RECOVERY RATE AND CHILD GROWTH AFTER SUPPLEMENTARY FEEDING IN DAYNILE DISTRICT HOSPITAL, MOGADISHU–SOMALIA

BY

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BSc. Public Health

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DECLARATION

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

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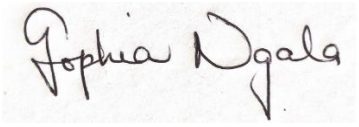

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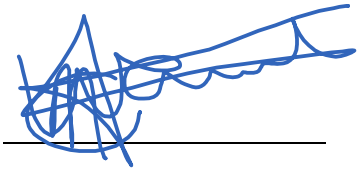
Signature:  Date: 2/11/2020

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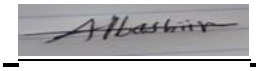
Signature:  **Date:** 2/11/2020

DEDICATION

This work is dedicated to my whole Abdi Ade family for their support and encouragement throughout the entire period of my study. To my uncle Abdurrahman Moalim, Sister Maryam Abdulle and my niece Anisa, thanks for being helpful and understanding throughout the period and to my parents Mr. Isse Abdi and Mrs. Hakima Sheikh, thank you for providing a firm foundation for my life.

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ABBREVIATIONS AND ACRONYMS

BMI:	Body Mass Index
CSB:	Corn-soya blend
CF:	Complementary Feeding
ENA:	Emergency Nutrition Assessment
DDS:	Dietary diversity score
FAO:	Food and Agriculture Organization
FSNU:	Food Security and Nutrition analysis Unit
FVS:	Food variety scores
HC:	Head Circumference
IMAM:	Integrated Management of Acute Malnutrition
IYCF:	Infant and Young Child Feeding
LNS:	Lipid based nutrient supplements
MAM:	Moderate Acute Malnutrition
MNDs:	Micronutrient deficiencies
MUAC:	Mid Upper Arm Circumference
ODK:	Open Data Kit
SPSS:	Statistical Package for Social Sciences
SMART:	Specific, Measurable, Attainable, Realistic, and Timely
RUSF:	Ready to use supplementary food
UNFPA:	United Nations Population Fund
UNHCR:	United Nations High Commissioner for Refugees
WFA:	Weight for Age
WFH:	Weight for Height
WHO:	World Health Organization

OPERATIONAL DEFINITION

Child growth: increases in height and weight and other body changes that happen as the child grows

Complementary feeding:-period during which other foods or liquid are provided along with breast milk (WHO, 2006b).

Complementary foods:-Any non-breast milk foods or nutritive liquids that are given to young children during the period of complementary feeding (WHO, 2006b).

Dietary intake: Is defined as the quantity and quality of meals that are consumed for a given period of time.

Introduction of solid, semi-solid or soft foods: Proportion of infants 6–8 months of age who receive solid, semi-solid or soft foods during the previous day (WHO, 2007).

Maternal knowledge: Mothers' understanding, information, perception and familiarity with complementary feeding, based on the guiding principles of complementary feeding for a breastfed child.

Minimum dietary diversity: Proportion of children 6–59 months of age who receive foods from four or more food groups during the previous day. The seven food groups used for this indicator were: grains, roots and tubers; legumes and nuts; dairy products (milk, yoghurt and cheese); flesh meats (meat, fish, poultry and liver/organ meats); eggs; vitamin A-rich fruits and vegetables; and other fruits and vegetables (WHO, 2007).

Nutritional status:- For this study it was defined under the following categories; underweight (weight-for-age below-2 Standard deviation (SD) of the WHO Child Growth Standards), stunting (height-for-age below -2 SD of the WHO Child Growth Standards), wasting (weight-for-height below -2SD of the WHO Child Growth Standards) among children 6-59 months of age.

Polygamous marriage: Refers to a state of marriage in which a man has more than one wife at the same time

Recovery rate: the rate at which a child improved from being severely malnourished to being moderately malnourished or well nourished

Supplementary feeding: defined as the provision of meals, drinks, or snacks to children or families in addition to their normal diets.

ABSTRACT

Somalia experiences a malnutrition burden among its under-five population. Infant growth is an important variable that indicates the nutritional and health status of children. Daynile District in Somalia is characterized by persistent terror attacks, famine, and hunger. This situation has made it hard for infants to access sufficient food and thus lead to under- nutrition. "Very little is known about the effect of supplementary foods during infancy. Few to no researchers have studied the outcomes of giving supplementary foods to the malnourished children and whether it enhances the children's growth to a level that compensates for lean food times. The overall objective of the study was to establish the association between dietary intake of supplementary food on infant recovery and growth of children attending Daynile District Hospital, Mogadishu Somalia. A longitudinal study was carried out among 196 children (6-59 months) attending Daynile District Hospital. Collection of data was done using digitized questionnaire in the Open data kit. Socio demographic and socioeconomic characteristics, morbidity, and immunization characteristics were analyzed using descriptive statistics such as frequencies. Chi-square tests were used to define the associations between variables. The dietary intake of children (6-59 months) was analyzed using the python software version 3.7 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.

Majority (73%) of the households had 2 to 6 members. Majority of caregivers were aged (69.7%) were aged 36-50 years and about 70%of caregivers were married while 30% were divorced or widowed. Slightly over half (51.5%) of the children were aged 6 – 24months, while 48.5% were aged 25 – 59 Months. "Slightly over a half (56.6%) of the caregivers were Salaried employees while (43.4%) had their main income source as Businessperson, farmers, Retired and Unemployed. The majority (73.1%) of households had an average Monthly income from all sources of above $120." Almost all (91.8%) the households reported to have been drinking tap water while the others drank water from the borehole or direct from the river.

Childcare practices seem to be dominated with less optimal practices whereby instances of unattended births at homes (30.1%) and at midwife homes (29.6%) still existing in the area. The risk of child under nutrition is evidenced by the less optimal child feeding

practices reported among the caregivers in Daynile. Cases of late initiation of breastfeeding (46.9%) and lack of exclusive breastfeeding practices (69.9%) were the most common among the caregivers in the area.

The percentage of children aged 6-59 months old category wasted were 17.3 %, moderately wasted 13.3 %, and 4.1 % were severely wasted. The total percentage of stunted children in the age of children aged 6-59 months old were 18.4 %. In the same age category, more than three-quarters (81.6%) of the children aged 6-59 months were normal while 13.8 % were moderately and 4.6 % were severely stunted. About 27.0 % of children aged 6-59 months old were underweight. Information obtained from child health cards indicated that the majority all study children (61.7%) had been immunized.

The most consumed food group was dairy products (90.3%) while the least consumed was legumes (22.4%) and other fruits vegetables and (20.4%).There was no significant associations between mother's complementary feeding practices and all the socio-demographic factors except Household's income with minimum meal frequency (p=0.032). Male children had a mean energy intake of 915.90 kcal compared to females at 674.90 kcal. There was no significant differences between the mean energy values of the two groups (p=0.92). The protein intake was also high among the boys (31.3g) compared to the girls (26.4g). No significant association was also observed in the means between the two groups (p=0.67).The female children, on the other hand had higher intakes of Vitamin A, Vitamin C, Folate and Iron compared to their male counterparts with no significant association observed at (p=0.06, p=0.92, p=0.62, p=0.86) respectively. The Recommended Dietary Allowance for Vitamin A and Zinc was not met by any of the children.

The feeding regime indicated that 9 out of 28 children (32%) transitioned from Ready to Use Supplementary Food(RUSF) to Lipid Based Nutrient Supplement (LNS) , 7 out of 28 (25%) did not transition from RUSF while the remaining 12 (43%) children received LNS all through the entire one month of monitoring. At the end of follow up 56% of the 16 children improved and were transitioned to lipid based nutrient supplement. The overall mean height, weight, and Mid Upper Arm Circumference (MUAC) differences for all the children who took RUSF and LNS increased throughout the assessment period an indication that most children had increased in height, weight, and MUAC by the end of the assessment period.

The study children were malnourished due to the less optimal child feeding practice among caregivers in Daynile district. They had high prevalence of stunting, wasting, and underweight. Treatment of moderate acute malnutrition with RUSF and LNS resulted in higher recovery rates of children.

There is need to introduce nutrition education on child nutrition, feeding practices and the importance of exclusive breast feeding as part of the health education packages to the caregivers.” Introduction of effective and sustainable supplemental feeding programmes as a stop-gap solution in effort to address the high malnutrition rates among these children should also be implemented.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Growth is a process that takes place in a number of steps and it is systematic. Infant growth is therefore defined as the increase in size (in terms of their height, weight, and mental reasoning) over their lifetime. Infant growth is an important variable that determines the nutritional and health status of children (Prendergast, 2015). Kramer et al. (2015) argues that infant growth (weight and height) of well fed and healthy children drawn from diverse backgrounds and different contextual settings is arguably same at least to an age of 6 years (should be 5 years). Severe incidences of low dietary intake of children can result into increases in mortality and morbidity while adequate dietary intake results into development of intellect, psychological growth and cognitive development. Growth retardation among infants has been attributed to delayed acquisition of motor skills and mental development. One of the benefits of children consuming adequate food is normal growth (Kollar et al., 2006).

Dietary intake is defined as the quantity and quality of meals that are consumed for a given period of time. "Dietary intake has an influence on growth of infants. Large intakes of food lead to obesity, too little food intake results into under-nutrition. The later condition may lead to emergence of deficiency conditions like Kwashiorkor and Marasmus (Mahmudiono et al., 2016). According to Mallan et al. (2016), infants need to be fed with various types of food that are distributed to at least 5 to 6 meals per day. The WHO states that out of 7 food groups infants should be given 4 food groups while they are breast feeding (WHO, 2010). The children' intake of food should be diverse and balanced diet (Mallard et al., 2016).

It is argued that 40% of world death can be traced to various environmental elements including poor dietary intake. These factors explain about 4 million deaths of infants across the world on an annual basis. An estimated total of 1,500 people die per twenty minutes among developing countries because of neglected diseases most of which are related to dietary intake. On a daily basis, close to 5,500 infants across Eastern and Southern Africa countries continue to die before attaining the age of 5 years, majorly attributed to dietary intakes (Robson et al., 2016).

Somalia is among the sub-Saharan countries characterized by drought and hunger which has over a long period of time, Somalia has experienced a high number of both natural and man-made emergencies such as armed conflict, poor governance, floods and droughts and collapse of institutions/infrastructure (UNDP, 2017). This has led to disruptions in livelihood systems, limited provision of basic services, and a break down in the social care network, subsequently affecting the nutrition situation in the region negatively. A meta-analysis from surveys conducted in Somalia from as early as the 1980s have constantly documented high levels of acute malnutrition, mortality rates even in seasons of improved food security (UNDP, 2017; Masese, 2016).

Somalia experiences a malnutrition burden among its under-five population. As of 2009, the country's under-five wasting prevalence was 15% which is greater than the developing country average of 8.9% the national prevalence of under-five. Overweight was at 3%, which had reduced slightly from 4.7% in 2006. The national prevalence of under-five stunting was 25.3%, which was a little greater than the developing country average of 25% (UNICEF, 2009). The GAM rate in Daynile is critical at 19.9%, with the Somali national GAM level sitting at 17.4%, the situation in Daynile is worse compared to the national average (UNICEF 2017). The MAM in Daynile 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).

Daynile District is in Somalia, characterized by persistent terror attacks, famine, and hunger. This situation has made it impossible for infants to access sufficient food and thus leading to under-nutrition and this formed the need for 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).

Studies examining food and nutrient intakes among children are inadequate and mostly cross-sectional despite the knowledge on the significance of good eating habits during childhood and infancy (Devaney et al., 2004; Fox et al., 2004). While adherence complementary feeding guidelines has been shown to predict diet of children 6-59months and to track throughout

childhood." Very little is known about the effect of supplementary foods during infancy. Few to no researchers have studied consequence of giving supplementary foods to the malnourished children and whether it enhances the children's growth to a level that compensates for lean food times.

1.2 Statement of the problem

Daynile District in Somalia is characterized by persistent terror attacks, famine, and hunger. There are growth monitoring services, prenatal and postnatal services, malnourished children habilitation facilities in the hospitals and even mobile clinic.

However, malnutrition is still rampant in the communities. There is a possibility that the situation is aggravated by famines making it impossible for parents to access and provide sufficient food for their children. 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).

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1.3 Justification of the Study

The Non-Governmental Organizations working in Somalia can use the results of this study to provide better services by making evidence-based decisions during interventions. The community also can use the information on complementary feeding to provide better care of their children. The Government structures have to inform health workers and nutritionist on the need to give priorities to children when food is being distributed. The training for Health personnel can use to include more emphasis on dietary intake of children to allow children growth.

1.4 Aim of the Study

The aim of this study was to contribute to the efforts of the government in reducing the level of underweight children hospitalized in Daynile District Mogadishu Somalia

1.5 Purpose of the Study

The purpose of the study was to establish association between dietary intake of supplementary food and infant recovery and growth in Daynile District Hospital, Mogadishu Somalia.

1.6 General Objective

The main objective of the study was to determine the association between dietary intake of supplementary foods and child recovery and growth in Daynile District Hospital, Mogadishu Somalia

1.6.1 Specific Objectives

i. To determine Socio-demographic characteristics of children (6-59 months) attending Daynile District Hospital
ii. To determine the dietary intake of children (6-59 months) attending Daynile District Hospital
iii. To assess the nutritional status of children attending Daynile District Hospital
iv. To assess and monitor physical growth of the children receiving supplementary food at Daynile District Hospital.

1.7 Research Questions

i. What is socio-demographic characteristics of children (6 – 59 months) attending Daynile District Hospital

ii. Does the Socio-demographic characteristics determine the dietary intake of children (6-59 months) at Daynile District Hospital

iii. How does the dietary intake (6-59 months) affect the nutritional status of children attending Daynile District Hospital

iv. What is the effect of supplementary feeding on the physical growth and rate of recovery of children (6-59 months) at Daynile District Hospital?

1.8 Benefits of the Study

The study findings will inform policy makers in the ministry of health, donor agencies, future scholars, and academicians on the benefits of supplementary feeding on child growth and rate of recovery. The ministry of health in collaboration with the World Health Organization (WHO) can rely on the findings of the study to formulate relevant policies that can enhance growth of infants. Donor agencies working in Mogadishu to effectively handle malnutrition can find the findings of the study as relevant in their effort to improve on delivery of humanitarian assistance. The study acts as a reference point for future studies on malnutrition among scholars and academicians especially in Hospital settings. The study contributes to existing literature on supplementary feeding of malnutrition infant.

CHAPTER TWO: LITERATURE REVIEW

2.1 Dietary Intake

Early childhood is a very important period with regards to dietary intake. Between 6-59 months is a period characterized with fluctuating nutritional requirements and physiological demands coupled with rapid relative growth. It is a period where a child transitions from exclusive breastfeeding to formula milk and finally to complementary feeding (Schwartz et al., 2011).

Dietary intake influences the quantity and quality of nutrients (proteins, carbohydrates, fats and micronutrients) consumed by people in a day to produce energy required by the body. Too much intake of these nutrients may result into overweight and obesity and would lead to infant mortality. On the other hand, little intake of these nutrients may lead to under nutrition and weakened immune systems which can predispose infants to deficiency conditions like Kwashiorkor and Marasmus (Mahmudiono et al., 2016). A study by Siega et al. (2010) shows that the diets that children are fed at the early stages are nutritionally poor foods and beverages and are high in energy while the consumption of fruits and vegetables is less than required . Nutrient intake deficiencies have been shown to be minimal in developed countries apart from probable exceptions of zinc, fibre and iron (Zhou et al., 2012; Butte et al., 2010).Women who follow the stipulated dietary recommendations of having foods that are healthy are more likely to have children with the same eating patterns (Robinson et al., 2007).

Complementary feeding practices are suboptimal in West Africa compared to the Northern Africa. The two most common groups of complementary foods given to children is porridges and family dishes that is not nutritionally adequate. Improved food processing such as fermentation, dehulling, germination and malting have been used to develop the enriched (Mitchodigni et al., 2018).

Besides breast milk infants should also be given complementary foods at the age of 6 months as recommended by WHO, at first the child should be fed two-three times in a day, three-four times at 6-8 months, and continue increasing to 3-4 times daily between 9-11 months and 12- 24 months, snacks should also be offered once or twice per day. The new WHO indicators for complementary feeding practices assesses whether infants aged 6 to 8 months are receiving semi-solid or solid foods irrespective of being breastfed or not (WHO et al., 2010).

When we are introducing infants to complementary feeding, feeds should comprise of sufficient amounts of proteins and also vitamin A-rich fruits and vegetables daily in order to achieve dietary diversity. A minimum of 4 out of the recommended 8 food groups is regarded as satisfactory to meet the child's dietary needs. In Kenya 41% of children aged 6-23 months had an adequately diversified diet (KDHS, 2015) compared to 58% in 2010 (KNBS and ICF Macro, 2010). In order to ensure adequacy of certain nutrient intakes, complementary foods should be given at appropriate times, more frequently and consistently depending on how the child is so as to satisfy the child's feelings of hunger (Parada et al., 2007). Mineral and vitamin supplements as well as fortified complementary foods should be used where necessary to ensure certain nutrient intakes meet their requirements in the body (Bhan, 2010).

Dietary intake according to Taylor et al. (2017), can be measured in variety of ways and methodologies for instance 24-hour dietary recall, food frequency questionnaires, and anthropometric measures. According to Lind et al. (2017), the method used to measure dietary intake is informed by the nature and type of question to be asked, the required outcomes and the participants.

2.1.1 Determinants of Dietary Intake

Literature indicates the there are several factors that influence dietary intake including which are broadly classified as cultural, socio-demographic, economic and demographic factors (Mak et al.,2012).The key socio-demographic factors which influences dietary intake include the gender and age. The level of education of the parent is expected to increase the awareness on the needs of infants (King et al., 2000). An increase in the size of the family may have an adverse influence on dietary intake among infants. In some communities, male infants are perceived to be more energetic and thus receive more preference as compared to female infants. As such, they tend to receive more nutritional intake compared to their female infants (King et al., 2000).

Age as a determinant of nutrition intake is such that during the first years of the child, the nutritional needs of an infant are mostly satisfied through breastfeeding coupled with an intake of complementary food (Thomassen et al., 2017). Socioeconomic indicators such as a mother's occupation, level of education and income are some of the determinants

related to stunting while environment factors such as sanitation, urban or rural setting influences both overweight and stunting. Maternal and household factors, such as maternal age, large household size, education, and lower socioeconomic status influences concurrent overweight and stunting (Keino et al., 2014).

It is argued that infants always need energy and nutrients for survival and thus would respond to feelings of hunger. Economic determinants of dietary intake include the cost of food and the ability of parents to afford certain specific foods. Parents who have low income are reported to take up unbalanced diets which affect the nutrients of the infants (Lönnerdal, 2017). Physical determinants include factors like accessibility to sources of food within shops. Social factors include different classes of parents and the culture (Koletzko et al., 2017). For instance, different social classes of parents consume different food choices. Parents in higher social classes are perceived to feed their infants with healthier and balanced diets. Psychological determinants of dietary intake include things like stress which may lower appetite for food intake (Koletzko et al., 2017).

2.2 Dietary Intake and Infant Growth

Infant growth entails major development milestones that children below the age of two years undergo as they grow up which is influenced by both intrinsic and extrinsic factors creating huge variations and hence infant growth becomes unique in different children (WHO, 2009).

Growth occurs in terms of physical growth and neurodevelopment. Infant growth is affected by several factors that are very critical in determining the life time developmental process. According to Pem (2015), breastmilk makes the best form of food for infant and hence should be availed in abundance through exclusive breastfeeding. Breast milk contains vital fatty acids that are crucial in brain cell development hence positive cognitive development and visual acuity (Pem, 2015).

Developmentally, most infants are ready for other foods at about 6 months, this is the period that becomes increasingly difficult for the infants to meet their nutritional needs through breastmilk only (WHO, 2009). In areas where the sanitation is not good, waiting until even past 6 months to introduce the child to complementary feeding might minimize the risk of getting food borne diseases (WHO, 2009).

Contrary, inadequate complementary feeding has been noted to affect infant growth negatively. Inadequate complementary feeding leads to deprivation of important nutrients and hence limiting the infant's growth and development process (WHO, 2009). Well-timed introduction of suitable complementary foods promotes growth of infants and young children and also enhances good health (Kim et al., 2003).

Young infants maybe eating large quantities of food that are of poor nutritional quality due to the nature of soils where the food were grown. To bridge the nutritional gap during complementary feeding, supplementation maybe adopted with targeted nutrients. Supplementation affects the infants development process depending on nutrients provided in the supplements (Lin et al., 2020). According to a study by infants who received supplements were noted to have an increased in weight and length. In another study, preventative Vitamin A supplementation in infants was proven to reduce mortalities in infants and reduce the risk to infectious diseases (Imdad et al., 2011). A study done in Mauritius investigating dietary intake and lifestyle behavior among children showed that males as compared to female children were more active due to dietary intake (Budhun et al., 2018).

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

Malnutrition in children manifests its self in two forms; Under-nutrition and over-nutrition. The former is the most common in Somalia and particularly in ASAL areas. Under-nutrition is having a low weight for age (underweight), too short for age (stunting), low weight for a certain height (wasting). Excessive fat accumulation is termed as over-nutrition and it may impair health which is presented as overweight and/or obesity (WHO, 2012). The deficiency of micronutrients may lead to deficiency conditions including Marasmus, Kwashiorkor, and Marasmic-kwashiorkor. While marasmus entails insufficient intake of calories and proteins, infants with kwashiorkor although may have some degree of intake of calories, proteins intake is however insufficient (Worthington et al., 2017).

One of the major leading causes of childhood mortalities in low- and middle-income countries is malnutrition and has been shown to have permanent consequences on metabolic, physical, mental development (UNICEF, 2012). Areas suffering complex emergencies such as drought or conflict are often faced with the acute malnutrition crisis (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). A study conducted in Somalia by Osman et al. (2019) showed that the nutrition situation in Daynile was critical (GAM 19.9%). The situation in Daynile district was actually less serious in comparison to the Somali national GAM level sitting at 17.4% (UNICEF 2017; UNHCR 2017). Compared with the national MAM figure of 3.2%, the MAM in Daynile (8.0%) was more than the national data (Osman et al., 2019).

A poor dietary practice remains one of the several determinants of undernutrition. Most households, especially in low-income countries still face the problem of appropriate complementary feeding and caring practices by caregivers (Melaku et al., 2013).Moreover, about 6 % of under-five mortalities in the developing world can be prevented particularly if optimal complementary feeding is ensured, thus contributing towards the realization of the Millennium Development Goal 4 (WHO, 2006). Nutritional status is a complex phenomenon and it can be measured through different methods and techniques. However, the common method of determining nutritional status is the clinical methods that include assessment of bilateral pitting oedema among infants, examining presence of bitot's spots and analyzing the presence of goiter (Rudolph, et al., 2017).

2.4 Supplementary feeding and Child Growth

The purpose of supplementary feeding programs is to treat moderate acute malnutrition and prevent it worsening to severe acute malnutrition. About 13% of children under 5 years of age worldwide are affected by moderate and severe acute malnutrition. Severe acute malnutrition affects fewer children but is associated with higher rates of mortality and morbidity (Lenters et al., 2016).

African children face a myriad of problems resulting to poor dietary intake, which calls for supplementation to bridge the nutritional gap brought about by inadequate dietary intakes. As noted by (Kristjansson et al., 2016), supplementary feeding plays an important role in ensuring children attain the correct height and weight as they grow up. Additionally, supplementary feeding is linked to positive cognitive development and improved psychomotor development in children.

A study determining the effects of novel supplementary porridge in Uganda showed a positive correlation between the use of supplements and increased recovery rates of children with moderate acute malnutrition (Kajjura et al., 2019). The use of locally available and nutrient dense commercially manufactured supplements showed to be important in management of moderate acute malnutrition in most districts of Uganda (Kajjura et al., 2019).

A study by Medoua et al. (2015) in Cameroon , to compare a ready-to-use supplementary food (RUSF) with an improved corn-soya blend (CSB+) showed that of children treated with CSB+ and RUSF, 85 % and 73 % respectively, recovered from moderate acute malnutrition, with no significant difference between groups (Medoua et al., 2015). A similar study in Southern Ethiopia among children showed higher recovery rates from moderate acute malnutrition with RUSF (Karakochuk et al., 2012).

In another study conducted in Kenya, supplementation with locally available foods was determined to decrease malnutrition and improve the gain in weight among study participants (Tomedi et al., 2012). A study conducted in Niger among children 6 to 59 months concluded that supplementation is important in reducing the decline in weight for height and also reducing incidences of wasting and severe wasting (Isanaka et al., 2009). Through outpatient programs children were offered home based treatment focusing on addressing malnutrition. In study conducted in Malawi using lipid-based nutrient supplement which has been proven to be effective in treating severely wasted children found that supplementation lead to weight increase in moderately underweight children (Thakwalakwa et al., 2008).

Supplementary feeding programs in Somalia are mainly conducted by the government, both local and national and non-governmental organization such as the world vision (WV) and the world food program (WFP) (WV, 2015). Chronic malnutrition has been affecting most children in Somalia calling for collaborative actions to ensure the problems is halted and brought to an end. Nutritional supplementation has been one of the strategies adopted by stakeholder in the fight against chronic malnutrition (Reinhardt and Fanzo, 2014).

Integrated Management of Acute Malnutrition (IMAM) is one of the program developed with international standards and adopted for use in the management of chronic malnutrition in Somalia. Further delving into the supplementary feeding programs under the IMAM, two approaches have been adopted in Somalia (Matunga and Bush, 2012). These approaches are curative and preventive supplementary feeding programs. Under the curative programs, activities targeting malnourished children are undertaken with aims of treating acute malnutrition and severe acute malnutrition (ACF 2010; WHO 2013; WHO 2007). Under the blanket supplementary feeding program interventions targeting nutrition supplementation in the cases of emergencies are adopted where high Moderate Acute Malnutrition (MAM) in population, high food insecurity (availability and/or access) or high prevalence of chronic malnutrition and micronutrient deficiencies (MNDs) exists prior to the emergency (ACF 2010; WHO 2013). Under the Maternal and Child Health Clinics Nutrition Support (MCHN), supplementation is done offering children with supplements enhancing their growth within a period of 100- days (Matunga and Bush, 2012).

2.5 Policies guiding Supplementary feeding in Somalia

There are several policies in Somalia concerning Infants and young children. The one guiding supplementary feeding currently is the Somali Nutrition Strategy 2011–2013 ‘Towards the Millennium Development Goals (WHO, 2010).

Due to inadequate governance structures in parts of Somalia, nutrition response programming is mainly undertaken by UN, international and national NGOs (WFP, 2010). Nutrition interventions are primarily focused on responding to alarming rates of acute malnutrition throughout the country. Food security and nutrition surveillance and early warning reports (FSNAU, FEWSNET, and WFP) are key activities providing quality

information and analysis for the targeting of appropriate and timely responses to changing needs in country (FSNAU, 2009). Activities for the prevention of moderate acute malnutrition include the provision of fortified supplementary food by WFP to all children under-two and pregnant and lactating women, through UNICEF-supported MCH clinics at selected sites (WFP, 2008; UNICEF, 2009).

In addition, in 2009, UNICEF launched a new initiative for the prevention of malnutrition, targeting 100,000 children aged 6-36 months with blanket distribution of ready-to use food (Plumpy Doz) every two months in areas showing the highest malnutrition rates(UNICEF, 2009).

WFP also provides a general food ration consisting of cereals, CSB, sugar, fortified oil, and iodised salt when available, to the rural population affected by the humanitarian crisis, the urban poor, and IDPs. In 2009 this food assistance covered around 3 to 3.5 million people a month – almost half the population – on the basis of FSNAU seasonal assessments (WFP, 2008).

2.6 Gaps in knowledge

The young children in Somalia undergo a lot of nutritional problems which deny them chance to attain their highly potential physical and mental development. There is a high prevalence of severe malnutrition in underweight and stunting connected with incidence of micronutrient deficiency, lacking in standard feeding and quality breastfeeding practice. Several studies have focused on malnutrition as health problem in Somalia. Nevertheless there is in adequate information about dietary intake malnutrition and child growth. Therefore diets have a critical role in development and interventions towards reducing malnutrition.

CHAPTER THREE: METHODOLOGY

3.1 Study Site of households of children attending Daynile District Hospital Mogadishu

The study was conducted at Daynile District, which is in the South East Banadir region of Somalia (the largest district). The study was conducted in the district hospital. Daynile District covers the northern outskirts of Mogadishu (the capital city of Somalia) and boarders the middle and lower Shebelle region. Daynile District has been selected because it has the highest prevalence of children malnutrition in Somalia (ARC, 2018).

Daynile District is among the largest districts in Southern Banadir region of Somalia. The region experiences an average annual rainfall of 1228 mm and average temperature of 18.5 °C There estimated population of residents in Daynile District is about 55,000 adults and children (World Bank, 2017). The major livestock kept include cattle, sheep, and goats (Masese, 2017). There is general hospital in Daynile District which shall form the unit of observation for the study. Each division in Daynile has nutritional Mather and child centers

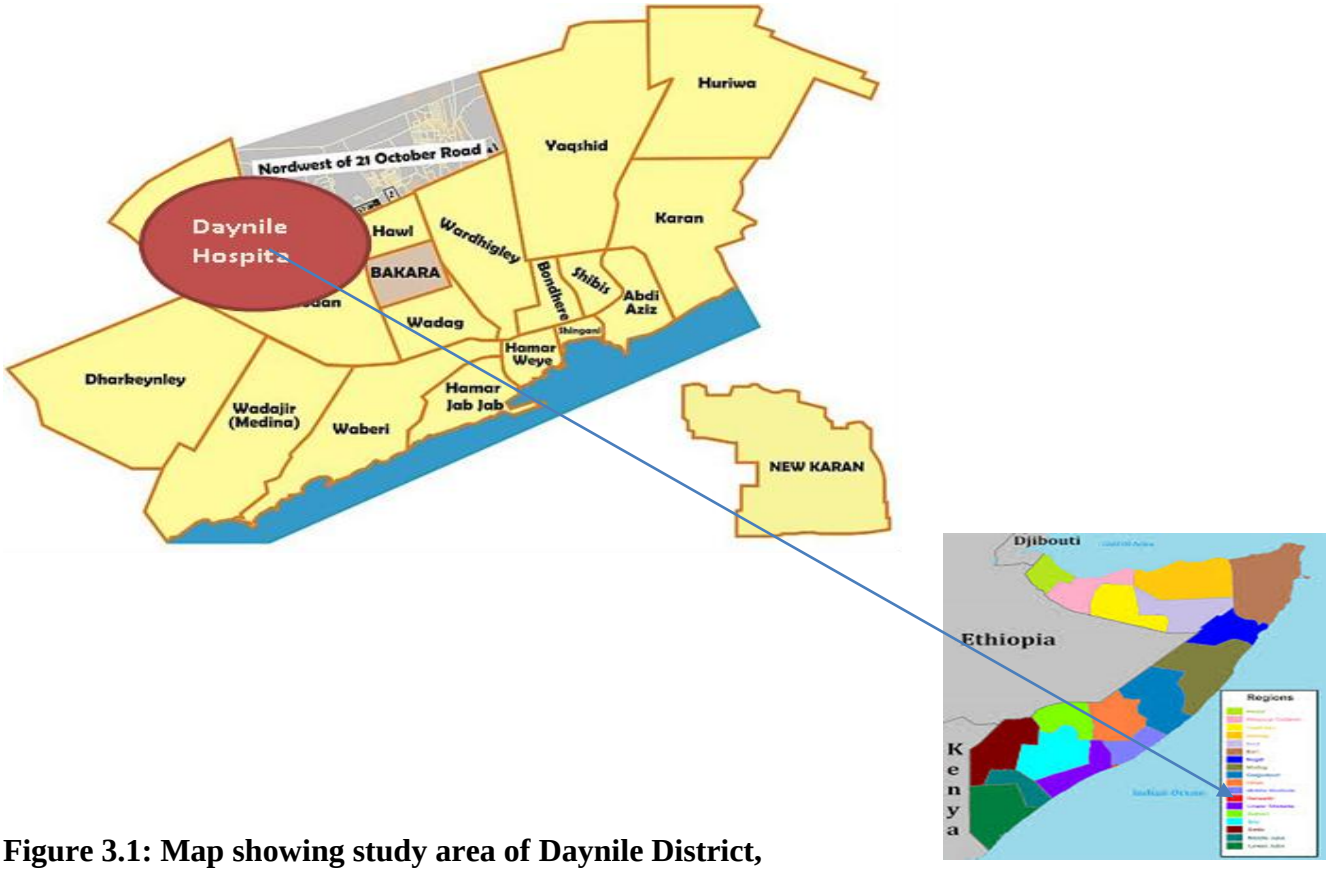

Figure 3.1: Map showing study area of Daynile District, Mogadishu, Somalia

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

The study was longitudinal study and used anthropometric measurements of children aged 6- 59 months. Initial data collection including the baseline nutritional status of children was measured among other factors. Children with nutrition status below -2 Z scores of weight-for-height were recruited for the follow up part the study. The recruited children were followed up four weeks while they were receiving two supplementary foods. The children were measured using anthropometric measurements and giving them supplements such as Ready to use supplementary foods RUSF and lipid based nutrient supplements LNS then measuring the growth rate. Caregivers who were present in the hospital provided answers to research interviewers on Open data kit (ODK).

3.3 Target Population of a study in of children attending Daynile District Hospital Mogadishu

The target population is mothers who had children aged (6-59 months) in Daynile district Mogadishu Somalia.

3.3.1 Inclusion Criteria of study children attending Daynile District Hospital Mogadishu

Infants within 6-59 months admitted to the hospital.

3.3.2 Exclusion Criteria of study children attending Daynile District Hospital Mogadishu

1. Diarrhea: child having diarrhea.
2. Any heart disease (congenital disorder) or deformity
3. Known allergy to ingredients used to formulate the supplementation product

3.4 Sample Size Determination of study children attending Daynile District Hospital Mogadishu

Sample size determination was computed using Fischer's formula (1991):

$n = (Z^2pq)/$

d^2 Where;

z is the critical value

z = 1.96 for 95% confidence level

P is the estimated value of the prevalence of children aged 6 to 59 who were malnourished in Somalia which is 13.5% (FSNAU, 2015)

q= 1-p

d= degree of accuracy= 0.05

$$n = \frac{1.96 \text{ X } 1.96 \text{ X } 0.135\text{X}0.87}{(0.0025)}$$

n = 180.4

After adding 10% attrition

n= 180.4/0.9 = 201

3.4.1 Sampling for the follow up phase of a study of children on supplementary feeding in Daynile District Hospital Mogadishu

All children receiving the supplements were followed up for one month. There were three groups, one receiving RUSF (7) another that transitioned from RUSF to LNS (9) and the other LNS (12). The size of the group was 28 children.

3.5 Sampling procedure for study children attending Daynile District Hospital Mogadishu

Multistage sampling was employed to select the study participants. At the first two phases, Somalia as a whole was selected using purposive sampling which followed

by a selection of Daynile district using the same method. In the third phase, Daynile district hospital was also selected purposively. At the fourth phase well-babies attending the hospital were selected using exhaustive sampling and finally included in the study (Figure 3.2).

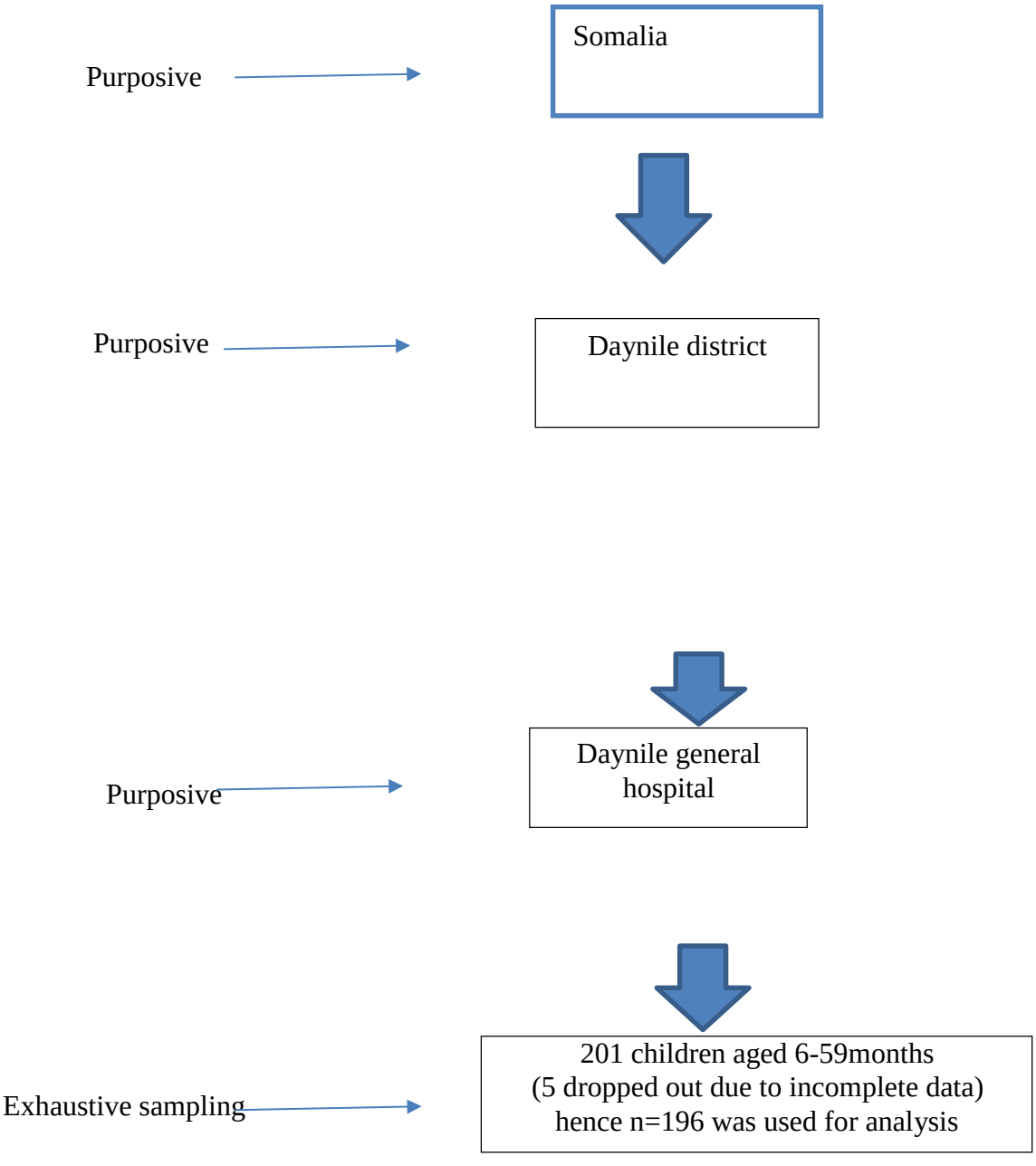

Figure 3.2: Sampling Schema for study of children attending Daynile District Hospital Mogadishu

3.6 Data Collection Instruments

The study used digitized questionnaires in Open data kit (ODK) to gather data. The questionnaires collected information on social demographic and socio-economic factors, feeding practices, nutrition status, water sanitation and hygiene practices and data on feeding practices conducted 24hr recall.

3.6.1 Determination of socio- demographic characteristics of households of with children (6-59 months) attending Daynile District Hospital

Socio- demographic data was collected from the study households using a semi structured questionnaire. The questionnaire had questions on marital status, level of education, relationship to household head, occupation and main source of income, how much they earn, whether the house they lived in was their own or rented, the type of assets owned by the family and the type of cooking fuel

3.6.2 Determination of the dietary intake of children (6-59 months) attending Daynile District Hospital

3.6.2.1 24-hour recall questionnaire

"A 24-hour dietary recall (24HR) is a structured interview intended to capture detailed information about all foods and beverages consumed by the respondent in the past 24 hours, most commonly, from midnight to midnight the previous day. A key feature of the 24HR is that, when appropriate, the respondent is asked for more detailed information than first reported. For example, a respondent reporting chicken for dinner or a sandwich for lunch was asked about the preparation method and type of bread. This open-ended response structure is designed to prompt respondents to provide a comprehensive and detailed report of all foods and beverages consumed.

In addition to other detailed descriptors, such as time of day and source of food, portion size of each food and beverage is captured. Food models, pictures, and other visual aids used to help respondents judge and report portion size. The multiphase method approach was used during the interview. Dietary recalls typically ask about foods and beverages first, before questions on dietary supplements" (Gibson, 2005).

3.6.2.2 Individual Dietary Diversity Questionnaire

The Individual dietary diversity questionnaire in intended to get information from the respondent on foods and drinks they ate or drank the previous day (yesterday) during the day and at night, whether at home or outside. The respondent was supposed to remember all foods and beverages they consumed beginning the previous day morning (yesterday morning) when they woke up. "The respondent was informed that that the questions refer to them and not any other member of the household. Then the questionnaire pertaining to the child was also administered. The responses were ticked according to corresponding food group category. At the end of the interview a total score was entered at the bottom of the questionnaire.

3.6.3 Examining the nutritional status of children 6-59) months attending Daynile District Hospital

Anthropometry measurement data for both the children and Women (of child bearing age) was undertaken using procedures recommended by Gibson (2005).

Age: The clinic card, birth certificate, baptism card or ID was used to ascertain and record the age.

Recumbent length: Children less than 2 years, recumbent length is measured with a wooden measuring board to the nearest 0.1mm. The length measurements were done according to standardized procedures.

Height: Children greater than 2 years and adults were measured in the standing position, using a free standing stadiometer.

Modified tapes of measures which measures up to 2m was used in the absence of a height board. Height should be measured to the nearest 0.1mm. The height measurement was done according to standardized procedures (Gibson, 2005).

Weight of children: The children were weighed using a suspended scale, (UNICEF salter scales). They were also weighed naked or with minimum clothing. After slipping the subject into the sling, the weight was recorded to the nearest 0.5gm. This process was carried out according to standardized procedures (Gibson, 2005).

3.6.4Assessing and monitoring the physical growth of the children receiving supplementary food at Daynile District Hospital

Twenty eight (28) children were selected for assessment of change in physical growth to assess the impact of two supplementary foods that is, Ready to Use Supplementary food (Plumpy sup 100g - RUSF) and Lipid based Nutrient

Supplement (Plumpy doz 50g-LNS). Both are distributed by WFP at local NGOs to the health facilities. The children received one packet of RUSF (100g) and LNS (50g) on a daily basis for one month." The children anthropometric measurements were taken (height, weight and MUAC) as follows; day 0 (recruitment day), two weeks, and at four weeks. The feeding regime was as follows; children with MUAC 11.5-12.5 RUSF, MUAC > 12.5 LNS.

3.7 Data quality Assurance

3.7.1 Pre-testing of Tools

Before data collection, the research instruments were pretested to test for reliability and validity. Respondents who took part in the pilot study were not involved in the final data collection to avoid possible biasness. Pretesting was carried out to establish the extent which the research instruments were valid and reliable. The study purposively selected 8 respondents to take part in the pretesting of the questionnaire. Each questionnaire took approximately 20 to 30 minutes.

3.8 Recruitment of Research Assistants and Training

3.8.1 Recruitment of Research Assistants

The study recruited 10 research assistants who helped in administration of the questionnaires. The research assistants were students who had completed high school education With Clear qualifications including previous experience in data collection. Good communication and interpersonal skills was a key qualification in recruitment of the research assistants.

3.8.2 Training of Research Assistants

There was an initial purchase of stationery and organizing logistic for the training. The objectives and purpose of the study was explained to the research assistants. A five days training of research assistants was conducted on the administration of the questionnaire, role play of interviewing techniques, training on taking measurements of anthropometry and a day for piloting, feedback session and adjustment of the questionnaire. The length of time needed for interview at each caretaker/mother was determined at the training session.

3.9 Ethical Considerations

A letter of introduction to the authorities and the respondents was acquired from the Department of Food Science, Nutrition, and Technology of the University of Nairobi that stated the objective of the study as being for academic purpose. The study also sought for permission from respective hospitals to collect data.

The respondents signed a consent form before they were recruited into the study. They were assured of confidentiality. The researcher also provided assurance to all respondents that information collected was only used for academic purpose. No respondent was forced to take part in the study and the names of respondents was not indicated anywhere in the questionnaire. The respondents were informed that they are free to leave the study any time they wished. The study also applied for an ethical clearance from the responsible authorities in Somalia.

3.10 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.

Anthropometric indices were calculated using WHO child growth standards. ENA for SMART and SPSS was used for calculation of Z scores. The mean weight-for-age, height-for- age, and weight-for-height were determined. Stunting, underweight or wasting was defined by Z score < -2SD for weight-for-age, height-for-age, and weight-for-height respectively. Mid- upper arm circumference (MUAC) with a cut-off point of 12.5 cm for < under five will be used as a proxy for low weight-for-height. The nutritional status of the study children was assessed using weight-for-age (indicator for underweight), weight-for-height (indicator for wasting), and height-for-age (indicator for stunting) nutritional indicators. Children who fell below -2 z-scores were considered malnourished and above -2 z-scores were considered well nourished.

From the food consumption data means DDS, FVS, and Nutrients were determined using Nutri-survey. The mean intakes were calculated. Subjects below the average intake were calculated. Prevalence of inadequate intake was determined. Minimum dietary diversity and minimum meal frequency were used to determine complementary feeding practices. Since all infants 6-8 months old had been introduced to complementary foods appropriately as recommended, introduction of solids semi-solids and soft foods was left out (WHO, 2007).

Sociodemographic and socioeconomic characteristics were analyzed descriptive statistics such as frequencies, chi-square tests were used to define the associations between variables. The dietary intake of children (6-59 months)" was analyzed using the python software version 3.7 while the nutritional status, morbidity, and immunization characteristics was analyzed with the ENA for SMART (version 2012), chi-square was used to analyze the physical growth of the children.

CHAPTER FOUR: RESULTS

4.1 Socio-demographic characteristics of households of study children attending Daynile District Hospital Mogadishu

A total of 196 caregivers with children aged 6 – 59 months attending Daynile District Hospital were interviewed. Majority of the caregivers were aged 36-50 years, (5.7 %) of caregivers were aged 18-35 years old and small percentage of them (14.7%) were aged above 51 years old. Nearly (70%) of caregivers were married while 30% were divorced or widowed. Majority (73%) of the households had 2 to 6 members. More than two thirds of the caregivers had a lower primary level of education while (30%) had above secondary education (Table 4.1).

Table 4. 1: Socio-economic and demographic characteristics of households of study children attending Daynile District Hospital, Mogadishu

Characteristic	**N=196**
	Percent (n)
Caregiver's age	
36-50 18-35 69.5(137) 15.7(30)	
51 and above	14.7(29)
Marital status of Caregivers	
Divorced	21.8(43)
Married	69.5(137)
Widowed	8.7(17)
House hold size	
6-and below	73(143)
7 and above	27(53)
Care giver education level	
Never went to school	6.1(12)
Madrasa	32(62)
Primary	29.4(58)
Secondary	26.9(53)
Tertiary/University	5.6(11)

***Footnote: The numbers in parenthesis are the absolute figures or actual numbers while those outside are the percentages**

4.1.1 Characteristics of study children attending Daynile District Hospital Mogadishu

Information regarding children was obtained from caregivers and a review of the child's Health card. Over a half (54.1%) of the children were girls while (45.9%) were boys. Over half (51.5%) of the children were aged 6 – 24months, while 48.5% were aged 25 – 59 Months. Nearly half (57.8%) of the children were born in the hospitals both public and private health facility while around 30.1% of the children were born in mother's homes, and 29.6% in midwife homes (Table 4.2).

Table 4.2: Characteristics of study children attending Daynile District Hospital Mogadishu

Characteristic	N=196
	Percent (n)
Sex of the child	
Female	54.1 (106)
Male	45.9 (90)
Age of the child	
6-12months	27 (53)
13-24months	24.5 (48)
25-36months	23.5 (46)
37-48months	14.8 (29)
49-59months	10.2 (20)
Child delivery places	
Home	30.1 (59)
Midwife homes	29.6 (58)
Private-health-facility	25.0 (49)
Public-health-facility	15.3 (30)

* **Footnote: The numbers in parenthesis are the absolute figures or number of children.**

4.1.2 Socio-economic characteristics of households of study children attending in Daynile District Hospital Mogadishu

Slightly over a half (56.6%) of the caregivers were Salaried employees while (43.4%) had their main income source as Business person, farmers, Retired and Unemployed. The majority (73.1%) of households had an average monthly income from all sources of above ($120). About a third (33.7%) of household lived in their own house, 15.8% were living in refugee camp, and 18.4% in rented houses. The remaining households (33.7%) were hosted by parents, relatives, and friends. Nearly all (91.8%) of the caregivers' households did not have any type of livestock while 8.2 % had livestock. Most of the households (87.8%) used charcoal while 10.7% of the households used firewood and less than 2% of the households used gas as fuel. Almost all (91.8%) of the households reported have been drinking tap water while the others drank water from the borehole or direct from the river. Treatment of water before drinking was done by 39.3% of the households mainly through boiling and using chemicals while those who did not treat took the water as it was directly from the borehole or the river (Table 4.3).

Table 4. 3: Socio-economic characteristics of households of study children attending Daynile District Hospital Mogadishu

Characteristic	N=196
	Percent (n)
Household head occupation	
Salaried employee	56 (111)
Business persons	15.3 (30)
Unemployed	14.3 (28)
Farmers	9.2 (18)
Others	4.1 (8)
Retired	0.5 (1)
House hold income per month	
0_to_80$	6.6 (13)
81_to_120$	20.3 (40)
121_to_150$	23.4 (46)
151_to_200$	32.9 (64)
201_to_250$	12.2 (24)
251_to_300$	4.1 (8)
301$_and_above	0.5 (1)
Home Ownership	
Self – owned	32.1 (63)
Hosted by parents	20.9 (41)
Rented	18.4 (36)
Refugee camp	15.8 (31)
Hosted by relatives for free	10.2 (20)
Hosted by friends for free	2.6 (5)
Family livestock ownership	
No	91.8 (180)
Yes	8.2 (16)
Fuel type of household	
Charcoal	87.8(172)
Firewood	10.7(21)
Gas	1.5(3)
Water drinking of households	
Tap	91.8(180)
Other	8.2(16)
Household water treatment status	
Not treated	60.7(119)
Treated	39.3(77)

Footnote: The numbers in parenthesis are the absolute figures

4.2 Breast feeding practices of women with children attending Daynile District Hospital Mogadishu

Majority of the children's mothers (72%) started breast feeding the child within the first hour of child's life while three quarter (28%) of mothers started child feeding few hours after child birth. As shown in the Table 4.4 around 69.9% of children were not exclusively breastfed while around 30.1% of children were exclusively breastfed.

Table 4. 4: Breast feeding practice of women with children attending Daynile District Hospital Mogadishu

Characteristic	N=196
	Percent(n)
Breast feeding started	
Within the first 30 minutes	53.1(104)
Few hours after birth	25.0 (49)
Immediately after birth	18.9 (37)
Others	3.0 (6)
Exclusive breast feeding practice	
Not exclusively breastfed	69.9 (137)
Exclusive breastfed	30.1 (59)

- **Footnote: The numbers in parenthesis are the absolute figures**

4.3 Complementary feeding practices of study children attending Daynile District Hospital Mogadishu

Majority of children 6-59 months had received solid, semi-solid or soft foods the previous day of the data collection. Mothers reported to have introduced other foods apart from breast milk. Child feeding practices among the children is as summarized in **Table 4.5**. About three in every ten (30.1%) of the respondents began complementary feeding beyond six months. More than 57.1% of the children were given their meals twice a day or below. About eight in every ten (83.7.0%) of the children were fed on food sourced from within the household. Handwashing before child feeding was very good practice among the women with up to 76%.

Table 4.5: Complementary feeding practices of study children attending Daynile District Hospital Mogadishu

Characteristic	N=196 Percent(n)
Age of onset of complementary feeding	
1-6 months	69.9(137)
7-12 months	30.1(59)
Number of feeding in a day	
Once	27(53)
Twice	57.1(112)
Three times	15.8(31)
Source of food fed to the child	
Cooking home	83.7(164)
Feeding centers	3.6(24)
Buying	12.2(7)
From relatives	0.5(1)
Hand washing before child feeding	
No hand washing	76(149)
Hand washed before child feeding	24(47)

Footnote: The numbers in parenthesis are the absolute figures

4.4 Nutritional status, morbidity and immunization of the children aged 6-59 months in Daynile District Hospital

4.4.1 Wasting

The total percentage of children aged 6-59 months old category wasted was 17.3 % (12.7 - 23.3 95% C.I.) while the children aged 6-59 months old 13.3 % (9.2 - 18.7 95% C.I.) were moderately and 4.1 % (2.1 - 7.8 95% C.I.) severe wasted (Table 4.6)

4.4.2 Stunting

In this study the total percentage of stunted children in the age of children aged 6-59 months old was 18.4 % (13.6 - 24.4 95% C.I.). In the same age category, more than three-quarters (81.6%) of the children aged 6-59 months were normal while 13.8 % (9.6 - 19.3 95% C.I.) were moderately and 4.6 % (2.4 - 8.5 95% C.I.) were severely stunted (Table 4.6).

4.4.3 Underweight

In this study slightly 27.0 % (21.3 - 33.7 95% C.I.) of children aged 6-59 months old were underweight. In the same age category, slightly less than three-quarters (73. %) of the children were normal while 21.4 % (16.3 - 27.7 95% C.I.) of the children aged 6-59 months old were moderate and 5.6 % (3.2 - 9.8 95% C.I.) of the children aged 6-59 months were severe underweight (Table 4.6)

Table 4. 6: Nutritional status of the children aged 6-59 months in Daynile district hospital

Nutritional status indicator	**Prevalence of wasting, Stunting and underweight (<-2 z-score)**	**moderate(<-2 z-score and > =-3 z-score)**	**sever(<-3 z-score)**
Weight-for-length(wasting)	(34) 17.3 % (12.7 - 23.3 95% C.I.)	(26) 13.3 % (9.2 - 18.7 95% C.I.)	(8) 4.1 % (2.1 - 7.8 95% C.I.)
Length-for-age(stunting)	(36) 18.4 % (13.6 - 24.4 95% C.I.)	(27) 13.8 % (9.6 - 19.3 95% C.I.)	(9) 4.6 % (2.4 - 8.5 95% C.I.)
Weight-for-age(underweight)	(53) 27.0 % (21.3 - 33.7 95% C.I.)	(42) 21.4 % (16.3 - 27.7 95% C.I.)	(11) 5.6 % (3.2 - 9.8 95% C.I.)

Footnote: The numbers in parenthesis are the absolute figures and the confidence Intervals

4.5 Morbidity Prevalence and vaccination rate of children attending Daynile District Hospital

The child morbidity status was determined based on a two-week recall by the mother. About 42.9% of the children were reported to have been sick in the past two weeks of the data collection. Of those infants reported to have been sick, those who had diarrhea were (14.2%), cough- common cold (15.5%), fever (21.4%) and malaria (32.1%) and worms while 16.8% had other illnesses. While majority of the children (57.9%) did not get ill. Information obtained from child health cards indicated that the majority of all study children (61.7%) had immunized. However (38.3%) had not been immunized (Table 4.7).

Table 4.7: Morbidity and vaccination rate of children attending Daynile District Hospital

Characteristic	N=196
child morbidity	**Percent(n)**
Child sickness status	
Children sick in the past 2 weeks	42.9(84)
Prevalence of common illness	
Malaria	32.1 (27)
Fever	21.4 (18)
Worms and Others	16.8 (14)
Cough or common cold	15.5 (13)
Diarrhea	14.2 (12)
Child vaccination	
Vaccinated	61.7 (121)
Not vaccinated	38.3 (75)

Footnote: The numbers in parenthesis are the absolute figures

4.6 Minimum dietary diversity of children attending Daynile District Hospital Mogadishu

Majority of the children (90.3%) had eaten food prepared from dairy products. The intakes of vitamin A rich fruits and vegetables were 38%, iron rich foods intakes (flesh meats) was 35.2% while the consumption of cereals was highest from grains, tubers and roots (88.8%), and lower in eggs (31.6%) and least for legumes and other fruits vegetables (22.4%) and (20.4%), respectively (Figure 4.1).

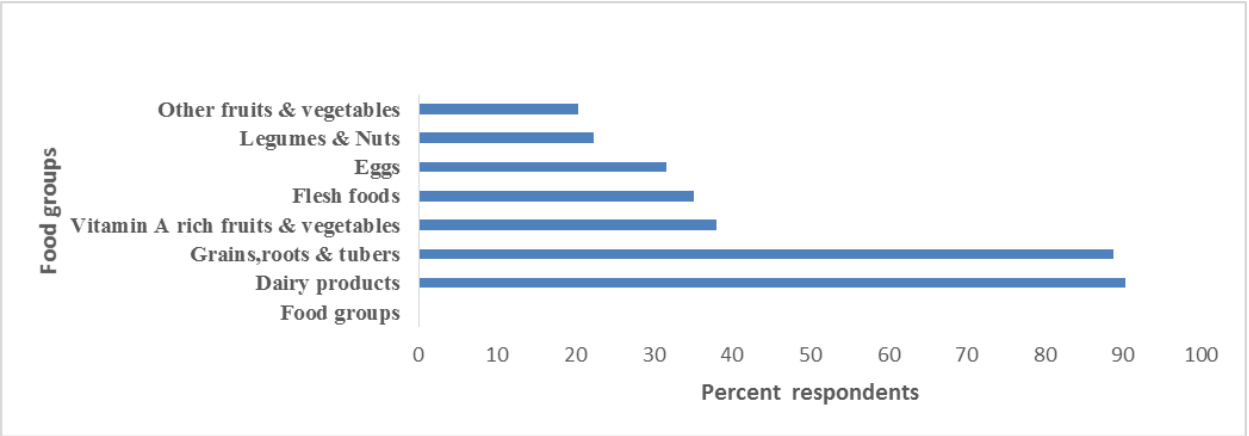

Figure 4.1: Food consumption among children 6-59 months attending Daynile District Hospital

4.6.1 Relationship between complementary feeding practices and socio-economic and demographic factors of household with children attending Daynile District Hospital

Demographic factors: sex of the child, marital status, mother's education level, and occupation, income of the household and their association with mother's complementary feeding practices was determined. There was no significant associations between mother's complementary feeding practices and all the socio economic and demographic factors except household's income with minimum meal frequency (p=0.032*) (Table 4.8).

Table 4. 8: Relationship between complementary feeding practices and socio- economic and demographic factors of households with children attending Daynile District Hospital

Characteristics N= 196	Complementary feeding practices	p value
Marital status	minimum meal frequency	0.422
	Minimum dietary diversity	0.156
Sex of child	minimum meal frequency	0.06
	Minimum dietary diversity	0.413
Household's income	minimum meal frequency	0.032*
	Minimum dietary diversity	0.360
Caregivers education	minimum meal frequency	0.855
	Minimum dietary diversity	0.178

***significant relationship at p-value <0.05**

4.7 Intake of selected nutrients among 6-59 months old children in Daynile District Hospital (24hr recall)

Male children had a mean energy intake of 915.90 kcal compared to females at 674.90 kcal. There was no significant association between energy intakes of females and males (p=0.92). The protein intake was also high among the boys (31.3g) than their female counterparts at 26.4%. The Zinc levels were higher for boys than girls at 2.25 mg and 2.21 mg, respectively. No significant association was observed between intakes of protein (p=0.67) and Zinc (p=0.92) between the males and females. The females on the other hand had higher intakes of Vitamin A, Vitamin C, Folate and Iron compared to their male counterparts. There was also no significant association observed for the intakes of Vitamin A, Folate and Iron at (p=0.06, p=0.62, p=0.62) (Table 4.9).

Table 4.9: Intake of selected nutrients among 6-59 months old children in Daynile hospital

Nutrients taken	Mean ± SD	p-value
Energy (kcal)		
Male	915.90± 521.34	0.92
Female	674.90 ±0.11	
Protein (g)		
Male	31.33±14.03	0.67
Female	26.44± 0.18	
Vitamin-A-retinol-met (μg)		
Male	42.79± 31.16	0.06
Female	79.54± 1.93	
Vitamin-C (mg)		
Male	21.39± 16.16	
Female	28.08± 0.27	
Folate (μg)		
Male	145.64±105.59	0.62
Female	153.05±0.50	
Iron (mg)		
Male	458.17±537.86	
Female	618.65±0.18	0.86
Zinc (mg)		
Male	2.25±2.06	0.92
Female	2.21±0.11	

The Recommended Dietary Allowance (RDA) for energy was met by only 40% of the boys and 29% of the girls. The RDA for protein was also met by a higher percentage of male (90%) compared to the females (79%). The RDA for Vitamin A and Zinc was not met by any of the children. Folate intake was 10% for boys and 22% for girls. Iron was met by 90% of the males and 61% of the girls and an almost equal number of RDA for Vitamin C at 30% and 32%, respectively for the males and females (Table 4.10).

Table 4.10: Proportion of children attending Daynile Hospital who met and those that did not meet the Recommended Dietary Allowance (RDA) of selected nutrients

Nutrients	% RDA met	% RDA not met	p-value
Energy-met (kcal)			
Male	40	60	0.78
Female	29	71	
Protein –met (g)			
Male	90	10	0.74
Female	79	21	
Vitamin-A-retinol-met (μg)			
Male	0	100	1
Female	0	100	
Vitamin-C-met (mg)			
Male	30	70	
Female	32	68	0.78
Folate-met (μg)			
Male	10	90	0.78
Female	22	78	
Iron-met (mg)			
Male	90	10	0.18
Female	61	39	
Zinc-met (mg)			
Male	0	100	0.96
Female	0.7	99.3	

Footnote: met means meeting the Recommended Dietary Allowance

4.8 Physical growth of children attending Daynile District Hospital on RUSF and LNS supplementary

The supplementary feeding regime showed that 9 out of 28 children (32%) transitioned from RUSF to LNS, 7 out of 28 (25%) did not transition from RUSF while the remaining 12 (43%) children received LNS all through the entire one month of monitoring (Figure 4.2).

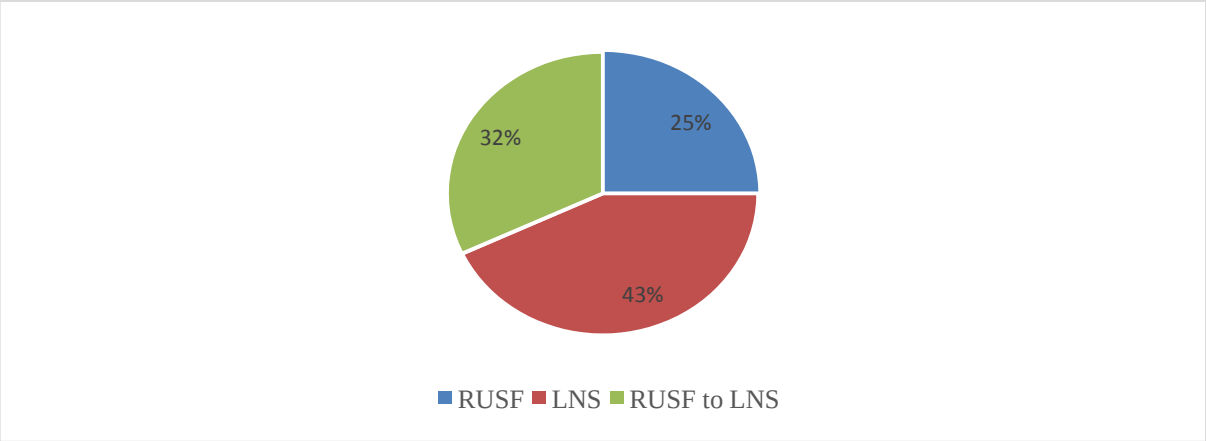

Figure 4.2: Distribution of children attending Daynile District Hospital by supplementary feeding regime based on the supplements provided during the follow up period

4.8.1 Child growth improvement within the period of supplementary foods among children attending Daynile District Hospital.

Children with MUAC between 11.5 to 12.5 were 16 in number at period zero of follow up. At the end of follow up 56% of the 16 children improved and were transitioned to lipid based nutrient supplement (Figure4.3).

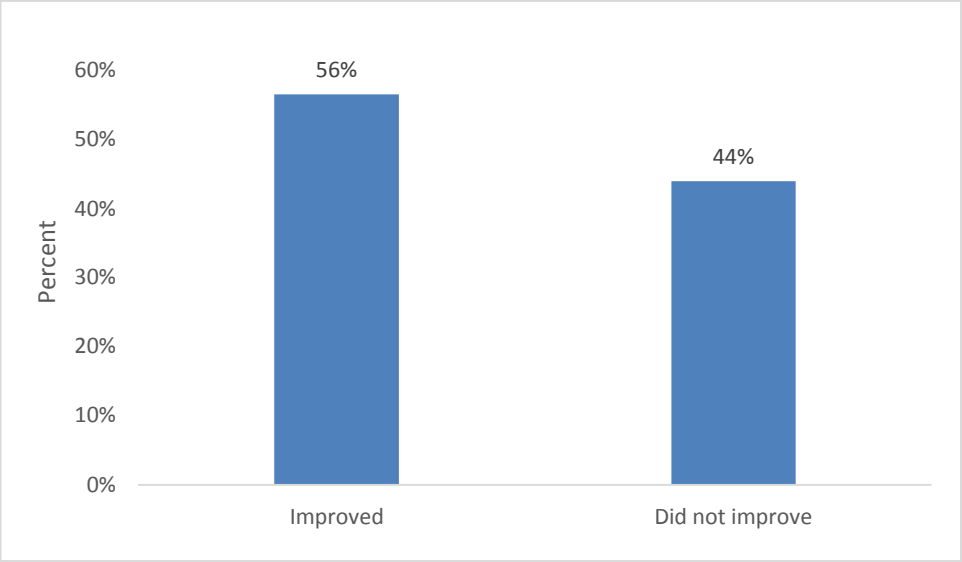

Figure 4.3: Child growth improvement within the period of supplementary foods among children attending Daynile District Hospital.

4.8.2 Child Height assessment within follow-up period while attending Daynile District Hospital

The female children had an overall significant mean difference of 0.4 with a SD of 0.5 for children who took RUSF with mean height for the successive experiments being 73.3, 73.3, and 73.7, respectively. The mean difference for those that transitioned from RUSF to LNS was 0.4 with a SD of -0.2 while those on LNS had a mean difference of 0.5 with a SD of 0. For male children who took RUSF, their mean difference is 0 in the first and second stage of assessment. However, the third period indicates an increased mean value of 0.3. For children who took LNS, their mean heights had a minimal increase difference in stage one to two. The mean difference in the last period there was a mean difference of -2.6 with a SD of 0.2 which is smaller compared to the previous stage meaning that some children might have

transitioned from taking RUSF to taking LNS thus increasing the number of children who took LNS. It was because of this increase in number and insignificant change in heights that led to a smaller mean value at the last assessment period. No statistically significant differences were observed. The mean value of both groups of children who took RUSF increased gradually at every stage meaning that majority of the children under the supplement gained height compared to those taking LNS (Table 4.11).

Table 4.11: Child Height assessment within follow-up period while attending Daynile District Hospital

	Period of Height assessment							
	One		Two		Three			
	Mean	SD	Mean	SD	mean	SD	Difference	p-value
Females								0.971
Both	71.5	2.8	71.6	2.9	71.9	2.6	0.4	-0.2
LNS	77.2	3.3	77.3	3.2	77.7	3.3	0.5	0
RUSF	73.3	1.1	73.3	1.1	73.7	1.6	0.4	0.5
Males								
Both	74.1	7.9	74.3	8	74.8	7.7	0.7	-0.2
LNS	81.1	4.5	81.2	4.4	78.5	4.7	-2.6	0.2
RUSF	72.4	7.1	72.4	7.1	72.7	7.2	0.3	0.1

Footnote: LNS- Lipid Based Nutrient Supplement, RUSF- Ready to use Supplementary Food

4.8.3 Child weight assessment within supplement provision time of children attending Daynile District Hospital

Female children had a gradual increase in mean weights of the children who took RUSF at 7.6 to 8.3 to 8.9, respectively, an indication that majority of the children gained weight during the assessment period. The mean weight difference for the children taking LNS was 1.6 with a SD of 0. An increase in mean weight for the different periods was noted for children taking LNS,

from 9.5 to 11.1 kg generally meaning most of the children gained weight throughout the assessment period. The overall mean weight difference for children who took the two kinds of supplement notably increased from 7.5 to 8.89kg an indication that most children gained weight during the entire assessment period.

Male children had an increase in mean weight throughout the entire assessment period for children who took RUSF from 7.6 to 8.9kg for females and from 7.7 to 9.0 kg for males and LNS from 9.5 to 11.1kg for females and from 10.5 to 11.2 kg from for males. Relatively, for the children who took, LNS the mean weight did not change in period three, however, the mean differences for the overall period was positive an indication that most children gained weight.

In general, the statistics of both the group of children who took RUSF and LNS clearly indicates that most children gained weight during the entire assessment period (Table 4.12)

Table 4. 12: Child weight assessment within supplement time of children attending Daynile District Hospital

		Period of weight assessment								
		One		Two		Three		Difference		p-value
		Mean	SD	mean	SD	Mean	SD	Mean	SD	
Females										
	Both	7.5	0.2	8	0.2	8.9	0.4	1.4	0.2	0.938
	LNS	9.5	0.8	10	1.1	11.1	0.8	1.6	0	
	RUSF	7.6	0.6	8.3	0.6	8.9	0.5	1.3	-0.1	
Males										
	Both	8	2.2	8.9	2.1	9.8	1.9	1.8	-0.3	
	LNS	10.5	0.5	11.2	0.8	11.2	1.8	0.7	1.3	
	RUSF	7.7	1.6	8.2	1.5	9	1.8	1.3	0.2	

4.8.4 Mid-upper arm circumference assessment in a month of follow-up of children attending Daynile Hospital

Female children had an increase in mid upper circumference throughout out the assessment period for female children who took RUSF supplement from 12.0 to 13.0 cm. The data further indicates that the mid upper arm circumference mean difference for children who took LNS increased throughout the assessment period from 13.3 to 14.5cm. In line with this, the overall mid upper arm circumference mean difference for both group of children who took RUSF and LNS increased gradually from 12.1 to 13.1cm and indication that majority of the female children mid upper arm circumference grew bigger.

Male children had a gradual increase in the mean data of mid upper arm circumference for children who took RUSF throughout the three assessment period from 12.1 to 12.8cm. In conjunction to this, the mean value of the three-assessment period for the children that took LNS increased in the second period from 13.2 to 14.1cm and stagnated in the third period at 14.1. The overall mean period was positive an indication that the mid upper arm circumference of most male children enlarged. The statistics of both groups of male children that took RUSF and LNS indicates a gradual increase in mean value of mid upper arm circumference from

12.2 to 13.4cm throughout the three period a clear indication that a large number of male children had an enlarged mid upper arm circumference, but this was not statistically significant (p=0.899) (Table 4.13).

Table 4.13: Mid upper arm circumference assessment in a month of follow-up

		Period of MUAC assessment							
		One		Two		Three			
		Mean	SD	Mean	SD	mean	SD	Difference	p-value
Females									0.899
	Both	12.1	0.2	12.6	0.2	13.1	0.1	1 -0.1	
	LNS	13.3	0.2	14	0.4	14.5	0.4	1.2 0.2	
	RUSF	12	0	12.4	0.1	13	0	1 0	
Males									
	Both	12.2	0.1	12.8	0.4	13.4	0.6	1.2 0.5	
	LNS	13.2	0.2	14.1	0.3	14.1	0.9	0.9 0.7	
	RUSF	12.1	0.2	12.4	0.1	12.8	0.5	0.7 0.3	

CHAPTER FIVE: DISCUSSION

5.1 Socio-demographic characteristics of households with children attending Daynile District Hospital

Majority of caregivers in Daynile district Hospital were middle-aged and which is indicative of the reproductive age of most women (UNFPA, 2016). Most of the caregivers were women. A finding similar to a study done by Omer et al. (2020) in Mogadishu, Somalia where women comprised of over 60 % of the population . The majority of the caregivers were married. This is a common observation of marital status in developing country (Jensen and Thornton, 2003). It could also have been influenced by the Muslim culture in Daynile which advocates for women to get married and despises divorce (National Center on Cultural and Linguistic Responsiveness, 2012). The household size was large. This could be due to the existence of polygamous marriage among the population which contributes to large number of family members and the fact that Somali families are traditionally large and extended (UNFPA, 2016). The average household size estimated in Daynile was in agreement with the estimate from PESS 2014 of 5.9 persons (UNFPA/PESS, 2014). The Somalia Demographic Health survey 2020 reported higher household sizes of 5.3-6.2 persons (Directorate of National Statistics Federal Government of Somalia, 2020). Large household sizes are usually regarded as a risk factor for malnutrition in particularly for infants and young children (Rather, 2004).

The caregivers in this study had a low level of education. The findings in this study corroborate with those of the Somalia Demographic Health Survey 2020 whereby almost half of the women had no formal education (Directorate of National Statistics Federal Government of Somalia, 2020). Access to education is one of the most significant and important determinants of health, thus influences child health and nutrition in a big way (National Center on Cultural and Linguistic Responsiveness, 2012).

The study household had petty businesses as the main source of income. A similar study found that in Mogadishu town, most households are associated with low agricultural production, as it is urban hence most people venture into businesses besides frequent clashes also affect agricultural production (Webersik, 2006). Livestock production by households was low. These findings are similar to those of a study in Somalia that showed that most livestock products came from the rural areas from the agro-pastoralists or the nomads and

there was minimal livestock keeping in the urban areas (Nur, 2005). The research observed that the study households had low income levels. Another research linked to high unemployment levels, low education levels and high poverty levels in the Somali country (ARC, 2018; UNHCR, 2016). Use of charcoal as fuel was rampant in the area as it is one of the cheapest, readily available, and affordable for most households. These findings agree with those of Masese (2016) that found charcoal to be the most used source of fuel. However, use of charcoal has imposed pressure on the forest resource leading to desertification and degradation of arable land (Rembold et al., 2013) .The study community depending on petty businesses, not engaging in agricultural production and use of charcoal as source of cooking fuel is an indication of a vulnerable people.

Tap water was the common source of drinking water in households. This corroborates to a study done in Mogadishu, Somalia where over 80% of the population had their main source of water as tap water (Abdi et al., 2019). Six in every ten of the households in Somalia are connected to piped water thus Mogadishu being an urban area the tap water is the most common source of water.(Directorate of National Statistics Federal Government of Somalia, 2020), Boreholes and rainwater serve as additional sources of water utilizable among the urban population in the Mogadishu City as established in the Somalia Demographic and Health Survey 2020.

The research found that the study households did not treat their drinking water. Similar findings were reported in the Somalia Demographic Health Survey 2020 whereby 70% of the urban dwellers applied no further water treatment techniques to their drinking water (Directorate of National Statistics Federal Government of Somalia, 2020). Untreated water is exposed to microbial and fecal contamination hence increasing the risk of waterborne diseases in Mogadishu (ARC, 2018). Access to clean drinking water helps in controlling diseases (Taylor et al., 2015). Treatment of drinking water by boing and use of chemicals was not a common practice in Mogadishu Town Hygienic practices have been shown to prevent illnesses especially food and waterborne diseases (Cheraghi et al., 2014). Low levels of education observed in the study households could be the reason for the poor hygiene practices observed.

5.2 Characteristics of caregivers' practices of children attending Daynile District Hospital

The study showed that more than 50% of children were born at home. This could be linked to cultural and the belief in a different medical model based on going to the hospital only when symptomatic or in severe medical difficulty (Deyo, 2012). According to WHO only two percent of women in Somalia deliver in hospitals (WHO, 2006a). Delivery at homes poses a risk to mothers during delivery due child birth complications (Zepro and Ahmed, 2016).

Breast feeding within first hour after child birth was common in Daynile. This indicates that most mothers had the knowledge of its importance as it boost the baby's immunity due immunological effects of colostrum (Hanson and Korotkova, 2019; Karim et al., 2019). Majority of households did not practice exclusive breast feeding of children. Exclusively breast feeding children (0-6months) has been reported to boost immunity (M'Rabet et al., 2018). This is because milk contains antibodies that fight against viruses and bacteria (Hanson and Korotkova, 2019). Studies have reported that exclusively breast fed children are less susceptible to illnesses as compared to those unexclusively breast fed (Karim et al., 2019; Legesse et al., 2015). The findings in this study can be used to corroborate the high mortality rates as evidenced in the study by Aden et al. (2019).

5.3 Breast feeding practice of children attending Daynile district Hospital

In the current study, the mothers displayed a mix in the practices whereby majority practiced early initiation of breastfeeding whereas on the other hand a majority tended not to observe exclusive breastfeeding. This findings agree with those of a study done in Marsabit in Kenya that reported early initiation of breastfeeding and but not strictly observing exclusive feeding practices (Galgallo, 2017). Health recommendations on childcare dictate that breastfeeding should be initiated within the first hour after birth coupled with exclusive breastfeeding in the first six months of the baby (Ahmed and Salih, 2019; Woldeamanuel, 2020). The Somalia Demographic and Health Survey reported similar findings whereby exclusive breastfeeding among children was reported to be as low as 34% (Directorate of National Statistics Federal Government of Somalia, 2020). A study by Jama et al. (2020) reported that risk factors

against continued exclusive breastfeeding in Somalia included lack of skilled birth attendance and lack of formal education among the caregivers. This is the same scenario in the current study as proportion of attendance of skilled birth and formal education among caregivers was low. Optimal breastfeeding practices have been shown to promote child development and growth (Brown-Belfort, 2017). Essentially, ease of childcare is promoted with the use of optimal breastfeeding as without observing such it results in increased cries, restless sleeping frequent awakening and disinterest in the child (Tedder, 2013). Moreover, the health of the mother is promoted by such practices.

5.2 Complementary feeding practice of children attending Daynile District Hospital

The study showed that most mothers fed children twice a day or below. This findings are similar to a study done in Somalia that reported the feeding practices to be sub-optimal in that the mothers fed the children two times in a day (Masese, 2016). WHO has recommended complementary feeding of children after 6 months of exclusive breast feeding (WHO, 2008). Feeding of children aged 6-59 months with solid, semi-solid and soft foods is to a new trend in Somalia as most children are introduced to foods early due the common practice of unexclusive breast feeding among many women (UNICEF, 2018). Low frequency of child feeding could be linked to lack of foods attributed to the low income levels among the households affecting affordability of foods for children and low agricultural production in Somalia making foods inaccessible (Nshimyiryo et al., 2019). Most mothers fed children on foods sourced within the households based on affordability and availability of the foods (Meyer, 2007).

5.4 Nutritional status, morbidity and immunization of the children aged 6-59 months in Daynile District Hospital

5.4.1 Wasting

The current study indicates that percentage of severely wasted and moderately wasted children aged 6-59 months was high. This was higher than global levels which indicate risk of sustained malnutrition among the population (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).Additionally, a study conducted by Abdullah (2018) indicated high prevalence of wasting in children in Mogadishu. The Somalia Demographic Health Survey reported that wasting among Children in the country could be

as high as 18% especially among the children under 6 months (Directorate of National Statistics Federal Government of Somalia, 2020). Wasting is an indicator of poor feeding practices of children attributed to undernutrition (Fekadu et al., 2015). Severe wasting is directly corrected to the poor complementary feeding practices reported in the region (Mihretie, 2017; UN, 2011).The high level of poor nutrition status could be an indicator of the feeding practices in the study area

5.4.2 Stunting

The current study indicated lower stunting levels. The levels were lower than the findings reported by the Somalia Demographic Health Survey whereby 28% percent of Somali children under the age of five years are stunted with 17 percent being severely stunted. (Directorate of National Statistics Federal Government of Somalia, 2020). In as much based on the findings by Kinyoki et al. (2015), the stunting rates in an urban areas like Daynile urban area are expected to be higher, this was not the case. This can be explained other factors like rainfall and vegetation that confound the predictor models for stunting in Somalia (Kinyoki et al., 2016). A study by Mzumara et al. (2018) indicated that stunting in children is influenced by sex and age of the child; mother's age and level of education; wealth status; source of drinking water; duration of breastfeeding and residence. Studies have shown that consumption of inadequate food groups exposes children to risk of stunting due to low nutrient intake (Mwaniki et al., 2014; Sanin et al., 2018). Inappropriate food supplementation during the weaning period when infants should undergo a transition from exclusive breastfeeding to including complementary foods in their diet is a major contributor to stunting in children (Nshimyiryo et al., 2019). Household level of income and stunting have a reverse association as household income is used to purchase food for the children (Nshimyiryo et al., 2019) hence in Daynile the low income levels could have contributed to stunting in their children.

Most children aged 6-59 months in Daynile were of normal nutritional status. a study observed that children of normal nutrition status received adequate nutrient in the dietary intake to cater for body requirement which can be attributed to improved feeding habits (Omer et al., 2020). Good health status of children is a sign that children are not having recurrent chronic illnesses (WHO, 2006b). The level of stunting in the study children could be a reflection inadequate nutrition over extended periods consistently.

5.4.3 Underweight

Underweight in children aged 6-59 months was high indicating a state of malnutrition among children in Daynile. 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). Studies done by Food Security and Nutrition analysis Unit indicate that malnutrition is rampant in Mogadishu and globally high prevalence levels of acute and severe malnutrition (FSNAU, 2016). Malnutrition in children is harmful as it can lead to physical consequences such as delay in their physical growth.

5.5 Morbidity Prevalence and vaccination rate of children attending Daynile District Hospital

There was a high prevalence of common-cold, fever and malaria among children aged 6-59 months in the study children besides the Immunization coverage in the study children was high. A similar study done in West- Golis Somalia showed high prevalence of malaria, common cold and acute respiratory diseases among children (Masese, 2016). These illnesses are the major cause of child mortality in Somalia (WHO, 2012a). Child immunization is effective in boosting immune system and reducing child's susceptibility to illnesses as evident in Daynile where most immunized children and were not diseased. WHO advocates for immunization of children to boost their immune as they are vulnerable to diseases (WHO, 2012b).

5.6 Minimum dietary diversity of children attending Daynile District Hospital

The current study indicates high dietary intake of grains, tubers and roots and low intake of eggs, legumes and fruits and vegetables suggesting low dietary diversity of the diet of study children in Daynile. This corroborates to a study done in West Golis in Somalia that found dairy products and cereals as the most consumed food (Masese, 2016). In Africa diet diversity is practiced inappropriately and minimum dietary diversity and meal frequency are not met (Mulat et al., 2019). Cereals, roots and tubers are a good source of starch in diet and provide energy for the body (Chandrasekara and Josheph Kumar, 2016). Legumes and protein rich foods are recommended in child's diet for growth and development (De Jager et al., 2019).

Unbalanced diets are contributors to malnutrition in most children increasing risk of stunting, wasting and being underweight (Caulfield et al., 2004). Eating a diet that is diverse suggests a possibility of a child having access to a adequate diet which is an important phenomenon in the nutritional status of a child especially in reducing risk of malnutrition (Fekadu et al., 2015). A more diversified diet leads to increased nutrient adequacy and better nutritional status.

5.7 Nutrient intake of children attending Daynile District Hospital

The study shows that the RDA for energy and proteins was met by the children. This could be because of the high intake of cereal and dairy products by the study children. This corroborates with findings from other studies that recorded high consumption of cereal products and milk among children in Somalia (FSNAU, 2004; Masese, 2015). There was low consumption of Vitamin A rich fruits and vegetables and organ meat among the children in the study, reflected in nutrient values below RDA for Vitamin A –Retinol and Zinc. A study by (Atuobi-Yeboah, 2010; Olumakaiye, 2013) found that Vitamin A rich fruits and vegetables were the least consumed food group among children below five years. Contrary to this, a study in Ghana reported higher proportion (84%) of the study children of the same age consuming Vitamin A rich fruits and vegetables (Tandoh, 2015). The findings of this study agree with those of (Abeshu et al., 2016) which noted that Zinc and Vitamin A are the problematic nutrients in the diets of children during complementary feeding. Results from this study also corroborates with the ones from Ferguson et al. (2015) that showed zinc as the limiting nutrient in complementary foods of children. According to Lassi et al. (2016), most of the foods in low income countries are often deficient in Zinc, Iron, and Vitamin A which in turn may lead to growth retardation increased risk of respiratory tract as well as impaired immune system in children.

5.8 Child growth and recovery rate of study children on supplementary feeding in Daynile District Hospital

The study found that the overall mean height, weight, and MUAC differences for all the children who took RUSF and LNS increased throughout the assessment period an indication that most children had increased in height, weight, and MUAC by the end of the assessment

period. The findings are similar to a study done in Cameroon that indicated a higher weight gain among children given RUSF (Medoua et al., 2016). A similar study by Lazzereni et al. (2013) showed that LNS also improved mid-upper arm circumference, weight gain and weight-for-height although the improvement was modest for these outcomes. A study that evaluated the impact of LNS given at point-of-use to non-hospitalised infants and young children aged 6 to 23 months showed that LNS reduced moderate stunting by 7%, moderate wasting by 18% and moderate underweight by 15% (Das et al., 2019). A lipid-based nutrient supplement (LNS) has been advocated to be one of the nutritional interventions to prevent malnutrition. Unlike most other micronutrient supplements, LNS provides energy, protein and essential fatty acids as well as vitamins and minerals (Das et al., 2019).

The observed improvement in the height, weight, and MUAC of the children suggests that the products were relatively successful in the treatment of Moderate Acute Malnutrition (MAM) in children.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The urban area of Daynile is dominated by large household sizes with caregivers with low level of education. Childcare practices seem to be dominated by less optimal practices whereby instances of unattended births still tended to dominate in the area. The households utilized unsafe water for drinking thus exposing them to water-borne diseases. The study household relied on the tap water for sourcing the essential water for use.

The study children were malnourished due to less optimal child feeding practices among the caregivers in Daynile. The intake of micronutrients including vitamin A seemed less optimal among the under five children.

The study children had high prevalence of stunted, wasted, and underweight children in Daynile. The study children suffered illnesses like malaria, fever and common cold which is a major threat to children aged 6-59 months in Somalia (and to children in the whole world).

The overall mean height, weight, and MUAC differences for all the children who took RUSF and LNS increased throughout the assessment period an indication that most children had increased in height, weight, and MUAC by the end of the assessment period .Therefore treatment of moderate acute malnutrition with RUSF and LNS resulted in higher recovery rates of children.

6.2 Recommendations

This study recommends:

1. Introduction of nutrition education for caregivers on child nutrition and child care and feeding practices.
2. The introduction of programmes aimed at improving dietary diversification among these children for example kitchen gardening.
3. Introduction of effective monitoring and evaluation criteria for most of the programmes implemented in the country in order to improve their nutrition outcomes.
4. Introduction of effective and sustainable supplemental feeding programmes as a stop- gap solution in effort to address the high malnutrition rates among these children.

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APPENDICES

APPENDIX 1: CONSENT FORM

Introduction and consent form for a study on **Recovery rate and child growth after supplementary feeding in Daynile district hospital, Mogadishu–Somalia Investigator:**

Hello, my name is_____and I am working in collaboration with Abdisalam Isse Abdi from the University of Nairobi, Department of Food Science, Nutrition and Technology, Applied Human Nutrition Programme. I am conducting a research survey that seeks to determine **Recovery rate and child growth after supplementary feeding in Daynile district hospital, Mogadishu–Somalia.**

Purpose

The information you provide will be only used **Recovery rate and child growth after supplementary feeding in Daynile district hospital, Mogadishu–Somalia.**

Confidentiality

Information given will be kept confidential and used to prepare a dissertation which will not include any specific name. Reference numbers will be used to link you name and your answers without identifying you.

Your participation in this study is voluntarily.

Benefits

The benefits of this study is that the information will be useful in **Recovery rate and child growth after supplementary feeding in Daynile district hospital, Mogadishu–Somalia** By signing or approving this consent indicates that you understand what will be expected of you and you are willing to participate in the survey.

Signature of respondent…… Date……..

Signature of Interviewer……... Date……..

APPENDIX 2: QUESTIONNAIRE

DIGITAL QUESTIONARE BUILD IN ODK

Put the current time ……..

What is the current study period in weeks …….

This is the …… week of the study? If correct proceed to the next question.

Clinic name……

Enter the child's full name……

Mothers telephone number……

What is your name? .....

Name of your district…….

OBTAIN CONSENT FIRST

Hello, my name is (Abdisalam Isse Abdi)

My dear respondents, I am a postgraduate student from University of Nairobi. I am conducting a research which regards **Recovery rate and child growth after supplementary feeding in Daynile district hospital, Mogadishu–Somalia**. The finding of this study will help provide timely and proper nutritional and health care services to yours and other children's. Thus this interview is prepared for this purpose to get appropriate data on the study we are conducting. The in data that I will obtain using this interview will only be used for research purposes and they will have treat with confidentiality. The study has no risk to you and your child except sparing a maximum of 30 minutes of your time. You have the right not to respond at all or to withdraw in the meantime, but your participation is highly valuable for the success of my research objectives. Therefore, I politely request to participate in this interview

Are you willing to participate in the study? YES ☐ NO ☐

SECTION A: DEMOGRAPHY

Q1.List all HH members in the table below and information corresponding to each member by using the appropriate code

Serial number	Name	Sex	Age	Relationship To HHH	Marital status	Level of Education	Occupation
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							

1. Male 2. Female 3. Others

Relation to HHH	Marital status	Education	Occupation
HHH	Married	None	Salaried employee
Spouse	Single	Underage	House wife
Son	Divorced	Preschool	Farmer
Daughter	Widowed	Primary incomplete	Self employed
Brother	Others (specify)	Primary complete	Causal labour
Sister		Secondary incomplete	Student
Grand child		Secondary complete	Unemployed
Niece		College	Retired
Others (specify)		University	Others (specify)
		Others (specify)	

Socio-economic characteristics

What are your sources of income…… If other specify……

What is your total household income per month…….

Please describe the home where you live…… If other specify……

What is the main type of cooking fuel……. If other specify……..

What is the main source of energy for lighting……If other specify……..

Approximately how much money do you spend on food per month……..

SECTION B: CHILD FEEDING INFORMATION (6-59 MONTHS)

Breast feeding practice

When was (child name) first breasted……. If other specify……..

Was the child given anything immediately after birth other than breast milk …….

What was the child given immediately after birth other than breast milk……

During the first three (3) days was the child given anything other than breast milk……..

What foods was the child given during the first three (3) days other than breast milk……

In the first 6 months, was the child given any fluid including water, or other foods other than breast milk……..

Is the child currently breast-feeding? …… Did the child ever breast feed earlier on**.....**

How old was the child when you stop breastfeeding (age in months) ……..

Why did you stop breastfeeding…….

Yesterday, did the child drink anything from the bottle with nipple/teat……

Yesterday, did the child drink anything from the container and spoon…….

Testing knowledge on breast feeding

In your opinion, should a baby be put on the breast immediately they are born……..

Should a baby be given the very first milk (colostrum) from the breast at birth or soon after……

During the first 3 days after the child was borne did you receive any practical support or advice to help you to start breastfeeding……If yes, who gave you the support……..

Complementary feeding

How many times is food served in a day…….. If other specify…….

Where do you get food for the child…….. If other specify…….

Do you wash your hands before feeding the child……..

Are there some foods that should not be fed to children because they are a taboo……..

Names of food avoided…….

Breastfeeding and Complementary feeding pattern of the mothers

Did you ever breastfed……

Why not breastfeed your baby…….

How soon after birth did you put your child on breast……

In the first three days after delivery was the child given anything to drink other than breast milk…...

Is your child is still breastfeeding…….

How long do you want to breast feed this child…….

Have you started giving your child other foods……..

Which food did you first introduce to your child ……. if other specify…….

Are you currently taking any soils/stones?

During the pregnancy of this child were you taking any soil/stones……

SECTION C: WATER AND HEALTH FACILITY

What is your main source of drinking water……. if other specify……

Do you treat your drinking water……

Do you have access to health facility……

SECTION D CHILD HISTORY OF ILLNESS.

How many times you visited Antenatal care in health institution when you are pregnant of this child……

Where did you deliver your child……. if other specify……

Did you attend post-natal care service after delivery of your child……..

Was your child weighted at birth……

What was the weight of your child in kg …….

Did your child received vaccination……

If yes, did your child took all vaccination……

If card available check has the child been sick in the past fourteen days…….

What was the child suffering from…… if other

specify…….

SECTION E: DIVERSITY OF FOOD FOR THE INDEX CHILD

Food groups with examples

Cereals: Millet/Sorghum/Maize porridge,

Cereal products: Spaghetti, pasta, rice, bread, mandazi, posho, chapati or other foods made from grain like: Sorghum, Millet, and Wheat

Vitamin A rich vegetables and tubers: Pumpkins, carrots, orange or yellow fleshy sweet potatoes

White tubers and roots: Sweet Potato (white), white Yams, Cassava, Irish Potato or any other foods made from roots

Dark green leafy vegetables including wild green vegetables like: cassava leaves, amaranthus, pumpkin leaves, spinach, kales, sweet potato leaves, osubi

Other vegetables: Cabbage, Eggplants, Tomatoes, Onions, Green Pepper, Mushroom, Okra, celery

Vitamin A rich fruits: Ripe mangoes, papayas + other locally available vitamin A rich fruits

Other fruits: Bananas, Oranges, Lemons, Tangerines, Pineapples, coconut

Organ meat (iron rich: Liver, Kidney, heart, gizzard or other organ meats

Fresh meats and offals: Meat, poultry, offal (e.g chicken/poultry, goat meat, beef)

Eggs: Chicken, Ducks, Guinea fowls, Turkey, Pigeon, or other eggs from any kind of birds

Fish: Fresh or dried fish or shell fish (Tilapia, octopus, crab)

Pulses/Legume, nuts (e.g beans, lentils, green grams, Cowpeas) Milk and milk products (e.g. goat/fermented milk, milk powder) Oils/fats*(e.g. cooking fat or oil, butter, ghee, margarine) Sweets, Sugar, honey, sweetened soda or sugary foods such as chocolates, sweets or candles.

Condiments and Spices: Chillies, Pepper, Ginger, Spices, Herbs, Salt

Beverages: Coffee, Black tea, Yellow tea, Green tea

SECTION F: DIETARY INTAKE 24 HOUR RECALL

Will you fill the 24 hour questionnaire?

Welcome to the 24 hour recall section report meals and snacks:

Meals

Select the meals that the child ate yesterday?

Questions about breakfast

Time of when breakfast was taken…….. where the child ate the breakfast…….

Indicate the type of food the child eat at breakfast……

(When adding a food, add a group. Then type the name of food mentioned by the participant). Then select the shorted list.

Name of the food eaten at breakfast…….

(When adding a food, add a group. Then type the name of food mentioned by the participant). Then select the shorted list.

Food eaten in breakfast

How was the ${current_name1} prepared

How would you report the amount that the child ate? ${current_name1} how many ${hhm1}

Did the child actually eat of the ${current_name1} Was oil added into the ${current_name1}?

What kind of oil was used to cook the ${current_name1} how do you want to estimate amount of ${oil11} taken

How many ${hhm1} did the child actually eat? of the ${oil11} was sauce added to the ${current_name1}

What sauce was added……..

How do you want to estimate amount of ${sauce11} taken……

How many ${hhm1} did the child actually eat? of the ${sauce11} did you add anything else that you have not reported…….

What else was added to the ${current_name1}……..

How do you want to estimate amount of ${anythingelse11} taken how do you want to estimate amount of ${anythingelse11} taken.

Questions about lunch

Time of when lunch was taken

Where did the child eat the lunch

Indicate the type of food the child eat at lunch. (When adding a food, add a group. Then type the name of food mentioned by the participant. Then select the shorted list).

Name of the food eaten at lunch. (When adding a food, add a group. Then type the name of food mentioned by the participant. Then select the shorted list).

Food eaten in lunch

How was the ${current_name2} prepared

How would you report the amount that the child ate? ${current_name2} how many ${hhm2} did the child actually eat? of the ${current_name2} Was oil added into the ${current_name2}?

What kind of oil was used to cook the ${current_name2} how do you want to estimate amount of ${oil22} taken

How many ${hhm2} did the child actually eat? of the ${oil22} was sauce added to the ${current_name2}

What sauce was added……. how do you want to estimate amount of ${sauce22} taken

How many ${hhm2} did the child actually eat? of the ${sauce22} did you add anything else that you have not reported

What else was added to the ${current_name2}?how do you want to estimate amount of ${anythingelse22} taken how do you want to estimate amount of ${anythingelse22} taken

Questions about supper

Time of when supper was taken……where did the child eat the supper…….

Indicate the type of food the child eat at supper. (When adding a food, add a group. Then type the name of food mentioned by the participant. Then select the shorted list).

Name of the food eaten at supper. (When adding a food, add a group. Then type the name of food mentioned by the participant. Then select the shorted list).

Food eaten in supper

How was the ${current_name3} prepared

How would you report the amount that the child ate? ${current_name3} how many ${hhm3} did the child actually eat? of the ${current_name3} Was oil added into the ${current_name3}?

What kind of oil was used to cook the ${current_name3} how do you want to estimate amount of ${oil33} taken

How many ${hhm3} did the child actually eat? of the ${oil33} was sauce added to the ${current_name3}

What sauce was added? how do you want to estimate amount of ${sauce33} taken

How many ${hhm3} did the child actually eat? of the ${sauce33} did you add anything else that you have not reported

What else was added to the ${current_name3}?how do you want to estimate amount of ${anythingelse33} taken how do you want to estimate amount of ${anythingelse33} taken

Snacks

Did the child eat any other food or drink between meals?

Indicate the type of food the child eat at morning snack. (When adding a food, add a group. Then type the name of food mentioned by the participant. Then select the shorted list).

Name of the food eaten at between breakfast and lunch. (When adding a food, add a group. Then type the name of food mentioned by the participant. Then select the shorted list).

Food eaten in morning snack

How was the ${current_name4} prepared

How would you report the amount that the child ate? ${current_name4} how many ${hhm4} did the child actually eat? of the ${current_name4} Was oil added into the ${current_name4}?

What kind of oil was used to cook the ${current_name4} how do you want to estimate amount of ${oil44} taken

How many ${hhm4} did the child actually eat? of the ${oil44} was sauce added to the ${current_name4}?What sauce was added? How do you want to estimate amount of ${sauce44} taken

How many ${hhm4} did the child actually eat? of the ${sauce44} did you add anything else

that you have not reported What else was added to the ${current_name4}
How do you want to estimate amount of ${anythingelse44} taken how do you want to estimate amount of ${anythingelse44} taken
Indicate the type of food the child eat at morning snack. (When adding a food, add a group. Then type the name of food mentioned by the participant. Then select the shorted list).
Name of the food eaten at morning snack. (When adding a food, add a group. Then type the name of food mentioned by the participant. Then select the shorted list).

Food eaten in afternoon snack

How was the ${current_name5} prepared?
How would you report the amount that the child ate? ${current_name5} how many ${hhm5} did the child actually eat? of the ${current_name5} insert the amount of grams
Insert the size or quantity of the packet How big was/were the ${hhm5}
Was oil added into the ${current_name5}? What kind of oil was used to cook the ${current_name5} how do you want to estimate amount of ${oil55} taken
how many ${hhm5} did the child actually eat? of the ${oil55} was sauce added to the ${current_name5}?what sauce was added? How do you want to estimate amount of ${sauce55} taken
How many ${hhm5} did the child actually eat? of the ${sauce55} did you add anything else that you have not reported? What else was added to the ${current_name5}
How do you want to estimate amount of ${anythingelse55} taken how do you want to estimate amount of ${anythingelse55} taken? Indicate the type of food the child eat at morning snack. (When adding a food, add a group. Then type the name of food mentioned by the participant. Then select the shorted list).
Name of the food eaten at morning snack. (When adding a food, add a group. Then type the name of food mentioned by the participant. Then select the shorted list).

Food eaten in evening snack

How was the ${current_name6} prepared
How would you report the amount that the child ate? ${current_name6} insert the amount of grams?Insert the size or quantity of the packet How big was/were the ${hhm6}
How many ${hhm6} did the child actually eat? of the ${current_name6} Was oil added into the ${current_name6}?
What kind of oil was used to cook the ${current_name6} how do you want to estimate

amount of ${oil66} taken?how many ${hhm6} did the child actually eat? of the ${oil66} was sauce added to the ${current_name6}.

What sauce was added?how do you want to estimate amount of ${sauce66} taken

How many ${hhm6} did the child actually eat? of the ${sauce66} did you add anything else that you have not reported?Whatelse was added to the ${current_name6}

How do you want to estimate amount of ${anythingelse66} taken how do you want to estimate amount of ${anythingelse66} taken did you add anything else that you have not reported

Indicate the type of food the child eat at anthingelse7. (When adding a food, add a group. Then type the name of food mentioned by the participant. Then select the shorted list).

Name of the food eaten at anthingelse7. (When adding a food, add a group. Then type the name of food mentioned by the participant. Then select the shorted list).

SECTION G: ANTHROPOMETRY
Anthropometry of the Index Child
Does the child have edema
Grade of Oedema
Weight (Kg) measurement 1
Weight (Kg) measurement 2
Average weight in kilograms
MUAC in centimetre measurement 1
MUAC in centimetre measurement 2
Measure height in centimetres
Measure height in centimetres
Average height in centimetres

SECTION H: Supplementary feed given

Supplementary feed given based on the anthropometric measurements

#END

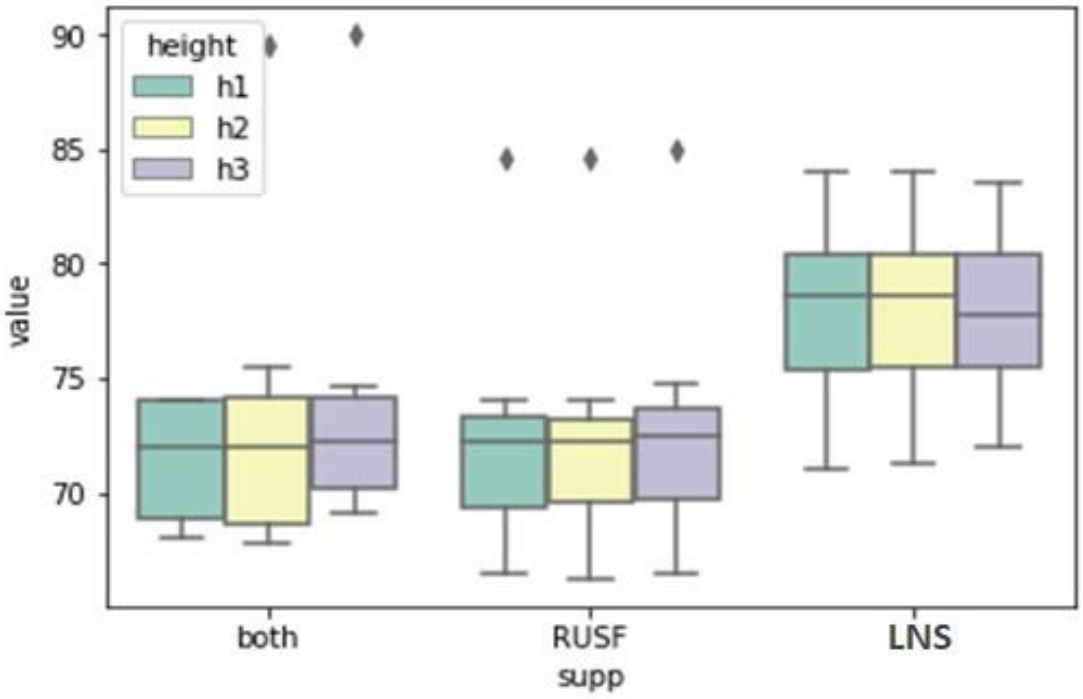
Thank you for the information. We have come to the end of the interview

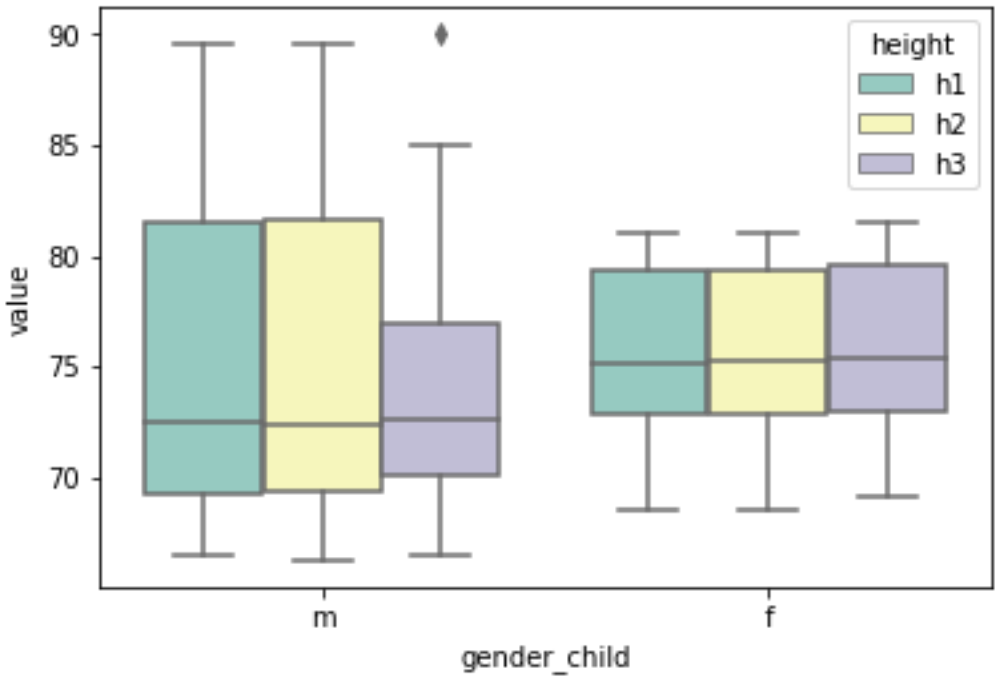
APPENDIX 3: SUMMARY OF LITERATURE AND RESEARCH GAPS

Table 2.1: Summary of Literature and Research Gaps

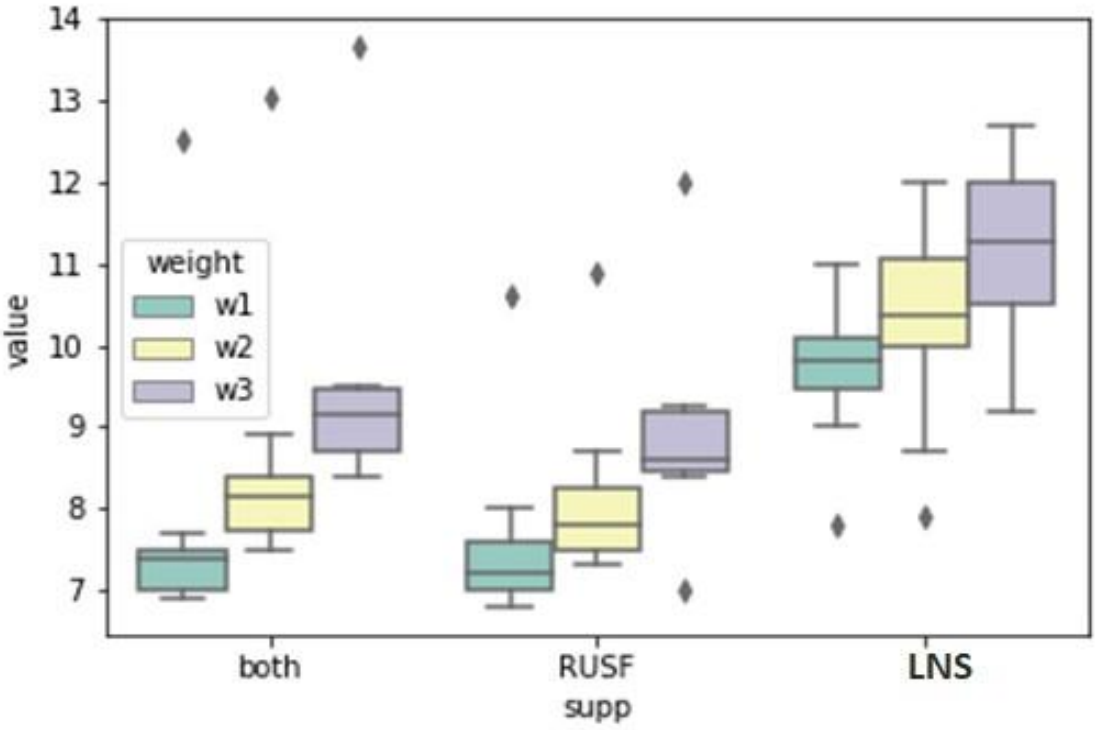
Author	Topic of the Study	Research Methodology	Key Findings	Research Gaps
Sleddens, *et al*., (2015) sought to	Factors influencing dietary behavior among youths	desk review methodology was used	socio-cultural factors, economic and demographic factors influence the dietary intake among youths	The study focused on youth and not specifically on infants
Akande, *et al*., (2015)	the determinants of dietary behavior and physical activities among infants in Canada	systematic review of literature used	social, cultural and environmental changes are key factors influencing the dietary intake among infants	The study was done in Canada and not in Somalia
Kabir, *et al*., (2018)	factors influencing eating behavior and dietary intake among residents' learners of universities in Bangladesh	in-depth interviews among 25 respondents and focused group discussions were used	several factors influence dietary intake among learners including individual factors, societal factors, the culture and environmental factors	This study was done in Bangladesh and not in Somalia
Okoro, *et al*., (2015)	influence of nutritional intake and food choice determinants among construction workers in South Africa	convenience and heterogeneity sampling techniques were employed	nutritional knowledge, economic and physiological factors determine the choice of food among people	The study was done in South Africa and not in Somalia

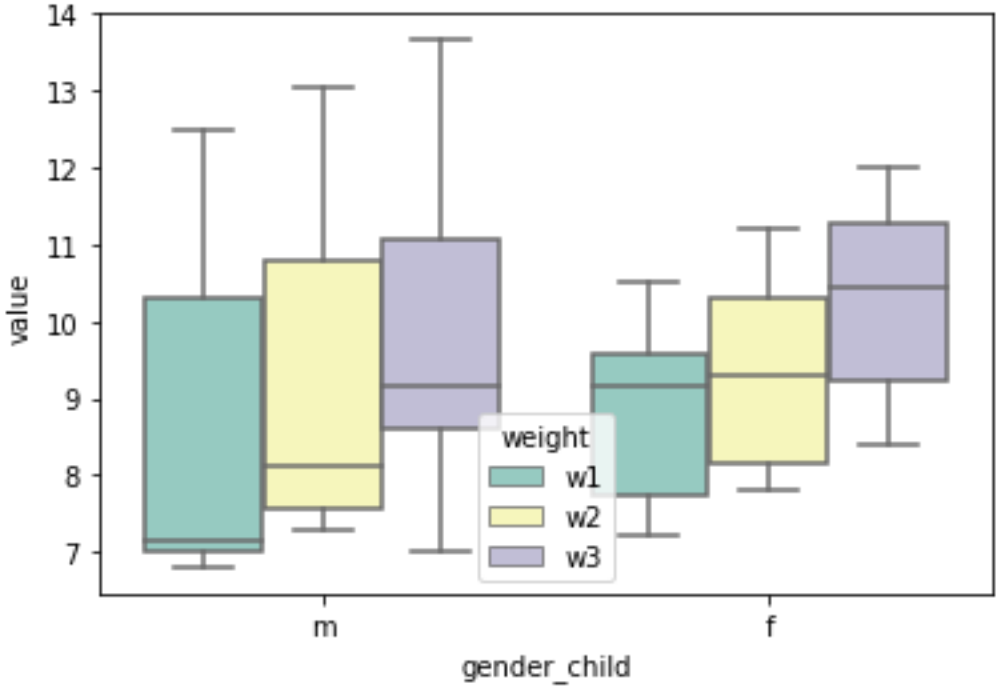
APPENDIX4: HEIGHT





APPENDIX5: WEIGHT





APPENDIX 6: MUAC