each variable to identify any outliers resulting from data entry errors and ensure consistency in responses across questions.

3.10 Recruitment and training of research assistants

With the help of SOS officers, two field assistant were recruited who were two nutritionists. Before gathering data, the investigator trained the research assistants. The research assistant underwent two day training to understand sampling techniques for collecting data, basic medical ethics, and use of equipment tools. The training's goal was to provide the research assistants with the skills and knowledge necessary for collecting high-quality data.

3.11 Data management and analysis plan

Specific objective one: to determine the socio-economic and demographic factors associated with malnutrition among children aged 6-59 months attending at SOS hospital in Mogadishu- Somalia. The data collected was checked for completeness and accuracy before being entered into SPSS software for analysis. All responses were coded numerically. Socio-economic and demographic characteristics were analyzed using SPSS version 20. Descriptive statistics such as frequencies, percentages, means, medians, ranges, and minimum/maximum values were computed. The data was presented in various formats including graphs and tables.

Specific objective two: To assess the caregiver’s knowledge and feeding practices associatedwith malnutrition among children aged 6-59 months attending SOS hospital in Mogadishu- The analysis of mothers' knowledge on complementary feeding in Somalia was conducted using SPSS. A set of 20 closed questions based on the guiding principles of complementary feeding for a breastfed child was used to assess mothers' knowledge and feeding practices (WHO,2001).

Mothers' knowledge on complementary feeding in Somalia was analyzed using SPSS. A score of "1" was given for a correct answer and a score of "0" was given for a wrong answer. Mothers who scored less than 50% were considered to have low knowledge on complementary feeding, those who scored between 50-70% were considered to have average knowledge, while those who scored 76-100% were considered to have high knowledge on complementary feeding practices.

Dietary diversity, meal frequency, 24-hour recall, and the introduction of solids, semi-solids, and soft foods were used as indicators for complementary feeding practices. The relationship between mothers' knowledge of complementary feeding and child nutrition was investigated using a chi-square test ($p<0.05$). Descriptive statistics were used to calculate frequency, percentages, and diagrams.

Specific objective three: To determine nutritional status among children aged 6-59 monthsattending SOS hospital in Mogadishu-Somalia.

The child nutritional status was analyzed using ENA for SMART and interpreted using the Z-Score (WHO, 2006). To define the outcome variable, anthropometric data was converted in to Z-Score using Emergency Nutrition Assessment (ENA) for SMART special software, 2012.Children with a Z-score of below -2SD for WHO, was considered stunted. Children below with a -3SD for WHO was considered severely malnourished. Children between -2SD and -3SD for the above indices was considered moderately malnourished. Those above -2SD were considered normal or well nourished (WHO, 2006. The descriptive analysis will be carried out.

Specific objective four: to determine factors associated with malnutrition among children aged 6-59 months attending SOS hospital in Mogadishu-Somalia.

Factors associated with malnutrition were analyzed using SPSS. Data was presented by bar graphs, tables, means and percentages by using descriptive statistics. Chi-square test ($p<0.05$) was used to investigate factors associated with stunting?

3.12 Data quality control

To ensure high-quality data, the research assistants underwent training in data collection techniques to standardize the procedure. The team also closely supervised the data collection process, ensuring that informed consent was obtained and confidentiality was maintained. Daily verifications were made of the information on the questionnaire to ensure its accuracy, consistency, and proper completion by the investigator. The data was coded correctly before finalizing. Throughout the study period, all measurement equipment was periodically checked to prevent instrumental errors that could arise from faulty equipment.

3.13 Ethical considerations

The study was conducted with the approval of the ethics committees at SOS Hospital and the University of Nairobi, and permission was obtained from the Ministry of Health and hospital administration. Participation was voluntary, and the confidentiality of the participants was maintained throughout the study. The study participants were informed that they could withdraw from the study at any time, and their names were not mentioned in the paper.

CHAPTER FOUR: RESULTS

4.1 Socio-demographic and socio-economic characteristics of study participants

4.1.1 Gender of study participants

The findings about gender in the SOS Hospital show that each gender category was relatively given an equal chance to be represented among the study participants that is 51% male and 49% female (Figure 4.1).

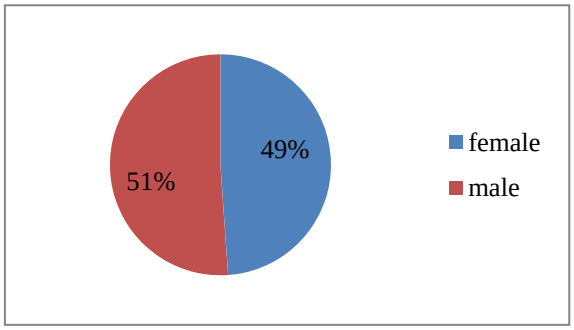

Figure 4. **1** Gender of the study children

4.1.2 Age of the study children

The age of the study children was categorized into the following age categories 6-16, 17-27, 28- 38, 39-49 and 50-59 months. About 45.6% of children were aged 6-16 months, 19% 28-38 months, 16.1% 39-49 months, 13.3% 7-27 months and only 5.6% aged 50-59 months (Table 4.1). The children had an average age of 28 months with a mode of 48 months, and a standard deviation of 17.

Table 4. 1 age of the study children

Age bracket	Percentage
6-16	45.6%
17-27	13.3%
28-38	19.4%
39-49	16.1%
50-59	5.6%

4.1.3Age groups of caregivers

The researcher was also interested in knowing the caregiver's age, and it was found that most of the respondents at SOS Hospital in Mogadishu were aged 31-45 years and this represented 57% of the total respondents. This was followed by the category of 15-30 years with 29% while 46 years and above were 14% (Table 4.2). This shows that most of the respondents were mature andhence they are expected to express honesty and integrity at work.

Table 4. 2 Respondents or caregivers by age

Age group	**Percentage (%)**
15-30	29%
31-45	57%
46 and above	14%

4.1.4 Respondents by Marital Status

Among the respondents 62% of them were married, 21% were divorced, 8% of the respondents were separated, 5% were widow and lastly 3% were single (Figure 4.2).

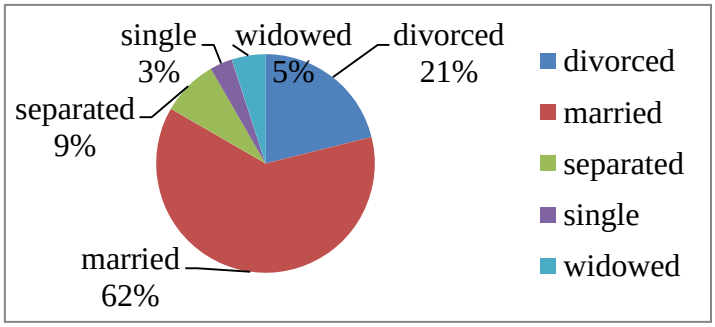

Figure 4. 2Distribution of respondents by marital status

4.1.5 Distribution of respondents by education level

Figure 4.3 shows that most of the SOS Hospitals respondents are primary school holders who were 33.3% of the total respondents. The rest of the respondents had no formal education 38.3%, while those with secondary level were 21.7% and 6.7% had university level of education.

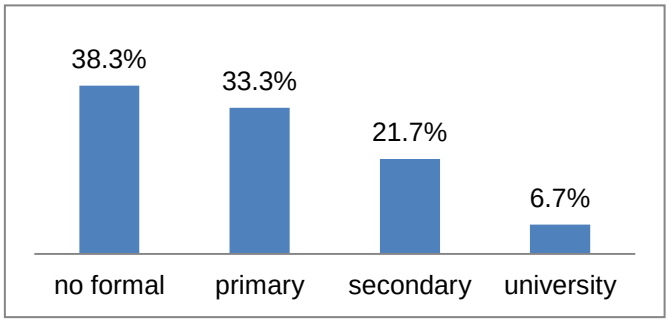

Figure 4. 3Distribution of respondents by their level of education

4.1.6 Total number of household members

Most of respondents (56%) said that they lived in their households with between 1-4 members, 39% lived with between 5-8 members, while 3.9% of the respondents lived with between 9-11 members (Table 4.3).

Table 4. 3 Household sizes of household involved in the study

Household size	Percentage
1-4	56%
5-8	39%
9-11	3.9%
12 and above	1.1%

4.1.7 Distribution of respondents by occupation of household head

Table 4.4 shows that most of the SOS Hospitals respondents were unemployed. This is represented by 32% of the total respondents, the businesspersons were 28%, the employeed had 26% and both the farmer and other catgeory were represented by 7% and lastly the retired had only 1 %.

Table 4. 4 Respondents by occupation of household head

Occupation of household head	Percentage (%)
Farmer	7%
Employee	26%
Unemployed	32%
Retired	1%
Businessperson	28%
Other	7%

4.1.8 Respondents by household assets and type of fuel they use

Table 4.5 shows that majority of the household (44.4%) owned a home, while (37.2%) paid rent. Only (8.9%) lived in refugee camps, while 9.5% were hosted by their parents and relatives for

free. Majority (98.9%) had mobile phones, while 46.7% owned a TV with only 9.4% owned a car. Most of the SOS Hospitals respodents use charcoal has their source of cooking fuel and this was represented by 54% of the total respondents, both gas and firewood sources of fuel were represented by 23% and none of the respodents used electricity as their source of cooking fuel

Table 4. 5 Household asset of the study and they the type of fuel they use

Property	Percentage
Cell phone	98.9%
TV	46.7%
Car	9.4%
House/home ownership	
Self-owned	44.4%
Pay rent	37.2%
Cooking Fuel	
Firewood	23%
Charcoal	54%
Gas	23%

4.1.9 Household livestock ownership

Most of the SOS Hospitals respodents (71%) don't have livestock in their household while the ones with the livestock in their household were 29% as shown in Figure 4.4.

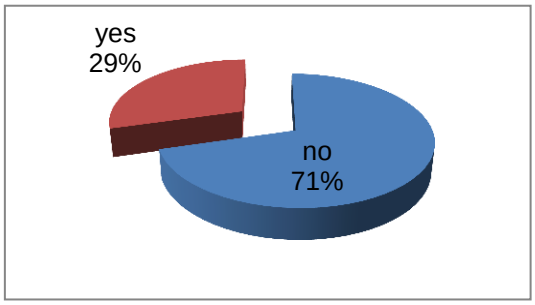

Figure 4. 4 Livestock ownership by respondent's households

4.2.1 Water sanitation and hygiene practices

Table 4.8 summarizes the water, sanitation, and hygiene practices in households. The majority of households (93%) used tap water as their primary source of drinking water, while only 1% relied on borehole water, whether protected or not. Four percent of households used river water as their main source of water. Most of the respondents do not treat their drinking water with 113 (63%) with the common methods of water treatment being use of boiling and chemicals (Table 4.6).

About half of the respondents (46%) use piped water, 38% walk to fetch water, 12% use cars and only 1% use a motorcycle as a means of transport. Most of the respondents (86%) were using traditional latrines, 12% used flush toilet while only 2% used open defeacation.

Table 4. 6 Hygiene and sanitation practices among the households

Practice	Proportion of households
Source of water	
Tap	93%
Borehole(protected)	1.6%
Other	5.4%
Treating water before use	
Yes	37%
No	63%
Water treatment techniques	
Chemicals	22.2%
Boiling	12.8%
What kind of toilet facility does your HH have	
Traditional toilet	86%
Flush toilet	12%
None/bush	2%
hand washing facilities with soap near the toilet	
Yes	17%
No	83%
Hand washing before preparing foods	
Yes	88%
No	12%

4.3 Caregiver's knowledge and feeding practices among children aged 6-59 monthsattending SOS hospital in Mogadishu-Somalia

4.3.1 Maternal knowledge

On the appropriate time for initiating breastfeeding, 52% of the respondents said within one hour of birth. The rest reported the time as after one hour (24%) and after two hour (7%) while 12% said after three hours and above and 6% of the respondents reported they didn't breastfeed (Table 4.7). Additionally, it was found that only 27% of the respondents were aware that newborns should be exclusively breastfed for the first six months of their life. Regarding the frequency of breastfeeding, 73% of the mothers stated that it should be done on demand, whereas the remaining 27% believed that there should be a specific schedule to follow while breastfeeding. Moreover, 53% of the study participant reported that they initiate giving complimentary foods below 6 months and 20% of the respondents said that they started complimentary at 6 months. While 27% of the study participant reported after 6 month.

Table 4.7 also shows that the average percentage score for nutritional knowledge was 52.3%, with a minimum score of 21.1% and a maximum score of 84.2%. The majority of participants (51.1%) had an average level of knowledge, while 43.9% had inadequate knowledge. Only 5% of participants had a high level of knowledge.

Table 4. 7 Assessment of feeding practices and knowledge of the respondents

Attribute	Percent
Time of initiating breastfeeding	
Within 1hour after birth	52%
After one hour	24%
After 2hour	7%
After 3 hour and above	12%
Other	6%
Infants exclusive breastfeeding for the 1st 6 months of life	
Yes	27%
No	73%
Time to initiate to complimentary foods	
<6 months	53%
6 months	20%
After 6 months	27%
Level of knowledge	
Low knowledge	44%
Average knowledge	51%
High knowledge	5%

4.3.2 Breastfeeding practices

The World Health Organization defines complementary feeding as the period when additional foods or liquids are introduced alongside breast milk (WHO, 2006). According to Table 4.8, nearly all of the children in the study (94.4%) had been breastfed. However, at the time of the study, only 37.8% were still receiving breast milk, and just 21.6% of children were exclusively breastfed (Table 4.8).

Table 4. 8 Breastfeeding practices breastfeeding practices

	Number	Percent
Ever breastfed	170	94.4%
Still breastfeeding	68	37.8%
Exclusively breastfed	39	21.6%

4.3.3 Food consumption pattern

Consuming a diverse diet raises the possibility that a child has consumed a balanced diet, which is crucial to the child's nutritional status. The number of food groups consumed by the index child in the 24 hours prior to the data collection was used to determine the index child's food consumption. The study includes the seven food groups that were internationally advised by WHO (2007). The food categories included cereals, roots, and tubers, legumes, nuts, dairy products, meat, animal products, eggs, vitamin A-rich foods, and other fruits and vegetables. The majority of children (60.8%) had consumed food prepared from grains, tubers, and roots (Figure 4.5). The consumption of vitamin A-rich fruits and vegetables was 44.2%, while the intake of iron-rich foods (flesh meats) was 43%. Consumption of other fruits and vegetables was 43.8%. Among the food categories, dairy products were the most commonly consumed, with 82.8% of children consuming them for their protein needs. Protein consumption was lower for legumes at 65%, and egg consumption was at 44%..

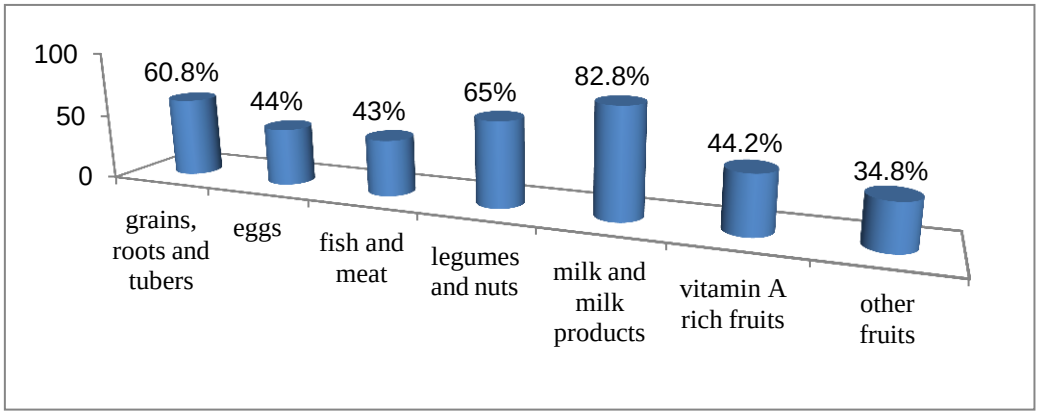

Figure 4. 5 Food consumption pattern

4.3.4 Dietary diversity score of children aged 6-59 months old

The Individual Dietary Diversity Score (IDDS) is a simplified technique used to evaluate the quality of diets. It is determined by the number of food groups consumed by an individual over a specific time period. For this indicator, the dietary diversity score was calculated by adding up the number of food groups consumed by the children over a 24-hour period. This was done to determine the level of diversity in their diets.

The individual dietary diversity score was calculated using the seven food groups defined by the WHO in 2007. The average score for individual dietary diversity was 1.6. Children who consumed three or fewer food groups were classified as having a low IDDS, while those who consumed four or five and six or more were considered to have medium and high IDDS, respectively. Based on this classification, only 5% of the children had a high IDDS. The majority of children (58.3%) had a low DDS, meaning they consumed up to three out of the possible seven food groups, while 37% had a medium DDS, as shown in Table 4.9.

Table 4. 9 Table Dietary diversity score of children aged 6-59 months old

DDS Category	Frequency(N=180)	percentage
Low IDDS(≤3)	105	58.3%
Medium IDDS(4-5)	66	36.7%
High IDDS(≥6)	9	5%

4.3.5 Nutrient intake

The study's results showed that half of the study children 50% met DRA for energy; more girls met RDA for protein 94% than boys 88% and none of the respondents who met the RDAfor vitamin A while 31% girls and 19% boys met the RDA for calcium. About 25% of the respondents met the RDA for zinc (Table 4.10).

Table 4. 10 Nutrient intake of children 6-59 months in SOS hospital

Nutrient	Mean± SD	p-value	% of children that met RDA	p-value
Energy				
Male	1,161.45±775.02	0.64	50	1.0
Female	1,075.67±619.43		50	
Protein				
Male	38.95±42.52	0.37	88	0.668
Female	127.14±90.99		94	
Calcium				
Male	Nan	0.40	19	0.386
Female	Nan		31	
Iron				
Male	50.92±238.67	0.44	41	1.0
Female	102.20±272.56		44	
Zinc				
Male	4.61±5.30	0.31	25	1.0
Female	3.56±1.97		25	
Vitamin A				
Male	55.64±41.43	0.09	0	0.748
Female	79.83±65.07		0	
Vitamin C				
Male	7.04±9.53	0.15	0.03	1.0
Female	11.01±11.44		0.09	

4.3.6 The morbidity status of the study children

Based on a two-week morbidity recall, over a third of the children in the study (40%) were reported to have been ill. The most prevalent illnesses among the children were fever with chills (53%), diarrhea (41%), worms (14.7%), and clinical malaria (6.7%), as shown in Table 4.11.

Table 4. 11 Morbidity status of the study children

Morbidity prevalence	%
Upper Respiratory Tract Infections (Coughing with difficulty, coughs and fever)	12%
Fever with chills	53%
Diarrhea	41%
Clinical Malaria (no laboratory confirmation)	6%

4.3.7 Immunization status of the study children

Table 4.12 shows mothers' response on whether her child received vaccination. About 80% reported that their child had received full vaccination.

Table 4. 12 Responses on whether the respondent child was received vaccination

Response	Percentage
Yes	80%
No	20%

4.4 Nutritional status among children aged 6-59 months attending SOS hospital inMogadishu-Somalia.

To assess the prevalence of malnutrition, weight for age (underweight), weight for height (wasting), and height for age (stunting) z-scores were used. Children with a z-score of less than -2 were considered undernourished, with those having a z-score of less than or equal to -2 classified as moderately malnourished and those with a z-score of less than or equal to -3 classified as severely malnourished. The study found a prevalence of 48.3% for wasting, 41.6% for underweight, and 28.3% for stunting among the children. None of the children had edema.

4.1 Weight for height (wasting)

The study findings indicate that the prevalence of global acute malnutrition (GAM) was 48.3%. Among the malnourished children, 16.1% were severely wasted while 32.2% were moderately wasted. The prevalence of wasting was higher among boys compared to girls, although this difference was not statistically significant (Table 4.13).

Table 4. 13 The prevalence of wasting among the children 6-59 months

	Normal		Moderate		Severe		
	N	%	N	%	N	%	p-value
Female	47	53.40	31	35.20	10	11.40	0.224
Male	46	50.00	27	29.30	19	20.70	

4.2 Weight for age (underweight)

Nearly a quarter (41.6%) of the study children was underweight of which 32.4% were moderately underweight and 9.4% were severely underweight. Even through there was no significance difference, there were more underweight boys than girls (Table 4.14).

Table 4. 14the prevalence of underweight among children 6-59 months

	Normal		Moderate		Severe		
	N	%	N	%	N	%	p-value
Female	57	64.80	26	29.50	5	5.70	0.123
Male	48	52.20	32	34.80	12	13.00	

4.3 Chronic malnutrition (stunting)

About 28.3% of the children were stunted of which 23.9% were moderately stunted and 4.4% were severely stunted (Table 4.15).

Table 4. 15The prevalence of stunting among children aged 6-59 months

	normal		Moderate		Severe		p-value
	N	%	N	%	N	%	
Female	67	76.10	17	19.30	4	4.50	0.37
Male	62	67.40	26	28.30	4	4.30	

4.5 Risk factors for malnutrition among children

4.5.1 Relationship between socio- economic and demographic factors and child nutritionalstatus

The study investigated the association between socio-demographic factors, including mother's age, marital status, education level, occupation, and the nutritional status (wasting, stunting, and underweight) of the children. Chi-square tests were conducted, but no significant associations were found between any of these factors and the nutritional status of the children (Table 4.16).
Mothers who were single or separated were found to have a higher likelihood of having wasted children. Additionally, mothers aged 31 and above were more likely to have wasted children

compared to younger mothers aged 15-30 years.

Table 4. 16Association between socio-demographics and child's nutrition status

	Wasting		Chi-value	p-value
Wasting				
Mothers' age in years	Wasted	Normal	10.021	0.4
15-30 (n=52)	25(43.8%)	27(47.3%)		
31-45(n=103)	46(44,7)	57(55.3%)		
46> (n=25)	16(64%)	9(36%)		
Mothers' marital status			6.145	0.631
Married (n=112)	53(47.3%)	59(43.7%)		
Single(n=6)	4(66.7%)	2(36.3%)		
Separated(n=15)	7(66.7%)	8(33.3%)		
Widowed(n=9)	5(55.6%)	4(44.4%)		
divorced(n=38)	18(47.3)	20(52.7%)		
Mothers' occupation			11.58	0.171
Famer(n=14)	3(21.4%)	11(78.6%)		
Salaried(n=26)	16(61.5%)	10(38.5%)		
Unemployed (n=96)	45(46.9%)	51(53.1%)		
Retired/student(n=10)	3(30%)	7(70%)		
Underweight	Underweight	Normal		
Mothers' occupation			7.279	0.507
Famer(n=14)	6(42.9%)	8(57.1%)		
Salaried(n=26)	9(34.6%)	17(65.4%)		
Unemployed (n=96)	38(40%)	58(60%)		
Retired/student(n=10)	2 (20%)	8(80%)		

Stunting	Stunted	Normal		
Mothers' occupation			4.91	0.767
Famer(n=14)	6(43%)	8(57%)		
Salaried(n=26)	5(19%)	21(81%)		
Unemployed (n=96)	28(29.2)	68(70.8%)		
Retired/student(n=10)	3(30%)	7(70%)		

4.5.2 Nutritional status of study children in relation to household size

Majority of the household (56.1) had less than five household members while 44.9 had more than 5 household members. This study established more children from households with more than five members were malnutrition (46%, 29% and 52% for underweight, stunting and wasting, respectively) as compared to those from households with less than five members(37.6%, 27.7% and 46% for underweight, stunting and wasting). There was no association found between household size and nutritional status. Chi square statistic values were as follows;Weight for age [Pearson chi-square test value=7.346 p-value =2.90], height for age [Pearson chi- square test value=8.343 p-value=0.214] and weight for height [Pearson chi-square test value=4.771, p-value=0.573] (Table 4.17).

Table 4. 17 Nutritional status of study children in relation to household size

		Nutritional status		p-value
Underweight				
	Number of family members	Normal	Underweight	
	Less than four	63(62%)	38(38%)	0.29
	More than four	42(53%)	37(46.8%)	
Stunting				
		Normal	Stunting	
	Less than four	73(72%)	28(28%)	0.214
	More than four	56(71%)	23(29%)	
Wasting				
		Normal	Wasting	
	Less than four	55(54%)	46(46%)	0.573
	More than four	38(48%)	41(52%)	

4.5.3 Relationship between breastfeeding and child nutritional status

The association between breastfeeding and nutritional status among children aged 6-59 months is presented in Table 4.18. The results indicated a significant (p=0.015) association between ever breastfeeding children and nutritional status based on underweight and stunting. Children who had not been breastfed were more likely to be underweight and stunted compared to those who had been breastfed. There was no association found between breastfeeding and wasting (p=0.096).

Table 4. 18 Relationship between breastfeeding and child nutritional status

feeding practice	nutritional status		P-value
Underweight			
Ever breastfeed	Normal	Underweight	
No (10)	2(20%)	8(80%)	0.015
Yes (170)	103(60%)	67(40%)	
Stunting			
	Normal	Stunted	
No (10)	4(40%)	6(60%)	0.015
Yes (170)	125(73.5%)	45(26.5%)	
Wasting			
	Normal	Wasted	
No (10)	2(20%)	8(80%)	0.096
Yes (170)	91(53.5%)	79(46.5%)	

4.5.4 The relationship between dietary diversity and nutritional status

The study examined the association between child nutritional status (wasting, underweight, and stunting) and dietary diversity score (DDS). Chi-square tests revealed a significant relationship between DDS and child nutritional status (wasting and stunting, p=0.009, p=0.046). Children who consumed fewer meals in a day than the WHO recommendation were more likely to be wasted and stunted than underweight (Table, 4.19).

Table 4. 19 association dietary diversity and child nutritional status

Dietary diversity score	Nutritional status		t-test	p-value
Underweight				
	Normal	underweight		
Low DDS(n=105)	63(60%)	42(40%)	5.544	0.236
Medium DDS(n=66)	40(60.6)	26(39%)		
High DDS(n=9)	2(22.2%)	7(77.8%)		
Wasting				
	Normal	wasting		
Low DDS(n=105)	61(58.1%)	44(41.9%)	13.586	0.009
Medium DDS(n=66)	31(47%)	35(53%)		
High DDS(n=9)	1(11.1)	8(88.9)		
Stunting				
	Normal	Stunting		
Low DDS(n=105)	67(63.8%)	48(36.2%)	9.683	0.046
Medium DDS(n=66)	56(84.8%)	8(15.2%)		
High DDS(n=9)	6(66.7%)	3(33.3%)		

4.5.5 The relationship between morbidity and nutritional status

Childs two week sickness was compared the nutritional status of the study children. Chi-square tests showed no significance association between child sickness and nutritional of the study children. Children who had sickness in the last fourteen days were more likely to have underweight and wasting 45.3% and 46.7%, respectively than stunting 28.6% (Table 4.20).

Table 4. 20 association between child sickness and child nutritional status

Last two weeks child sickness	Nutritional status		p-value
Underweight			
	Normal	Underweight	
Yes	41(54.7%)	34(45.3%)	0.308
No	64(61%)	41(39%)	
Stunting			
	Normal	Stunting	
Yes	54(72%)	21(28%)	0.410
No	75(71.4%)	30(28.6%)	
Wasting			
	Normal	Wasting	
Yes	37(49.3%)	38(50.7%)	0.829
No	56(53.3%)	49(46.7%)	

CHAPTER 5: DISCUSSION

5.1. Socio-Demographic and economic characteristics of mothers/caregivers of children 6-59 month

The study population had a large household size. This findings are almost similar to those from population estimation survey Somalia (PESS 2014) findings that estimates the average household size is 5.9 persons. According to study done in India found that when family size reached five, the proportion of severely malnourished children increased (Raw 1992).

The significance of water, sanitation, and hygiene (WASH) in regards to public health, as well as the health of infants and young children, has been acknowledged for a long time.

The finding of this study shows that the most of the respondents have access to clean water. This study agrees with a study done in Kenya whereby 63% of households obtain drinking water from better sources. About 91% and 54% of Kenya's urban and rural populations, respectively, are thought to have access to safe drinking water (KDHS, 2008/2009). 6.6 percent of the world's disease and disability burden is attributable to WASH issues, while diarrhoea, malnutrition, and its effects account for 2.4 million annual fatalities. Children in low-income countries face the most of the burden of this disease (Ngure, et al, 2014).

5.2 Caregiver's knowledge and feeding practices among children aged 6-59 months attending SOS hospital in Mogadishu-Somalia.

According to a report by the World Health Organization (WHO), initiating breastfeeding within the first hour of life could potentially save over one million newborn infants worldwide every year. In developing nations alone, early breastfeeding could potentially save as many as 1.45 million lives annually by reducing infant deaths caused by lower respiratory tract infections and diarrheal disease (WHO 2018).

Almost all of the children were breastfed, and more than half of the parents started breastfeeding within an hour after birth. These rates were slightly lower than FSNAU IYCN- assessment in 2016 (98% and 83%), respectively. The prevalence of exclusive breastfeeding was 21.6% but compared to study done in Mogadishu 2019 was low. It was conducted at a public health Centre in Mogadishu, which showed that 38.3 were exclusively breastfed. Negative community attitudes, such as inadequate breast milk supply and colostrum being thought to be harmful to the baby, are the main cause of reduced EBF. (Sodal, A.M., 2019).

5.21 Dietary diversity of children aged 6 - 59 months old

Increasing food variety is thought to ensure adequate nutrient intake and thereby support good nutrition and health. Dietary diversity has long been recognized as a crucial component of a high-quality diet (Hatloy, et al, 1998). According to UNICEF, dietary diversity is generally in poor in Somalia (UNICEF, 2016). The study findings show that only 5% of the children had high DDS, this finding agrees with the study done in Butembo (DRC) and Gitega Burundi with only 7% and 29% having consumed high diversified diets, respectively (Ekesa, et al, 2011). And The most of the children had consumed food made of grains, tubers, and roots, and the majority of their protein intake came from dairy products, primarily milk.

The Recommended Dietary Allowances (RDAs) are established levels of intake of essential nutrients that, based on scientific evidence, are deemed by the Food and Nutrition Board to be sufficient to meet the recognized nutrient requirements of virtually all healthy individuals (Allowances, R.D., 1989). In this study, it was found that nearly all of the infants did not meet the RDAs for most nutrients except for dietary protein. The reason could be that the infants' diet mainly consisted of maize flour porridge, milk, and meat, which are lacking in many other essential nutrients. Additionally, the consumption of vitamin A-rich foods such as eggs, fruits, and yellow, red, and green vegetables was limited among the children.

5.3. Nutritional status among children aged 6-59 months attending SOS hospital inMogadishu-Somalia

Too many young children continue to experience wasting. Stunting is declining too slowly, and malnutrition rates are still alarmingly high (UNICEF, 2018). The findings of this study show thatthe prevalence of wasting among the study children was 48.3%, underweight was 41.6% and stunting rates of 28.3%. These findings were higher than the national values. According to the FSNAU, following the GU' rains of 2015, the average national stunting rate was 12%, and the national GAM rate was 12.6%. There could be various reasons for the difference in prevalence rates between this study and the previous one, including variations in sample size and seasonal differences. A similar study conducted in Somalia to assess the nutritional status of children under five years old at Benadir hospital showed a high prevalence of stunting, wasting, and underweight, which were 30.7%, 49%, and 65%, respectively (Omar, et al, 2019).

5.3. Morbidity status and child immunization

According to WHO (2016), preventable diseases continue to be the primary cause of morbidity and mortality in children worldwide. At SOS hospital, the three main causes of morbidity in children under five are malaria, diarrheal illnesses, and upper respiratory tract infections. In the present study,

the high prevalence of morbidity (41.7%) was mainly attributed to diarrhea and malaria. Findings are comparable to study conducted in Madagascar that reported high diarrhea and vomiting cases (Moursi, et al, (2008). Also, the study reveals that Somalia has made noteworthy strides in vaccinating children, as 80% of the study's children have received vaccinations. This level of coverage aligns with the Global Immunization Vision and Strategy's objective of achieving at least 80% vaccination coverage in each district (WHO 2005).

CHAPTER 6: CONCLUSION AND RECOMMMENDATIONS

6.1 Conclusion

The nutritional status of children under the age of 5 years can be influenced by the demographic characteristics of their mothers and household size. In the present study, households had at least four members, which may have implications for child nutrition. Furthermore, caregivers at the SOS hospital had low levels of education, which could impact the nutritional status of their children.

General nutrition status of children is poor with half in the study area wasted. Exclusively breastfeeding is not practiced in the study households and infection were the main cause of malnutrition in children. Inadequate diets in terms of quantity, quality and small amounts of vegetables are also common among the households. Most of the children admitted in hospital suffered fever and diarrhea.

6.2 Recommendations

- It is recommended that the government, through the ministry of health and other stakeholders, increase awareness of the importance of exclusive breastfeeding and colostrum feeding for infants.
- Nutrition education programs should be initiated in the community
- A well-functioning healthcare system is essential for reducing the prevalence of malnutrition in a community. This includes providing access to immunization, oral rehydration therapy, routine deworming, early diagnosis, and effective treatment of common illnesses like malaria, measles, and diarrhea, which can all contribute to acute malnutrition in infants. By addressing these issues, a community can improve the overall health of its population and reduce the

incidence of malnutrition.

- There is need to develop guidelines that are acceptable for the community to adopt with affordable, easily accessible, appropriate home foods for their young children.

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APPENDICES

Appendix one: Consent form

My name is NAJI FARAH ABDULLE, a postgraduate student from university of Nairobi. I would like you to participate in a research study whose aim is to determine **risk factors of Malnutrition among children aged 6-59 months at SOS hospital in Mogadishu-Somalia. Purpose**

The information you give will only be used to determine the risk factors of stunting among children aged 6-59 months at SOS hospital in Mogadishu-Somalia.

Participation

You are required to respond to questions related on risk factors of stunting among children aged 6-59 at SOS hospital. The questions asked will include the caregivers socio-economic and socio-demographic factors, morbidity in the past two weeks and 24 hours dietary recall.

Confidentiality

Your participation in this study is voluntary and your information provided will be safeguarded. Your identity related into your participation will stay confidential. No names will appear in the final report or any other publication resulting from this study.

Benefits

The information obtained from this study will be used by policy makers, stakeholders and government to formulate appropriate policies aimed at addressing risk factors of stunting among children aged 6-59months and their effects.

Signature of the respondent _____

Thanks for your participation

Appendix two: Questionnaire

Questionnaire

My dear respondents, I am postgraduate student from University of Nairobi. I am going to conduct a research which regards to risk factors of malnutrition among children aged 6-59 months attending at SOS hospital Mogadishu, Somalia. The results of this study will help in providing your children and other children with timely and appropriate nutritional and medical care. Thus, this interview has been prepared in order to gather relevant information for the research I'm doing. The information I gather through this interview will only be used for research purposes, and it will be considered confidential. Except for giving up a maximum of 30 minutes of your time, the study poses no risk to you or your child. Although you have the option to not respond at all or to stop responding in the meantime, your participation is crucial to the achievement of my research's goals. Therefore, I politely request to participate in this interview

Part one: Demographic and socioeconomic characteristics

NO	QUESTIONS	RESPONSE	CODE
1	Gender of child	1. Boy 2. girl	
2	Age of child	1. 0 -8 2. 9-16 3. 17-24 4. 25-33 5. 34-41 6. 42-49 7. 50-59	
3	Caregivers age	1. 15-30 2. 31-45 3. 46 and above	
4	Marital status of caregiver	1. Married 2. Single 3. Divorced 4. Widowed 5. Separated	
5	Relationship to the child	1. mother 2. step mother	

		3. sister 4. father 5. grandmother 6. other	
6	Mother Educational status	1. No formal 2. Primary 3. Secondary 4. University 5. Other	
7	Total number of Household member	1. 1-4 2. 5-8 3. 9-13 4. 13 and above	
8	Occupation of household head	1. Former 2. employee 3. Unemployed 4. Retired 5. Businessperson 6. Other	
9	Cooking Fuel	1. Firewood 2. Charcoal 3. Gas 4. Electricity	

		5. Other	
10	Does your house-hold own livestock?	1. Yes 2. No	
11	If yes, which kind	1. goats 2. camel 3. poultry 4. sheep 5. cows 6. donkeys	
12	How many do you have?		

Part two: Water and sanitation

12	What is your main source of drinking water	1. tap 2. borehole(protected) 3. borehole(not protected) 4. river 5. well(protected) 6. well(not protected) 7. rainwater 8. other	
13	Do you treat your drinking	1. Yes	

	water?	2. No	
14	If yes, how do you treat your water?	1. Boiling 2. Use traditional herbs 3. Use of chemical 4. Filters 5. Other	
15	Which means of transport do you use to get there	1. Walking 2. Bicycle ride 3. Bus 4. Cart 5. Motorcycle 6. other	
16	What kind of toilet facility does your household have?	1. Traditional toilet 2. Flush toilet 3. None/bush 4. Digging a hole 5. Other	
17	Is there a hand washing facilities with soap near the toilet?	1. Yes with soap 2. No 3. Yes but no soap 4. Yes but no water and soap	
18	Do you wash your hands before preparing foods?	1. Yes 2. No	

Part three: DEITARY INTAKE ASSESSMENT

19	Intake of mother within last 24 hours	1. Once a day 2. twice a day 3. three times a day 4. Above 4 times a day	
20	Legumes and legume products	1. Once a week 2. twice a week 3. three times a week 4. Above 4 times a week	
21	Meat, fish and eggs products	1. Once a week 2. twice a week 3. three times a week 4. Above 4 times a week	
23	Oils and fats	1. Once a week 2. twice a week	

		3. three times a week 4. Above 4 times a week	
24	Milk products	1. Once a week 2. twice a week 3. three times a week 4. Above 4 times a week	
25	Any fruits or vegetables	1. Once a week 2. twice a week 3. three times a week 4. Above 4 times a week	
26	Any foods made from roots such potatoes, yams and others	1. Once a week 2. twice a week 3. three times a week 4. Above 4 times a	

		week	
27	Any sugary foods such as chocolates, cakes or biscuits	1. Once a week 2. twice a week 3. three times a week 4. Above 4 times a week	

Dietary Intake-24 hour dietary recall

Please describe the foods and drinks taken during the last 24 hours from morning to night time whether at home or outside the home.

(Researcher to list all foods mentioned, where composite meals are mentioned probe for the ingredients, when respondent is through probe for any meal that might not have been mentioned.)

Match the meal according to time given by the respondent.

Time	Dish	Ingredients	Total volume of of food prepared	Unit in in Grams	Amount served to the child	Amount left over	Amount consumed

Part four: Breastfeeding and Complementary feeding pattern of the mothers

28	Did you ever breastfeeding	1. Yes 2. No If yes go to question 30	
29	If no why	1. No milk 2. I didn't want to breast feed 3. Other (specify)	
30	If yes, how soon after birth did	1. Immediately after	

	you put on breast	birth 2. After 1 hr 3. After 2 hr 4. After 3 hr and above	
31	In the first three days after delivery was (name) given anything to drink other than breast milk?	1. Yes 2. No	
32	Is your child is still Breastfeeding	1. Yes 2. No	
33	If yes, how long do you want to breast feed this child?	In months	
34	Have started giving your child other foods?	1. Yes 2. no	
35	If yes, at what age did you begin giving other foods?	1. 1-5 months 2. At 6 month 3. 7 month and above	
36	Which food did first introduce to your child	1. Milk/ milk products 2. Glucose water 3. Porridge	

		4. Honey	
37	How often should you breastfeed your child?	1. On demand 2. According to timetable	
38	What method did use for feeding your child?	1. Spoon 2. Cup 3. Hand 4. Bottle	

Part five: child history of illness.

39	How many times you visited Antenatal care in health institution when you are pregnant of this child?	1. None 2. 1 3. 2-3 4. 4 and above	
40	Where did you deliver your child?	1. Public health facility 2. Private healthy facility 3. Home 4. Other 5. other	

41	Did you attend post natal care service after delivery of your child?	1. Yes 2. No	
42	Was your child weighted at birth?	1. Yes 2. No	
43	If yes how much did the weight of your child in kg	1. Below average 2.5kg 2. Average (2.5-4kg) 3. Above average	
44	Did your child received vaccination?	1. Yes 2. No	
45	If yes did your child took all vaccination? If card available check	1. Fully vaccinated 2. Currently on vaccination 3. Not fully vaccinated	
46	Has the child been sick in the past	5. YES	

	Fourteen	6. NO	
47	1. If yes what was the child suffering from	1. Diarrhea 2. cough / common cold 3. malaria 4. worms 5. fever 6. other	

Part six: Maternal knowledge on complementary feeding

No	Question	Yes	No
48	Infants should be exclusively breastfed for the first 6 months of life		
49	Breastfeeding should be continued up to 2 years and beyond		
50	A 6 months child should be fed on pureed or sieved foods		
51	Mother or a caregiver should feed a child based on hunger cues		
52	A breastfed child who is 12 months old should be fed solid foods two times per day		
53	Mothers/caregivers should wash hands before preparing children's Food		

54	Sick and recovering children should be fed porridge or diluted fruit juices only		
55	Feeding bottles are the best option for feeding children who have refused to breastfeed		
56	Water used to prepare food and drinks for a child should be boiled or Treated		
57	A mother or a caregiver should assist a child to eat until 2 years		
58	A child should be breastfed on demand		
59	A mother should be the primary feeder of the child		
60	A child's main meal should be a mixture of many food items from grains/cereals, meats/eggs/poultry, fish, legumes, roots/tubers, fruits/vegetables, fats/oils		
61	It's not advisable to give a child who is breastfeeding other protein foods such as poultry, eggs, fish even after 6 months since breast milk is adequate in proteins		
62	It is not possible for a baby to survive on breastfeeding for six months		
63	Nutritious food are expensive		
64	Malnutrition is caused by witchcraft and evil eye		
65	Some foods are too heavy for the children to digest for example eggs		
66	Does breast milk protect your child from illnesses		

67	First milk (colostrums) is very nutritious to the baby		

Part seven:Anthropometric index for children

68	Anthropometric index for children		
		Age in month	
		Weight in kg	
		Height in cm	
		MUAC in cm	