# STUNTING IN CHILDREN LESS THAN TWO YEARS IN RURAL AND URBAN HOUSEHOLDS IN TURBO SUB COUNTY, UASIN GISHU COUNTY

# NANCY MDOGA IMALI

A Thesis Presented to the Institute of Postgraduate Studies of Kabarak

University in Partial Fulfillment of the Requirements for the Award of Master of

Science in Human Nutrition and Dietetics.

KABARAK UNIVERSITY

November, 2020

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#### RECOMMENDATION

To the Institute of Postgraduate Studies:

This research thesis entitled "Stunting in Children less than Two years in Rural and Urban Households in Turbo Sub County, Uasin Gishu County" and written by Nancy Mdoga Imali is presented to the Institute of Postgraduate studies of Kabarak University. We have reviewed the research project proposal and recommend it be accepted in partial fulfilment of the requirement for award of the degree of *Master of Science in Human Nutrition and Dietetics*.

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# **DEDICATION**

I dedicate this work to my husband David Simiyu and my two daughters, Rose Kesa and Nelie Jasmine for their prayers, tenacious support, inspiration and understanding for the times I had to be away.

#### **ABSTRACT**

Globally about one fifth of children less than five years are stunted with more than a third from Africa. Stunting is low length for age with poor cognitive and physical development. It occurs in the first 1000 days of life increasing morbidity, mortality, reduced individual output and chronic conditions. Since surveys indicate stunted children are also found in food secure households with good access to diverse foods, there seems to be a major research gap on factors contributing to stunting in this households, more so in Turbo Sub County. The purpose of this study was to determine the contributors to high prevalence of stunting(31.2%) in Turbo, Uasin Gishu County. The study findings will inform the county on effective intervention strategies. The study objective was to find out contributors of stunting in food secure households in children less than two years in Turbo, UGC. Cross-sectional survey design was used for this study. A sample size of 331 stunted children aged 0-23 months were recruited using multistage, systematic random sampling. The results indicate that their biological mothers cared for 92.1% of the children. Children below six months were exclusively breastfed at 40.3% with more urban children than rural at  $\chi^2(P=0.001)$ . Continued breastfeeding at one year was 67.3% and at two years 47.1%. More rural children had a dietary diversity score of  $\geq 4$  than urban with  $\chi^2(P=0.004)$ . Dairy (66.4%) and business (46.9%) were the most practiced economic activities. There was poor knowledge on meal frequency with no difference between rural and urban at  $\chi^2(P=0.033)$  and  $\chi^2(P=0.019)$  for 9-11 and 12-23 months respectively. Rural families that produced milk fed it to children Fishers exact test  $\chi^2(P=0.004)$ . The study indicate poor feeding practices for stunted children and recommends training caregivers on infant and young child nutrition.

Keywords: Nutrition, Food security, Children, Infant

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#### ABBREVIATIONS AND ACRONYMS

**BFI**: Baby Friendly Initiative

**CHV**: Community Health Volunteers

**CU**: Community Unit

**DDS**: Dietary Diversity Score

**FAO**: Food Agricultural Organization

**FBS**: Food Balance Sheets

**HAZ**: Height for Age z score

**IDDS**: Individual Dietary Diversity Score

**IYCN:** Infant and Young Child Nutrition

**LAZ**: Length for Age z score

**MIYCN:** Mother Infant and Young Child Nutrition

**PUFA:** Poly Unsaturated fatty Acids

**PZC**: Plasma Zinc Concentration

**RNI**: Recommended Nutrient Intake

**SAM**: Severe Acute Malnutrition

**WHO:** World Health Organization

**WLZ:** Weight for Length Z score

**WFP**: World Food Program

OPERATIONAL DEFINITION OF TERMS

Breastfeeding Types: Groups of feeding including breast milk to children below six

months

**Caregiver**: The person who provides direct care of a child.

**Child**: Person below two years.

Children: Persons below two years.

**Complimentary Feeding:** Involves introduction of other foods in addition to breast

milk at six months of age when breast milk alone is no longer sufficient to

meet the nutritional requirements of infants.

**County:** Uasin Gishu County.

Exclusive Breastfeeding: Taking no other food or drink, not even water except breast

milk including milk expressed or from a wet nurse for the first six months of

life but allows the infant to receive ORS, drops and syrups of vitamins,

minerals and medicines.

**Dietary Diversity:** A qualitative measure of foods consumed that reflect access to a

variety of foods by households and a measure of nutrient adequacy of

individual diet.

**Food Groups:** Food classification based on their nutrient contribution.

Food Security: Food security exists when all people at all times have physical and

economic access to sufficient, safe and nutritious food that meets their dietary

needs and food preferences for an active life.

Food Access: Access by individuals to adequate resources to purchase or barter

appropriate foods needed to maintain adequate diet or nutrition

**Height Board:** A special calibrated board used to measure tallness.

**Household:** Number of people who eat from the same pot.

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**Predominant Breastfeeding:** Taking breast milk with water, juices and other clear liquids for children less than 6 months.

**Malnutrition:** A state of being under or over nourished.

**Mixed Feeding:** Giving a child breast milk plus other milks and solid foods for children below 6 months.

Mursik: Traditionally fermented milk among the Kalenjin's in Kenya

**Replacement Feeding:** Taking other food rather than breast milk for children below six months

**Rural:** It is an area with a low population density with people living in farms and agriculture as the main economic activity with a population below 2000

Stunting: Height for Age (HAZ) score of less than -2

**Sub County:** Turbo Sub County

**Target Population:** Total children 0 to 23 months

**Urban:** Area with a high population density with more created structures than the surrounding areas with a population of 2000 and above

Ward: Administrative units within sub counties in Kenya

**24 Hour Recall:** A quantitative research method that requires the respondent to recall foods eaten in the last 24 hours prior to interview.

#### **CHAPTER ONE**

#### INTRODUCTION

#### 1.1 Introduction

This chapter contains various sections that have been discussed in details. They include background to the study, statement of the problem, purpose, objectives, justification, scope, limitations and assumptions the researcher made in the study.

#### 1.2 Background information

Child poor nutrition status is a global challenge that has been addressed over years to reverse negative trends and its effect on growth and development. In 2015 child nutrition was given a new focus through the Sustainable Development Goal 2 that need to be achieved by 2030 of ending hunger, achieve food security, good nutrition and promoting agriculture, (Prendergast,& Humphrey, 2017). Stunting in children was estimated at 22.2% globally in 2017being a reduction from 32.6% in 2000. According to, (WHO, 2018) stunting in Africa was estimated at 39%. In Kenya, the prevalence of stunting was at 26% in 2014, a drop from 35% in 2008/09 where slightly more than a quarter of Kenyan children were shorter for their age. Stunting levels were reported highest in West Pokot and Kitui counties, which had 45.9% and 45.8% respectively. Uasin Gishu county was at 31.2%, (KDHS, 2014). The stunted children's future health, well-being and individual output is adversely affected.

Under-nutrition is recognised as one of the largest contributors to negative outcomes in relation to the growth and developments of countries. This is due to the challenge it poses to the health of people and productivity of populations (Sorgho, et al., 2016). The health risks include high morbidity and mortality owing to poor immunity in stunted children resulting from low fat mass, (Briend, et al., 2015 & Yaméogo, et

al., 2017). Stunting also results in obesity, with higher prevalence's of diabetes, hypertension and cardiac diseases in adults of short stature, and reduced intellectual performance due to poor brain cell development, (Hassen, et al., 2017&Prendergast, et al., 2017). However, reduction in stunting has been seen over years indicating effectiveness of interventions employed, these achievements were not seen in some continents as Asia and Africa. Asia reduced stunting from 38.1% in 2000 to 23.2% in 2017 while in Africa it reduced from 38.3% to 30.3% during the same period. Eastern Africa had highest stunting rates at 35.6% while North Africa was lowest at 17.3% in 2017, (WHO, 2018). Demographic health surveys conducted in East African countries in three consecutive years indicated that Tanzania had the highest stunting rates, 34.5% in 2015, Uganda 28.9% in 2016 and Kenya 26.2% in 2014,(UNICEF,2019)

Africa reduced stunting by 8.0% but it failed to achieve the set target of reducing stunting by half (19.2%) by 2015. Though this reduction was not seen much in Africa, countries like Ghana reduced stunting from 30% in 2008 to 19% in 2014. This has been attributed to Ghana's fast economic growth and political stability that led to much less social disruptions, (IFPRI, 2016). In some parts of East African countries stunting was found to be at 33.3% in sugar growing east central Uganda indicating producing food is not always positively correlated good nutrition for children, (Lwang, et al., 2015). This low reduction in Africa calls for more focused intervention of individual countries as Kenya in addressing the causes of stunting at agricultural rich regions.

In 2015, countries were given a challenge to work towards ending all forms of malnutrition and reduction in stunting by 40% by 2025. These efforts are geared towards achieving the Sustainable Development Goals (SDGs) 2 and 3 that focuses on

hunger, status of food security, nutrition, agriculture, healthy lives and wellbeing for all ages, (IFPRI, 2016). Stunting has also been included as one of the indicators for measuring hunger globally and food insecurity, giving it a special focus in interventions, (Global Hunger Index, 2015). Out of 7293 children assessed nationally 1597(21.9%) had a HAZ score of less than minus 2. The proportion of children stunted increased with age where only 10% of children less than 6 months were stunted and 35.5 % for 18 to 23 months indicating a problem with child care as age progresses, (KDHS, 2014). The international community, NGO's and governments towards improving nutrition status of children, has therefore put efforts in place. This includes addressing the four pillars of food security that comprise food availability, consistency in the supply of food, easy food access and proper utilization of the ingested food by the body, (FAO, 2009).

Comparing Uasin Gishu stunting rates(31.2%) to other food producing counties like Nandi 29.9% and Trans Nzoia 29.2%, the findings indicate other factors other than household food security could be contributing to stunting in children in agricultural rich zones, (CFSVA, 2016). This is not true for all agricultural rich counties in Kenya with NyeriCounty, which is a food; secure having lowest stunting rates of 15.1%. Turkana which is relatively drier had a stunting rate of 23.9% which was lower than some food producing regions, (KDHS, 2014). Therefore, there seems to be a major research gap to contributors of stunting in some counties that have shown to be food secure at household level in Kenya more so in Turbo Sub County, Uasin Gishu County. Studies are required to establish these factors to ensure informed interventions at County and national level.

#### 1.3 Problem statement

Optimal growth in children is achieved by the foods they consume besides other factors that include environmental, social economic, cultural or individual differences, (Herforth,& Ahmed, 2015). When children receive sufficient nutrients, they grow among other body measures in their height, weight with a strong immunity, (Njiru,& Matiri, 2013). However, when this is not met, stunting occurs in children where they do not achieve their required height for age.

Despite a report that households in Uasin Gishu had better food access with acceptable food consumption score (FCS)and an average house hold dietary diversity score HDDS) of 6.7, it recorded wasting prevalence of 3% which is acceptable, but stunting was in the "serious stage", a prevalence of 31.2% for children under five,(Leroy, et al., 2015& CFSVA, 2016). This indicates that about a third of the children are at risk of the negative effects of stunting.

Since the effects of stunting are permanent and response to intervention is been found to be more effective in the first 1000 days of life, Ghosh (2016) &Prendergast et al.(2017), prevention of stunting should be given priority. This will help reduce its negative effects of stunting and ensure healthy productive individuals. This study therefore, seeks to determine the possible contributors to stunting for children less than two years in Turbo Sub County, Uasin Gishu County.

#### 1.4 Purpose of study

The intent of this study was to examine the relationship between socio demographic characteristics, child feeding practices and foods produced by households with stunting in children less than two years in Turbo Sub County of Uasin Gishu County.

#### 1.5 Research objectives

The overall objective was to determine factors that contribute to stunting in children less than two years of age in Turbo Sub County, Uasin Gishu County.

#### Specific objectives were

- 1 To establish demographic and socio economic characteristics of families with stunted children.
- 2 To establish dietary diversity scores and breastfeeding practices for children below two years.
- 3 To establish child caregivers knowledge on infant and young child nutrition.
- 4 To ascertain the relationship between stunting with variety of foods grown and feeding practices in Turbo Sub County, Uasin Gishu County.

#### 1.6 Justification

In this study, we aimed at finding out the factors that lead to of stunting in Turbo area with food-secure households in terms of access. Since studies have shown a high dietary diversity score positively contribute to linear growth the study seeks to find if children are fed diverse foods, and most families had acceptable Food Consumption Score and a House hold dietary diversity score of 6.7 (CFSVA, 2016:Motbainor, et al., 2015). This was of importance since one study in Uasin Gishu concluded that OVCs living in the community 2 -3 times more likely to be stunted than institutionalized children although the households accessed adequate diet, (Braitstein, et al., 2013).

Turbo was selected because it has both urban and rural settlements studies have shown than stunting rates are different in both these settings, (Herrador, et al., 2014,). This sub county also has the highest population proportion of 21.7 % of the total

population, (KNBS, 2010). The study compared urban and rural households with stunted children since some studies have indicated differences in stunting prevalence's between urban and rural households with urban having more stunted children than rural areas, (Adenuga, et al., 2017). An analysis of stunting prevalence's from three demographic health survey results in middle income countries including Kenya showed higher prevalence's of stunting in rural areas with a steady increase in urban areas over years, (Jonah, et al., 2018). Therefore, this study sought to find out the differences between the urban and rural households in Turbo sub county, Uasin Gishu County.

#### 1.7 Significance of the study

In this study, we focused on finding contributors to stunting to inform focus areas in prevention programs. This was important since prevention mitigates the negative effects of stunting. Recommendations from this study will inform interventions on feeding practices of communities at household level. Communities will be advised on how to identify contributors to stunting and take preventive measures in time. Key persons concerned with child nutrition both at community level will undergo capacity building on implementation of community programs designed to address stunting in children. Finally, this study aimed at forming a basis for the ministry of health, ministry of education, the county government and stakeholders in establishing informed intervention programs. Also to provides a guide to evaluation of any programs already addressing stunting in the county to see whether they are addressing the actual causes as studied.

#### 1.8 Scope of the study

The study was carried out in Turbo Sub County that is one of the sub counties in Uasin Gishu County. The data was collected from 8<sup>th</sup> to 16<sup>th</sup> November 2018. The study focused on children less than 2 years who are stunted as studies have shown that occurrence of stunting is highest in this age group with a high rates of stunting occurring between ages 6 to 23 months and a small percentage occurs in children under 6 months of age, (Negash, et al., 2015). It also identified child feeding practices, caregivers' knowledge on feeding children, family socio economic status and types of foods produced.

#### 1.9 Limitations

- 1. Interviewing all caregivers would have taken more days and resources and this was countered by getting a sample from the study population.
- Accessibility to rural areas was difficult due to poor roads, and larger distances to cover between households, therefore a few villages from the selected wards were studied.
- Since foods consumed in some homes are varied from season to season the responses given could reflect only what caregivers have in the data-collecting period

# 1.10 Assumptions

- 1. The researcher assumed that the respondents would participate voluntarily.
- 2. The study assumed that caregivers would effectively recall foods given to their children in the last 24 hours.

3. The study assumed households in Turbo Sub County are food secure in terms of

access.

#### **CHAPTER TWO**

#### LITERATURE REVIEW

#### 2.1 Introduction

This chapter illustrates findings, arguments and recommendations in detail from literature on stunting of children. These details include literature on growth and development of children, infant and young child nutrition and knowledge on infant and young child nutrition. It also looks at the relationship between stunting and families' socio economic status, variety of foods grown and the individual dietary diversity score of children below two years.

#### 2.2 Overview of growth and development in children

A child grows in various aspects of the body that include cognitive and neurological development, weight and height, body organs and the immune system, (Herrador, et al., 2014). These benefits in children are realised when they are well nourished. Globally it was agreed that within 10 years starting from 2016 to 2025, nutrition activities be increased with an aim of eradicating hunger and all forms of malnutrition which are to be achieved within the 2030 SDG framework. This comprises of eliminating both over and under nutrition that includes stunting and non-communicable diseases as a result of poor nutrition by 2025, (UN Decade of Action on Nutrition, 2016; Gordon, et al., 1989).

A study ranking SDGs found that combating climate change and energy for all scored highest in developed countries while ending hunger and malnutrition through improved food security rated high in developing nations. Kenya, being a developing nation, needs to address this goal which has one of its indicators is ending all forms of malnutrition that includes stunting by 2030, (Osborn, et al., 2015). This is because sub

sequent generations are affected by the cyclic effect of malnutrition which increases poverty with reduced productivity, (Martorell,& Zongrone, 2012). Informed intervention programs addressing needs specific to regions are required to break this cycle. This is of importance to Kenya and other countries since studies indicated that Sub Saharan Africa had the second lowest mean Z scores of height for age after South Asian countries, (UNICEF, 2018).

World Health Organization developed cut offs rates of stunting that are used in planning and interventions at continental, regional and national level. Stunting as proportion of the total population of under five year old children was classified from acceptable (<20%), poor (20 to 29%), serious (30 to 39%) and critical above 40%, (WHO, 1995). This makes nutrition interventions possible and affects policy for countries and nutrition planning.

# 2.2.1 Kenya's stunting situation and analysis among children

Kenya is among countries that are working towards realizing the SDG goal 2, with an aim of reducing stunting by 40% by the year 2025, (SDG Indicators, 2016). Trends of stunting can be well compared between 2008/09 and 2014 as both surveys used WHO growth standards developed in 2006. Over this period there was a 9% decrease in levels of stunting from the results obtained from the two surveys, (KNBS, 2010 & KNBS, 2015). Earlier on in 2003 the United States National Centre for Health Statistics (NCHS) growth standards were used in the survey and the results were that children under five had 30% stunting rates which was much lower than the subsequent survey in which the WHO growth standards were used,(KDHS, 2003;KDHS, 2014).

The results of demographic health surveys of 2003, 2008/9 and 2014 indicated that stunting rates were highest in ages 18 to 23 months while wasting was highest in 6 to 11 months an age. Since some Kenyan children are seen to be stunted, government and stakeholders at both national and county level need to strategize on ways to reduce stunting. The intervention adopted should be region, county or area specific because the distribution of stunting it is not just because of lack or presence of food. Other factors that vary from place to place, inter and intra household's variations the same area contribute either directly or indirectly to stunting.

#### 2.2.2 The etiology of stunting

Stunting is defined in several ways some writers using the measures of stunting, others causes and others effects. It's the physical manifestation of chronic lack of nutrients that is manifested physically with failure to achieve optimal growth with a height for age of more than two standard deviations below the median height, (MDG Report, 2015). It has also been defined as a failure to attain linear and cognitively growth with effects that last for a lifetime. This effects are attributed to failure to receive adequate nutrition over a long time period or from recurrent wasting due to frequent acute shortages of food or disease, (Group, 2015).

In a systematic analysis, different researchers concluded that the most likely age for stunting to occur was the first 1000 days of a child's life starting from conception to 2 years of age. This was seen to occur intrauterine due to the poor nutrient supply to the foetus or after birth of child when optimal nutrition is not attained, (Prendergast, et al., 2017). This was also documented as the window period in which corrective interventions are responsive making this period of growth important in addressing stunting in children, (Victora, et al., 2010). Dewey and Adu-afarwuah, (2008), in

systematic review of studies on complimentary feeding concurs with the above findings that, children between the ages 6 to 24 months had the highest occurrence of growth faltering, micronutrient deficiencies and high morbidity. They also concluded that growth retardation that in height, brain and other functional impairments ware difficult to reverse after 2 years. Although Bhutta et al. (2008) had observed that it was difficult to reverse stunting after 36 months but agrees with the findings that intervention should be done when children are below 24 months.

Studies have associated child stunting with low micro nutrient supply in diets. In one study children with retarded growth had significantly low zinc serum levels than those with a normal height, (Bains, et al., 2015). Zinc micronutrient is not stored in the body and it is spared for other vital functions when in low supply. This affects growth as the body mobilizes zinc from tissues leading to wasting and subsequent stunting when corrective supplementation or feeding is not done. In a meta-analysis of studies on Plasma Zinc Concentration (PZC), Kenya was found to have low PZC among other countries as South Africa and Senegal yet it had high prevalence of dietary zinc intake according to FAO, Food Balance Sheets, (Hess, 2017). This can explain why some Kenyan children are stunted.

Stunting has also been associated with low supply of other micronutrients like calcium, magnesium and iron. This was demonstrated in a study by Bains et al. (2015), found that animal source foods filled the gap for iron, zinc and calcium when included in children's diets. This concurs with a study in China and Peru that demonstrated that when caregivers were encouraged to give specific animal source foods as liver, egg and fish a higher impact on growth was observed to contribute to stunting as a study in (Dewey,& Adu-afarwuah, (2008). Fahmida et al. (2014), in an

ecological study agreed with the above findings that countries which had higher intakes of animal source protein recorded lower levels of stunting. In Kenya and Nigeria high stunting rates were associated with inadequate intake of protein in cassava taking regions, (Manary, 2013). This same study also found a positive relationship between intake of cow's milk and higher height for age z scores, which can be explained by supply of calcium that is important in mineralisation of bones, (Ghosh, 2016).

Studies have shown meeting recommended nutrient intake (RNI) in children for zinc, calcium and iron was most problematic using locally available foods yet zinc and calcium directly contribute to bone and tissue growth. But the RNI for this nutrient's was achieved in children who were fed on foods fortified with micronutrients, (Osendarp, et al., 2016). One study therefore suggested children below 5 years should be supplemented with elemental micronutrients and fortification of staple crops mostly consumed by children, (Bains, et al., 2015). Children who increased intake of meats, eggs and other animal source foods were seen to have high serum zinc concentrations with improved linear growth, (Manary, 2013). This has further been explained by a study, which looked at importance of sulphur in cartilage formation. Sulphur is derived from catabolism of methionine, an essential amino acid and cysteine, since growth of the skeletal tissue depends initially on synthesis of the cartilage, (Golden, 2009). Supply of animal source foods is therefore important since it bridges the micronutrient gap and provides necessary amino acids for borne growth that positively influence length of children.

#### 2.2.3 Diagnosis of stunting

Stunting is diagnosed using a child's length in relation to their age. Length is body measurement taken on an individual and can be in centimetres, meters or feet. In children, length or height is taken for children less than 87cm and height for children above 87 cm. This is done using a length board and the measurements are recorded to the nearest 0.1 cm, (National Guidelines for IMAM 2015). A manual on taking length and height measurements directs that infants and all children below 24 months should be taken recumbent length and for children above 24 months measure standing height, (WHO, 2008).

The child's nutrition status is then established using reference charts developed by World Health Organization. This reference compares a child's height against age by plotting on a length for age growth chart. A height for age less than minus 2 (WHZ score <-2 SD) and minus 3 (WHZ score <-3 SD) standard deviations has been classified by WHO growth standards to indicate moderate stunting and severe stunting respectively in children less than 5 years, (WHO Child Growth Standards, 2006). Height for age growth charts have been adapted in Kenya through Mother Child Booklets that is routinely used in Mother Child Health clinics for monitoring children's growth. The booklet is issued to the pregnant mother on their first anti natal clinic visit and used until the child reaches five years old, (MCH Booklet, 2016).

#### 2.2.4 Growth patterns by age in relation stunting

According to WHO child growth is most rapid for the first six months after birth and this continues with the rate of growth reducing with time, (WHO growth charts 2006). According to Herrador et al., (2014), in a study in Ethiopia indicated that the probability of children being malnourished increased with age but the malnutrition

rates were similar amongst boys and girls. These agrees with Ekpo et al., (2008) who found that highest stunting rates were in children 12 to 23 months and the likely hood of stunting increased with age. A survey report done in Kenya indicates that stunting and severe stunting was high at 36 % and 12 % respectively in children 18 to 23 months and lowest at 10% and 3 % in children less than 6 months (KDHS, 2014).

This studies and surveys suggest that the age bracket of 6 to 23 months is critical as most stunting occurs at this age. This is the age when children are introduced to complementary foods indicating a gap in optimal nutrient provision in foods given to children. According to Briend et al.(2015)stunted children results from repeated episodes of wasting that are shown to occur mostly between 6 to 11 months. Children less than 6 months had the lowest stunting rates showing the growth effect of breast milk to children. Therefore, promotion of exclusive breastfeeding is important in preventing stunting.

#### 2.2.5 Effects of stunting on children

Previous studies have shown that stunting has both short term and long term negative effects, which can be at individual or group level. It also affects the health and survival of subsequent generation as where nutrient deficits in one generation increased probability of stunting and low weight in the next and increased mortality, (Cesani, et al., 2014 & Khatun, et al., 2018). One study looking at similarities in stunting and wasting demonstrated the effect of stunting, where children had an increased the risk of death when these two conditions occurred together. The researcher also observed that severely stunted children were at a higher risk of death yet the interventions to address malnutrition did not target stunting, (Briend, et al., 2015). This argument is also supported by a research that had findings which

indicated that children who are underweight, stunted and wasted had a 12 fold risk of death compared to children who were only stunted, only underweight or only wasted, (McDonald, et al., 2013).

Stunted children have been found to have low immunity due to low fat mass. Reduced fat mass results in less adipocytes and reduced production of leptin hormone that is necessary growth in height and immune function, (Briend, et al., 2015). This is so because studies have shown that a stunted children had low mid upper arm circumference (MUAC) values that indicates low fat and muscle mass, in than those with a normal height. This leads to over diagnosis of wasting in stunted children when MUAC is used, (Roberfroid, et al., 2015). Children who had moderate acute malnutrition based on MUAC were shown to have low poly unsaturated fatty acids, affecting their response to infection, (Yaméogo, et al., 2017). This could explain why wasted stunted children have higher risk of morbidity than children who are only wasted.

A study indicated that stunted children had sub optimal brain development that was seen to occur intra uterine and continues after a child is born, affecting long term brain functioning (Vazir,& Boindala, 2016). Studies conducted demonstrated that well-nourished children had higher cognitive scores than their stunted counterparts children in Ethiopia, (Shapira, 2009). It also identified n-3 PUFA, essential amino acids, vitamins B12, folate, choline, vitamins A and E in addition to minerals as zinc, selenium, iodine and iron as important nutrients for brain development. This is supported by a study in Ethiopia that found out that anaemic children had lower score in verbal reasoning test and those with low selenium levels had low scores on all cognitive tests, (Shapira, 2009). Therefore, preventing stunting is the key to optimal

brain functioning and interventions should be done early in life to avoid the negative consequences.

A previous study reported that women of short stature who had a height of less than 154.8 cm were observed to have obesity and overweight which was not significantly associated with high-energy intake. This study further explains that stunting that is induced nutritionally leads to alterations in metabolism such as less energy expenditure, reduced fat oxidation and inability to control food intake, factors that easily lead to obesity, (Ferreira, et al., 2017). Non-communicable diseases that are more common with low height are diabetes, hypertension and cardio vascular complications in adulthood as this was found to occur more in women of short stature than the tall ones, (Ferreira, et al., 2017).

The altered metabolism has been explained in a phenomenon termed as the "Thrifty phenotype" which occurs in maternal over or under nutrition, metabolic syndrome and other maternal complications. Complex changes occur in the growing foetus as it adapts to survive the harsh intrauterine environment with low nutrient supply, causing permanent structural changes of organs and tissues. This increases the likely hood of getting overweight and developing non-communicable diseases, (Smith,& Ryckman, 2015). Since the burden of NCDs is high in Kenya with a mortality rate of 27% and 50% of admissions in hospitals, (MOH, KNBS, 2015), stunting as a pre disposing factor need to be addressed.

#### 2.3 Infant and young child feeding practices and stunting

Child nutrition in the first 1000 days has received focused attention since is important in developing human capital, (Victora, et al., 2008). Kathyrn (2001), developed principles to govern feeding a breastfed child that included length of breastfeeding

exclusively, correct age for introducing other foods, maintenance of breastfeeding, responsive feeding and preparation and storing food safely. It also included consistency of food, frequency of feeding and nutrient composition of food consumed by children. Use of supplements and feeding during illness was also promoted. The child's gastro intestinal system function is facilitated by enzyme availability and concentration and maturity of gut which affects the type food, consistency and quantity given at different ages, (Martin, et al., 2016).

WHO recommends that infants be within one hour after birth and this requires proper positioning and attachment to the breast. They also define exclusive breastfeeding as giving only breast milk without adding liquids even water, except prescribed medications (WHO UNICEF, 2008). A child at 6 months starts taking other foods in addition to breast milk which is referred to as complimentary feeding, (Njiru,& Matiri, 2013). In Kenya exclusive breastfeeding was found to be highest in children less than one month at 84.1%, 2 to 3 months 63%, and 42% in 5 to 6 months, (KDHS, 2014). Community baby friendly initiative improved exclusive breastfeeding making the community strategy a vehicle for promoting it, (Gichihi, 2017). In a systematic review of studies in Kenya, mothers gave insufficient milk as the main reason for mixed feeding children. Cultural beliefs were also given as a reason for delayed initiation of breastfeeding within one hour and mothers waited for three days before introducing milk, (Mututho, 2017).

World Health Organisation (WHO) guidelines on complimentary feeding practices recommend that children should be given other foods to in addition to breast milk from six (6) to 23 months. The quality of complimentary foods given depends on the variety of foods used. A study in Ethiopia found out that complimentary foods

prepared in the community were mainly made from plant source foods with only 1.47% of households including animal source foods. This study also concluded that calcium and zinc nutrient densities, important micronutrients for borne growth were found to be lower across all the age groups from 6 to 23 months, (Geleta, et al., 2016). Bhutta et al.(2008), on investigating which interventions work for maternal and child care. Strategies geared towards promotion of complimentary feeding either with inclusion or exclusion of supplementary feeding found among others to improve survival of children. However, this study recommends that supplemental feeding of stunted children above 36 months be done with caution since it can lead to overweight and obesity predisposing them to non-communicable diseases.

## 2.3.1 Dietary diversity

Dietary diversity is a measure used in determining whether food taken at individual or defined group (household) meets desired nutrient needs. It is measured by counting the number of foods and food groups consumed over a specific time, (FAO, 2010). It's score increases as an individual consumes varied foods from different food groups in a given defined period,(Rah, et al., 2010). For this reason, it also used to measure nutrient adequacy from the total foods taken. Prendergast et al.(2017) concluded that there was a positive statistical association between dietary diversity and total energy contribution from foods and non-staples. This indicates that the more different types of food taken from different food groups the higher the nutrient variability and energy contribution from the foods.

Food diversity measurements can be done in a number of ways for have been documented that include food variety score and dietary diversity score. This involves counting the number of foods and food groups taken over a period of, (Ruel,

2003;Rah et al., 2010;Kerr, 2016). Rah et al.(2010) in their study to find effects of low dietary diversity on stunting classified the foods into nine food groups. The diet taken was determined by asking the number of days each of the nine-listed food groups was consumed in the past seven days. A twenty-four hour recall has been recommended for children, as it has been tested and found reliable to deduce feeding practices of children in a population. This method helps one to list specific foods and food groups the previous day and night, (WHO, 2010). The caregiver is asked to freely recall from morning the previous day what the child was fed on. This information is then recorded to match different unique food groupings, which are counted. Children are expected to take at least four food groups for them to achieve daily nutrient requirement, (WHO, 2008).

#### 2.3.2 Dietary diversity and stunting

Previous studies have established that dietary diversity is an important predictor of child stunting where an increased number of food groups consumed especially high in vitamin A, fruits, vegetables, meats and fishes positively contribute to a child's length (Herrador, et al., 2014). Two past studies in different settings examining dietary diversity and stunting had similar results where male and female children below six months who were well breastfed still became stunted if they received less diverse foods from 6 months of age, (Motbainor, et al., 2015; Rah, et al., 2010). Tzioumis and Adair (2014), in their study observed that the families' diet composition could explain why individuals gain weight without linear growth. This is so especially when animal source foods and micronutrients are low in the diet given. They also concluded meats from fishes, birds and other domesticated animals were important in diets prepared for children.

#### 2.3.3 Meal frequency as an indicator of IYCF

Meal frequency is the number of times a child is fed in a defined period and contributes to total energy and nutrient intake. WHO set the minimum meal frequency (MMF) which is defined as the proportion of children 6-8 months who consumed at least two times, 9-23 months at least three times? In addition children not breastfeeding who received food four or more times in a 24 hour period. Minimum meal frequency, aids caregivers to ensure children meet their daily energy and nutrient needs for the different age groups leading to optimal growth. Its determined by asking a caregiver how many times a child consumed solid semi solid and soft foods within a 24 hour period, (Beyene, et al., 2015;WHO, 2008). The meal frequency is important since children can only eat an amount relative to their stomach size which is about 30ml per kg body weight, (Anand, 2013). Therefore, as child progresses in age their energy and nutrient needs increase requiring an increase in the number of meals to meet daily requirement. As a coping strategy reducing frequency of feeding has been used by families which are food insecure, to stretch the available food to many days, (Hadley,& Crooks, 2012). This reduction in feeding frequency has been identified as one of the causes of malnutrition in Kenya, (Nutrition Division, 2013 & WHO 2006).

## 2.4 Caregivers knowledge and practices on feeding children less than 2 years.

#### 2.4.1 Breastfeeding and complimentary feeding

Caretakers' knowledge on breastfeeding and complimentary feeding is paramount in reduction of stunting. The knowledge aspects caretakers need to have includes groups of food to be fed to children, frequency of feeds and quantity of feeds that are measured using standard 250mls cup. This is important because a child stomach size and ability to digest and absorb food changes with increase in age and can only hold a

particular amount of food, (UNICEF, 2006). Previous studies have shown children below six months can efficiently digest and absorb breast milk and no other foods except commercially prepared breast milk substitute that are designed to mimic mother's milk, (Martin, et al., 2016). Breast milk has also been shown to improve the guts beneficial microorganisms, this aids a child's immune responses through complex pathways reducing infections, (Walker, 2013).

A previous study observed that mothers gave insufficient milk production as the main reason for giving children other foods below six months. The study also commented that mothers did not have clear knowledge on the benefits of breast milk, (Fairbrother, & Stanger-ross, 2009). Although this is true, government and work policies can reduce or increase food security aspect of infant and young child access to breast milk through length of maternity leave given to mothers, baby friendly work environments and allowing healthy mothers to wet nurse babies, (Salmon, 2015 & BFHI-WHO, 2018). A study in Canada investigating the relationship between level of food insecurity at household level in terms of access and mothers breastfeeding their children found no association between the two variables, (Van Den Heuvel, & Birken, 2018). This indicates apart from knowledge, policies for both governments and work environment affects access of breast milk by infants. Breast milk also provides food security for households since the available resources can be directed towards purchasing food in place of infant formulas, (Venu, et al., 2017).

One study found out that food secure households with low knowledge on complimentary feeding though producing their own food, can have undernourished children, (Herrador, et al., 2014). Knowledge on infant and young child nutrition is important since it influences actual feeding practice as Abate and Belachew (2017),

argues that actual child care practices ensures well-nourished children. Although knowledge has been found to be important, a review of articles on efficacy and effectiveness of complimentary feeding concluded that when food insecurity was not addressed nutrition education alone did not give positive results in relation to growth of children. But positive results were realized when education was accompanied by food provision, (Dewey,& Adu-afarwuah, 2008). Moench-Pfanner and Bloem(2013), therefore suggests multifaceted interventions that include education on infant and young child feeding and addressing food security issues should be adopted when addressing under nutrition in children.

In Kenya, feeding practices of infants and young children is influenced by the differences in geographical regions and cultural practices. A study in Teso Kenya indicated that diets for children 6 to 23 months were mainly prepared from carbohydrates and were low in animal source foods, fruits and vegetables. More than 50% of this children did not receive a minimal acceptable diet, (Lydiah, et al., 2010). A randomized control trial done in Western Kenya showed that education on IYCN resulted in children being fed from many food groups indicating knowledge gap on feeding children could be a contributor to under nutrition in Kenya, (Jordan, 2015). From this study, caregivers were unable to achieve a diverse diet without knowledge. However, with nutrition education on how to use the locally available foods to prepare a diverse diet, children nutrition status was seen to improve. In Uasin Gishu restrictions of certain foods for pregnant women as avocados, eggs and organs, meats except liver that is reserved for the pregnant woman were encouraged by older women. This is believed to ensure a small baby to protect the mother and child by ensuring an easy birth, (Monchari, et al., 2017).

# 2.4.2 Knowledge and intra house hold food distribution

Intra-household food distribution is a measure of individual access to food. It refers to how food is distributed among household members, including young children. Therefore understanding the nutrition requirements of family members in different age groups especially children is important in preventing malnutrition. This was demonstrated in a study in Ethiopia where a household had both over and undernourished persons. In this study, children were most affected presenting with stunting. This is so since children are members of families contributing the number of household members eating from the same pot with more nutritional needs, (Herrador, et al., 2014). The study also established that increased family size and low consumption of animal products were positively correlated to wasting in children. Tzioumis and Adair (2014), in a systematic analysis of 84 studies agrees with the above finding that a family can have both undernourished and over nourished individuals. This indicates low knowledge on nutrition needs of different age groups and more so children who are dependent on adult food decisions. The study further found that food distribution was influenced by individual differences, personal preferences, culture and household control.

Sraboni et al.(2014) carried out a study on women empowerment in Bangladesh and found out families individual calorie intake reduced with increase in family size, as the available food has to be divided amongst the family members. The heads of households under study received a more nutritious share of food, while women and children received a nutritionally inadequate share. In the same study households low food security score was a good wasting indicator while household food diversity was a strong determinant of stunting. This thought is further explained in a framework developed by Stewart et al.(2013), which explains inappropriate food allocation at

household level was a family home environment factor that contributed to stunting. In most communities in Kenya, particular foods are fed to defined groups depending on the existing belief system. This is demonstrated in a study among the Kalenjin where pregnant women and children were not allowed to consume eggs and organ meats except liver, (Monchari, et al., 2017). Another similar study indicated that some families believed is culturally wrong to give traditionally fermented milks (mursik) to children, (Kirui, 2017). Since knowledge and belief systems affect individual household food distribution, this can contribute to child stunting and households having both well and poorly nourished members.

### 2.5 Household socio economic status and child stunting

A household's economic status in terms earnings from property and livestock owned, employment and total income has been shown to influence the number of food groups included in the household diet. This is explained in a study where dietary diversity score was found to improve by 1% when families income improved by the same figure. There was also an increase total daily calorie intake and an increase in total energy from non-cereals, (Rah, et al., 2010). In a study done in Bangladesh looking at dietary diversity as cause of child stunting agrees less privileged families social economically consumed less food varieties while (Thorne-lyman, et al., 2010), found out that as a families expenditure increases the dietary diversity score also improves.

A study in Ethiopia contradicts the above findings where the researchers concluded that child caring practices were a good predictor to children's nutritional status than a families' wealth and economic status. This is because diet diversity was seen to increase as the family ability to spend increased. This was owed to increased purchase of variety of foods as spending increased (Abate,& Belachew, 2017). Although this is

true, a child's nutrition status is achieved if the child actually ingests the said foods. A countries ability to purchase food also influences diet diversity at household level as was seen in a meta-analysis of several studies where countries with high GDP purchased a variety of foods for its citizen even when they had low food production diversity than those countries with a low GDP. This was seen in countries like Malaysia where supply of variety of foods to its markets was sustained by trade, (Remans, et al., 2014).

Level of income influences level of education and health choices that individuals make for themselves and their children. A study looking at effect of women empowerment on agriculture, the researchers observed that there was an increase in total calories in the female headed households with improved dietary diversity, (Sraboni, et al., 2014). One study contradicts with the above findings, which indicated that female-headed households ate foods that were less varied than those in support programs (Sarah, (2016). In Kenya stunting was lower in children whose mothers had secondary education than those not finished primary education since education positively correlated with higher income,(KDHS, 2014). But for mothers who were still schooling the risk of stunting for their children increased significantly, (Keino, et al., 2014). Income therefore increases with education influences dietary choices for children.

#### 2.6 Food availability and dietary diversity

Food security is said to exist when people are in a state that they can physically access food, have the economic means to purchase food that is safe, enough and nutritious resulting in an active and healthy life, (FAO, 1996). In the global efforts to address food security, countries were tasked to work towards achieving food security for all

and improved nutrition, (SDG Indicators, 2016). This is explained further where countries classified as food insecure are considered to be at a higher risk of stunting and wasting in children since they are unable to meet the nutritional requirements of these fast growing age cohort, (WHO, 2012).

In Kenya WFP estimated that by January 2017, 1.25 million people were food insecure and the situation was expected to get worse with time, (Update, 2017). A survey on food security status of counties after devolution indicated that Uasin Gishu County was food secure with less than 10% of its population classified as food insecure while Turkana had 25% its population being food insecure, (Security, 2016). Comparing stunting rates for this two counties Turkana had a lower prevalence of stunting at 26% than Uasin Gishu at 31.2% (KDHS, 2014). Other food secure counties as Nandi and Trans Nzoia Counties' had serious levels of stunting of between 30 to 39% yet they produce surplus maize for the country. Therefore, other factors other than food access seems to be influencing nutrition status of children.

Food and nutrition security at a household level has been found to influence the health of individual family members especially children, where children from food insecure household were found to be at higher risk of undernourishment and hospitalization, (Poblacion,,et al., 2016). This was due to lack of continuity in daily food provision and intake of foods that were not varied. Lack of food contributed more to wasting than stunting, but studies have shown recurrent wasting leads to stunting. This indicates that prevention of wasting and correct intervention in wasted children can lead to reduced number of children getting stunted as they grow, (Motbainor, et al., 2015). A study by Abate and Belachew(2017), further elucidates that children with low meal frequencies were most likely to develop wasting and those whose food was

less varied developed stunting. Since frequency of meals is influenced by the food security status, we conclude from these studies that food insecurity results to wasting in the short term and stunting in the long term. Addressing food insecurity could therefore reduce incidences of stunting for children in the long term.

Food supply includes movement of food from producers to consumers. These can be within a country or between countries. Countries supply diversity was found to be independent of its production diversity. In Malaysia, mono cropping of palm oil trees reduced production of other foods but did not reduce supply diversity which was maintained through trade, (Remans, et al., 2014). This agrees with a study in several countries including Indonesia where farmers grow rubber in plantations and have a high dietary diversity attributed to income from rubber crop sales and not production diversity, (Sibhatu, et al., 2015). In Kenya Meru region, Kaibi et al.(2016), found stunted children from households with high food production diversity were not significantly different from those with low diversity.

In a cross sectional survey carried out among farming households in Kenya, Kiambu County, indicated there can be improved dietary diversity with food production diversity but not in all circumstances, (Sibhatu, et al., 2015). Herrador et al. 2014, observed as above where a study in a food producing area which had a wasting prevalence of 10% and stunting rate of 44% showing that food production alone is not always positively associated with good nutrition status. These negative associations especially on small holder farms, are because increased production diversity reduces specialization which in turn reduces family income resulting lowered ability to purchase food for the farming households, (Sibhatu, et al., 2015). Food production diversity should therefore not be used as the only way to address dietary diversity, but

area or region specific interventions should be employed after studies have been done to establish the actual contributing factors to poor nutrition status.

#### 2.7 Theoretical framework

Theories in nutrition that can help explain emergence of stunting with changing times, income and industrialisation. This include the Nutrition Transition Theory which explains changes in dietary patterns towards high intakes of saturated fats and simple sugars and low high fibre diets with changing incomes and urbanization. This has resulted in epidemiological shifts from infectious diseases to nutrient deficiency disease as stunting, wasting and obesity causing a dilemma on how to promote healthy eating with economic growth, (Adam,& Barry, 1997). Other theories explain that food and economy are not the only factors in play but genetics has an influence on individual physique that includes tallness. Although this could be true published evidence gives varying and sometimes contradictory results that genetics could be the cause of the differences, (Coffey,et al., 2013).

The Theory of Change identifies inadequate diet and disease as immediate causes. Underlying causes as inadequate access to food, care and health services that result in stunted children and other forms of child malnutrition, (UNICEF, TOC, 2017). In addressing stunting, the theory of change is based on the motto "Leaving no child behind" where every child has equitable chance in life, survives and thrives. Despite the efforts addressing immediate and underlying causes of stunting, Deaton and Dreze (2008), explain the "Slow Catch up Hypothesis" where populations that receive a balanced diet still have individuals with short stature than those that food supply and infections were improved long time ago, (UNICEF, TOC, 2017). This could therefore explain why developing worlds including Kenya have higher stunting rates as

compared to developed nations whose diets were improved for a long time and this has positively influenced the heights of subsequent generations. This can further elucidate why in ranking SDGs developed countries had energy supply and climate change as issues they wanted addressed and not hunger and malnutrition, (Osborn, et al., 2015).

The Child near Environment Theory explains that the immediate family factor, which includes parenting, play, feeding environment interchanges with other factors to prevent stunting, (Laura, et al., 1972). In handling stunted children, interventions should also look at "Stunting-over-weightiness Theory" where children who present with both stunting and obesity are double counted as stunted and as overweight affecting how interventions are done for the one child with both conditions, (Katie, 2014). The theories proposes that if countries increase their activities towards prevention of stunting among other interventions then young children will thrive and stunting rates will reduce gradually with subsequent generations.

**Intervening Variables** 

**Dependent** 

**Figure 1: Conceptual Framework** 

**Independent Variables** 

#### **CHAPTER THREE**

#### RESEARCH DESIGN AND METHODOLOGY

#### 3.1 Introduction

In this chapter, the researcher discusses the research design that was employed in this study. Details of the study area are given including, the population targeted for study, sample size calculation procedure and data collecting instrument used in the study. The chapter also focuses on how the researcher carried out data analysis, presentation and ethical requirements for the study.

### 3.2 Research design

A cross sectional survey design was employed in this study as Kothari, (2004) argues that descriptive survey can be used where study participants can be interviewed directly or indirectly and results obtained can reflect practices of the entire population. In this study caregivers of stunted children will be surveyed in Turbo Sub County

#### 3.3 Location of study

The study was carried out inHuruma and Ng'enyilel wards in Turbo, which is one of the six sub counties in Uasin Gishu County. It is located west of Eldoret town along Eldoret Malaba highway. These locations were randomly sampled. Huruma and Ng'enyilel were selected to represent the urban and rural area respectively. The study was conducted in households selected from villages randomly sampled from the community units.

# 3.4 Population of the study

The target population for this study was children less than two years who live in Turbo Sub County, Uasin Gishu County. This population of study was selected since

studies have shown stunting occurs within this age group and reversal is possible if interventions are done before children reach two years of age.

# 3.5 Sample size and sampling/recruitment procedure

### 3.5.1 Sample size

The sample size was drawn from the target population of children under two years. Turbo had a total population of 272,985 persons in 2018 from the last census report. Based on the population's proportions, children under five are 15.5 % of the total population resulting to 42,313, (KNBS, Census, 2010). Assuming uniformity in the population distribution for the following ages in months, (0-11, 12-23, 24-35, 36-47, 48-59) then 2/5 of the population was children less than 23 months, is 16,925.

Turbo Sub County has six administrative wards with the population distributed proportionally as follows; Huruma ward (18.7%), Kamagut ward (21.8%), Kapsaos ward (13.6%), Kiplombe ward (12%), Ngenyilel ward (9.9%), and Tapsagoi ward (24%). Using Multi stage systematic random sampling one ward was randomly chosen from two urban wards and one ward from wards from the four rural wards. The urban wards are Huruma and Kapsaos from which Huruma ward was randomly selected. Kamagut, Kiplombe, Ngenyilel and Tapsagoi wards are in the rural areas and Ngenyilel ward was randomly selected to represent rural households.

Community units were selected randomly from Huruma and Ng'enyilel wards. Villages were then selected randomly from the community units from which households to be interviewed were randomly drawn. Children below 2 years of age calculated in proportion to the population were 3,164 from Huruma ward and 1676 from Ngenyilel ward. The sampling frame was 4,840 children less than two years.

The sample size calculation was done using Fisher et al. (1991) formula.

nf = n/(1 + (n)/N), when the population is less than 10,000.

z= the standard normal deviation, level of significance 0.05.

CI= 1-0.05 giving 95% confidence level which is set at 1.96.

- p= the proportion of the target population estimated to have a particular characteristic of stunting. The documented prevalence rates are 31.2% (0.312), (KDHS 2014).
- q = the proportion of the population estimated not to have the characteristics of stunting (1.0-0.312), 0.688.
- d = the degree of accuracy required which is set at 0.05 corresponding to the 1.96  $n = \underbrace{\frac{1.96^2 \times 0.312(1-0.312)}{0.05^2}} = 329 \text{ children}$

$$nf = 329/(1 + 329) = 329/1.068$$

$$nf = 308 + 10/100 \text{ of } 308$$

Sample size = 331 children

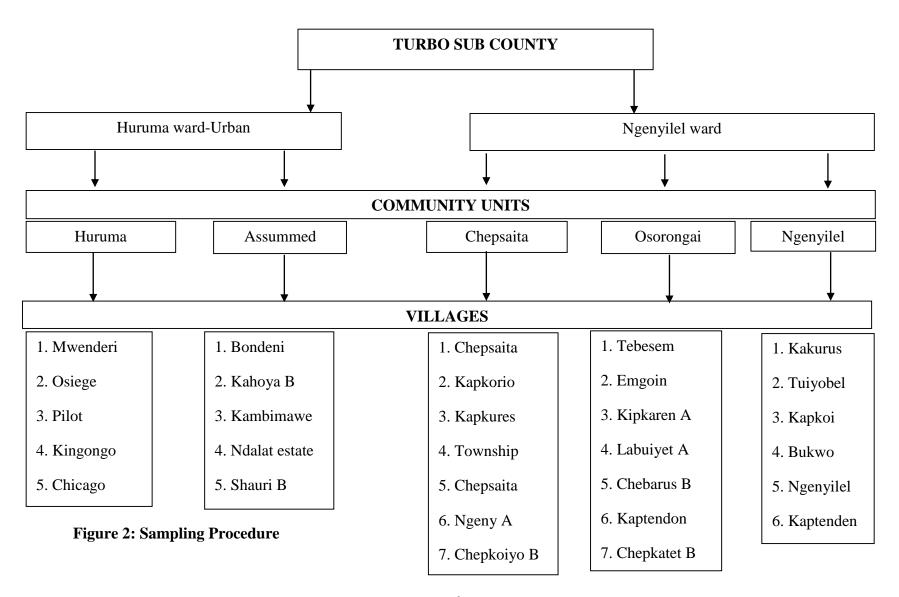
Therefore Huruma ward 65% of 331 =215 children were studied

Ngenyilel ward 35% of 331= 116 children were studied

# 3.5.2 Sampling/recruitment procedure

Huruma ward has one established unit with 10 villages and another 10 villages that have not yet been put in a defined community unit but has active community health volunteers. It was therefore assumed the 20 villages are one unit therefore 2 units were sampled, 5 villages for Huruma unit and 5 for the assumed unit. Systematic sampling was used and every n<sup>th</sup> child who is stunted was studied to get 21children per village. Ngenyilel ward has 5 community units with varied number of villages. Chepkemel unit has 13 villages; Chepsaita unit has 14, Osorongai 13, Ng'enyiliel 8, and Murgusi 12 villages. Three community units were selected randomly from the five community units. The numbers of villages selected randomly were 7 from Chepsaita community unit, 7 from Osorongai community unit and 6 from Ngenyilel community unit respectively to a total of 20 villages. From each village every nth child was sampled depending on the total number stunted. (Figure 2)

The data was collected for 6 days in the rural area from 20<sup>th</sup> to 25<sup>th</sup> August 2018 and 8 days in the urban from 20<sup>th</sup> to 27<sup>th</sup> August 2018. The data collectors included a nutrition and dietetics personnel licenced by the Kenya Nutritionist and Dietetics Institute and a Community health volunteer selected from the community unit sampled. No incentives were given to the study participants.



# 3.6 Study subjects

#### 3.6.1 Inclusion and exclusion criteria

- 1. The researcher-administered questionnaires were only to caregiver and child pair who were at home at the time of study since the length of the child had to be taken as part of the study.
- 2. The study included only children with moderate and severe stunting.
- 3. Sick and mentally disabled caretakers who could not give coherent information about their children were excluded from the study. Inclusion was however considered in circumstances where there was a guardian with direct responsibility over the child.

#### 3.7 Data collection instruments/ tools

This study employed the use of a researcher-administered questionnaire (Appendix I) that was developed by the researcher. A standard length board was used to measure length of children.

Pre Testing of Study Instruments was done by Test-Retesting method to determine the validity and reliability of the researcher administered questionnaire. This was carried out in Kapsaos ward, which has both rural and urban settlements. The sample size for pretesting was 10, (Chaudhary,& Israel, 2014). The results from the pretesting were used to revise questions, add explanations, clarified questions, and the process to the data collectors.

Validity is measure of how close the measurement is to the true value, (Creswell, 2002). This was insured by using a measuring length board with clear markings. Content validity was made sure by asking questions that answered each objective

exhaustively, (Kothari, 2004). Reliability is the ability of an instrument to give consistent results with repeated measures. To increase reliability, research assistants were trained together to reduce interviewer error, and use of clear questions that generate one answer when used across respondents. Using SPSS 2020 test retest reliability of the researcher-administered questionnaire was computed giving a Cronbach value of 0.892.

#### 3.8 Data Collection Procedure

Data was collected by asking questions to the respondents and filling in researcher-administered questionnaires. Data collectors included a qualified nutritionist and a Community Health Volunteers who are attached to the community unit and are familiar with households visited. The community health volunteers keep household health record in a register designated as MOH 513, titled "Household Register for Community Health Volunteers". Information collected in this register include household head, water source, toilet type, pregnancy status, immunisation status and MUAC for children. The register is updated after every six months. Since MUAC is the only nutrition status of children was determined by measuring height using standard measuring length board and interpretations done using WHO growth standard charts 2006.

The length of children was measured using the following procedure with use of height board.

- 1. The child's caregiver lays the child on their back on the length board and assists the nutritionist by holding the child's head in place.
- 2. The caregiver soothes the baby to help him/her calm down

- 3. The caregiver was shown to firmly hold the child's head against the fixed head board as she continues to reassure the child.
- 4. The nutritionist ensures the child lies straight with shoulders touching the board and the spine not arched.
- 5. The nutritionist then holds the child's legs with one hand applying gentle pressure to avoid injuring the child and the other hand moves the footboard to straightened toes.
- 6. The measurement was the read in centimetres to the nearest 0.1 cm

Stunting was the determined by using the WHO height for age growth charts 2006. (WHO Growth Standards, 2006). Children who had LAZ of less than -2 were classified as moderate stunting while those with less than -3 were classified as severe stunting. Foods consumed by children were determined using a 24 hour recall by asking caregivers to recall the types of food fed to children the previous day and night.

# 3.9 Data Management and Analysis

The researcher counted and grouped data collected. IBM SPSS version 20 was used to analyse data. The dependent variables were length and weight for length z score and independent variables were types of foods consumed, knowledge, socio economic activity and types of foods produced. Assumptions in data analysis included the following

- 1. All stunted children in the population had an equal chance of being selected therefore the sample taken was a representative of the whole population.
- 2. Data collected has a normal distribution.
- 3. Data from multiple groups have the same variance.

4. Variables studied were independent and did not affect the value of other observations. Measures of central tendency were used to get a representative figure of different variables. Frequencies were calculated for categorical variables. Cut off points for WHZ score were at <-2 for moderate stunting and <-3 for severe stunting. Dietary diversity scores were determined by counting number of food groups consumed. The strength of association between variables was calculated using Pearson chi square and fishers' exact test. Bar graphs and tables were used for displaying analysed data.</p>

#### 3.10 Ethical Consideration

The researcher sought permission from the Kabarak University Ethics Research Committee (Appendix iii) and National Commission for Science, Technology and Innovation (Appendix iv) before proceeding to collect data. Permission from the Ministry of Education and Ministry of Health Uasin Gishu County was also given for this study. Consent was sought for both the caretakers and the child. Participation was voluntary and those who wished to opt out while the study is on were allowed to do so. Participants were not coerced or threatened to participate in the research. They were informed there was no compensation for participating in the study. It was explained to the participants that confidentiality will be ensured and this was done by giving each participant a code and individual names were not used. The researcher remained sensitive to the participants concerns through the study.

# **CHAPTER FOUR**

# DATA ANALYSIS, PRESENTATION AND DISCUSSION

# **4.1 Introduction**

This chapter gives in details results of the study. The results detail participant information with data shown in charts, tables and graphs followed by comprehensive description of the results.

# 4.2 General and demographic information

**Table 1: Demographic information** 

		Resi	dence		Chi	Fisher
					square	exact
		Urban	Rural	Total	results	test
		n=215	n=116	n=331	P value	P value
		n (%)	n (%)	n (%)	=0.05	=0.05
Stunted child's	0-<6	34(15.8)	28 (24.1)	62(18.7)		
age group	6-11	60 (27.9)	22 (19.0)	82(24.8)	0.041*	***
	12-17	55 (25.6)	31 (26.7)	86(26.0)		
	18-23	66 (30.7)	35 (30.2)	101(30.5)		
Moderate stunting	0-23 months	139(64.7)	79(68.1)	218(65.9)		
Severe stunting	0-23 months	76(35.3)	37(31.9)	113(34.1)		
Childs sex	Males	96(44.7)	52(44.8)	148(44.7)		
	Female	119(55.3)	64(35.0)	183(55.3)	0.001*	***
Caregivers	Mother	199(92.6)	106(91.4)	305(92.1)		
relationship	(female				**	***
to child	parent)					
	Father (male parent)	4(1.9)	5(5.3)	9(2.7)		
	Grandmother	5(2.3)	3(2.6)	8(2.4)		
	Other	7(3.3)	2(1.7)	9(2.7)		
Caregivers	No formal	1 (0.5)	6(5.2)	7(2.1)		
education	education				**	***
	Primary	84 (39.1)	71(61.2)	155(46.8)		
	Secondary	104 (48.4)	33(28.4)	137(41.4)		
	College	26 (12.1)	6(5.2)	32(9.7)		
Mean HH size	Size	4.0	5.0	4.5	**	
Daligion	Christian	213(99.1)	116(100.0)	329(99.4)	**	
Religion	Muslim	2(0.9)	0(0.0)	2(0.6)		0.543

The researcher collected information from caregivers of 331 children below2 years with stunting WHZ score of  $\leq$ -2 and  $\leq$ -3, classified as moderate and severe stunting respectively. The children were selected from urban and rural area of Turbo Sub County, Uasin Gishu County. Moderately stunted children (WHZ score of <-2) were 65.9% while severely stunted children (WHZ score of <-3) were 34.1%. Children who participated in the study were from ages 0-23 months with 30.5% being between 18-23 months and 18.7% at 0-6 months. There was significant difference in the distribution of stunting across different age groups with  $\chi^2$  (p=0.041) between urban and rural children and distribution between males and females at $\chi^2$  (p=0.001) with more females stunted than males. Most of the children were taken care by their biological mothers (92.1%). The average household size was 4.0 persons for urban and 5 persons for rural area. Highest achieved education level for caregivers was primary level and most caregivers subscribed to the Christian religion with no difference in their distribution between urban and rural area. (Table 1)

### 4.3 Findings of the study

#### 4.3.1 Socio economic information of households with stunted children

The study aimed at finding out the socio economic status of families with stunted children. This section presents data on respondent's information and the socio economic characteristics of households with stunted children.

**Table 2: Socio economic status for households** 

		Resid	ence		Chi	Fisher
					square	exact
		Urban	Rural	Total	results	test
		n=215	n=116	n=331	P	P value
		n (%)	n (%)	n (%)	value =0.05	=0.05
Household	Mother	34(15.8)	31(26.7)	65(19.6)		
Provider of	Father	171(79.5)	73(62.9)	244(73.7)	**	***
food	Other	10(4.7)	0(0.0)	10(3.0)		
	Both parents	0(0.0)	12(10.3)	12(3.6)		
F 41 2	Employed	79(36.7)	24(20.7)	103(31.1)		
Father's	Self employed	90(41.9)	36(31.0)	126(38.1)	**	***
Occupatio	Farmer	0(0.0)	26(22.4)	26(7.9)	4.4	4.4.4.
n	Not Applicable	46(21.4)	30(25.9)	76(23.0)		
3.6.4.2	Employed	12(5.6)	9(7.8)	21(6.3)		
Mother's	Self employed	29(13.5)	21(18.1)	50(15.1)	**	***
Occupatio	Farmer	0(0.0)	13(11.2)	13(3.9)	<b>ተ</b> ተ	ጥጥጥ
n	House wife	174(80.9)	73(62.9)	247(74.6)		
House	Own house	11 (5.1)	80 (69.0)	91 (27.5)		
ownership	Rented	200 (93.0)	33 (28.4)	233 (70.4)	**	***
	Free housing	4(1.9)	3 (2.6)	7 (2.1)		
Income	Rental	7 (3.3)	4 (3.4)	11 (3.3)		
generating	Dairy	1 (0.46)	32 (27.6)	33 (10)	**	***
activities by	Business	101 (46.9)	35 (30.2)	136 (41.1)		
households	Rental and dairy	1 (0.46)	42 (36.2)	43 (13.0)		
	Rental and business	4 (1.86)	0(0.0)	4 (1.2)		
	Dairy and	0(0.0)	2 (1.7)	2 (0.6)		
	business	- ( /	( 11)	(2.2)		
	Rental dairy and	0(0.0)	1 (0.9)	1 (0.3)		
	business	101 (46.0)	0(0,0)	101 (20.5)		
<b>a</b> :	None	101 (46.9)	0(0.0)	101 (30.5)		
Savings,	Savings	81 (37.7)	24 (20.7)	105(31.7)	**	***
land and	Land ownership	105 (48.8)	97 (83.6)	202(61.0)	<u> </u>	ককক
farming	Practice farming	95 (44.2)	99 (85.3)	194(58.6)		

<sup>\*</sup>Significant value

The results indicate that fathers representing (73.7%) provideds food to families with stunted children. Most fathers (male parent) were self-employed at 38.1% with 31.1% employed. The rural respondents owned their houses at 69%, with urban respondents renting houses at 93%. Households housed by well-wishers were recorded lowest in both residences. Sixty six point four percent (66.4%), 27.6, 36.2, 1.7 and 0.9% of rural respondent's participated in dairy activities while business was the preferred

<sup>\*\*</sup> Not applicable for chi square analysis (cells with less than 5 counts)

<sup>\*\*\*</sup> Only for 2\*2 tables

income generating activity for the urban respondents at 48.76, (46.9 and 1.86%). Urban dwellers had more savings at 37.7% while rural at 20.7%. Most rural dwellers owned land at 83.6% engaged most in farming activities at 85.3%. Dairy farming and business activities were the most practiced in rural and urban respectively. (Table 2)

Table 3: Relationship between stunting and most practiced economic activities

		Resp	Response		Chi square	P value
		Yes	No		value	P=0.05
	Stunted	94(28.4)	124(37.5)	218(65.9)		_
Practice business	Severe stunting	48(14.5)	65(19.6)	113(34.1)	0.012	0.911
	_	142(42.9)	189(57.1)	331(100.0)		
Practice	Stunted	55(16.6)	163(49.2)	218(65.9)		
dairy	Severe stunting	24(7.3)	89(26.9)	113(34.1)	0.652	0.419
		79(23.9)	252(76.1)	331(100.0)		

The relationship between dairy farming and business to severity of stunting was determined and there was no significant relationship between severity of stunting and most practiced income generating activity that business and dairy farming. (Table 3)

# 4.3.2 Children's food consumption.

Analysis on foods consumed was done for children less than 6 months and children 6 -23 months. This was done using a 24-hour recall where caregivers freely recalled foods given to children in the previous day and night.

Table 4: Feeding for children less than 6 months

Residence	Age		Breastfeeding type					
	0-<6	Exclusive	Predominant	Mixed	Not			
	months	Breastfeeding	Breastfeeding	Feeding	breastfeeding			
	(n)	n (%)	n (%)	n (%)	n (%)	N		
Urban	(34)	13(38.2)	6(17.6)		1(2.9)	34		
				14(41.2)				
Rural	(28)	12(42.9)	2(7.1)		1(3.6)	28		
				13(46.4)				
Total	(62)	25(40.3)	8(12.9)		2(3.2)	62		
				27(43.5)				

Key: Exclusive breastfeeding (Breast milk alone and no other food, liquid or water except prescribed medication)
Predominant breastfeeding (Breast milk plus clear liquids, fruit juice, ritual liquids and water)
Mixed feeding (Breast milk plus other foods including non-human milk)

Foods consumed by children 0-6 months indicate that mixed feeding was the most practiced mode of feeding (43.5%) for both urban and rural respondents followed by exclusive breastfeeding (40.3%). Exclusive breastfeeding rates were higher at 42.9% in the rural and 38.2% in the urban area. More children in urban areas received liquids and water in addition to breastmilk as predominant breastfeeding was at 17% compared to rural areas at 7.1%. (Table 4)

Table 5: Continued breastfeeding at one to two years

Continued breastfeeding	Childs age		Children who received breast milk the previous day and night
		n	n (%)
At 1 year	12 -15 months	55	37(67.3)
At 2 years	20-23 months	68	32(47.1)

Results on continued breastfeeding at one year and 2 years for stunted children were determined. Continued breastfeeding at one year was 67.3% and at two years was 47.1%. (Table 5)

Table 6: Distribution of children by current breastfeeding status

	Child's age	Bre	Breastfed day and night		
	group	Yes	No	Not applicable	
	0-1	8(100.0)	0(0.0)	0(0.0)	8
	2-3	25(92.6)	1(3.7)	1(3.7)	27
Childle age	4-5	25(92.6)	2(7.4)	0(0.0)	27
Child's age	6-11	77(93.9)	4(4.9)	1(1.2)	82
	12-17	57(66.3)	27(31.4)	2(2.3)	86
	18-23	44(43.6)	55(54.5)	2(2.0)	101
	Total	236(71.3)	89(26.9)	6(1.8)	331

Stunted children breastfeeding status by age was determined and the current breastfeeding rate was 100% for children 0-1 month and reduced gradually for stunted children 18- 23 months to 43.6%. Only 71.3% of the total children studied were currently being breastfed. (Table 6)

Table 7: Individual food groups consumed by children 6-23 months

Individual food groups	Response	Urban	Rural	Chi square
		N = 181	N=88	P=0.05
		n (%)	n (%)	
Cereals, roots, tubers	Yes	176(97.2)	83(94.3)	0.338
	No	5(2.8)	5(5.7)	
Legumes, nuts	Yes	31(17.1)	19(21.6)	0.282
	No	150(82.9)	69(78.4)	
Milks and milk	Yes	102(56.4)	54(61.4)	0.725
products	No	79(43.6)	34(38.6)	
Flesh foods	Yes	40(22.1)	15(17.0)	0.481
	No	141(77.9)	73(83.0)	
Eggs	Yes	13(7.2)	11(12.5)	0.250
	No	168(92.8)	77(87.5)	
Vitamin A rich foods	Yes	26(14.4)	31(35.2)	0.001*
	No	155(85.6)	57(64.8)	
Fruits and vegetables	Yes	126(69.6)	64(72.7)	0.862
	No	55(30.4)	24(27.3)	

<sup>\*</sup>Significant difference

Cereal, roots and tubers foods were eaten most in urban at 97.2%/n=196 and rural 94.3%/n=83. Eggs were eaten least with 7.2% urban and 12.5% rural. There was no differences in consumption of all food groups between urban and rural children except

intake of vitamin A rich foods with a significant difference  $\chi^2$  (p=0.001). Vitamin A rich foods were eaten more in the rural areas at 14.4%. (Table 7)

Table 8: Low and minimum dietary diversity score for children 6-23 months

Residence	Childs		Dietary div	ersity score		
	age in	1	2	3	≥4	
	months	n (%)	n (%)	n (%)	n (%)	n
Urban	6-11	5(8.8)	12(21.1)	29(50.9)	11(19.3)	57
	12-17	4(6.6)	24(39.3)	20(32.8)	13(21.3)	61
	18-23	1(1.6)	17(27.0)	27(42.9)	18(28.6)	63
	6-23	10(5.5)	53(29.3)	76(42.0)	42(23.2)	181
Rural	6-11	1(4.8)	5(23.8)	7(33.3)	8(38.1)	21
	12-17	5(15.2)	2(6.1)	16(48.5)	10(30.3)	33
	18-23	4(11.8)	6(17.6)	8(23.5)	16(47.1)	34
	6-23	10(11.4)	13(14.8)	31(35.2)	34(38.6)	88
Total	6-11	6(7.7)	17(21.8)	36(46.2)	19(24.4)	78
	12-17	9(9.6)	26(27.7)	36(38.3)	23(24.5)	94
	18-23	5(5.2)	23(23.7)	35(36.1)	34(35.1)	97
	6-23	20(7.4)	66(24.5)	107(39.8)	76(28.3)	269

The dietary diversity score (DDS) of 3 was highest for both urban (42.0%/n=76) and rural at 35.2%/n=31. Results on minimum acceptable dietary diversity score shows the number and proportion of children who consumed at least four food groups the previous day within different age groups. The total number of children who had a dietary diversity score of four and above were 28.3%/n=76, with urban and rural having 23.2%/n=42 and 38.6%/n=34 correspondingly. (Table 8)

Table 9: Dietary diversity scores for rural and urban areas

	Resi	Residence		P value
Dietary Diversity	Urban	Rural	value	
Score (DDS)	n=181	n=88		p=0.05
	n (%)	n (%)		
DDS = 1	10(5.5)	10(11.4)		
DDS = 2	53(29.3)	13(14.8)		
DDS = 3	76(42.0)	31(35.2)	13.467	0.004*
$DDS \ge 4$	42(23.2)	34(38.6)		

<sup>\*</sup>Significant value

The relationship between place of residence and dietary diversity score showed a significant relationship with a Chi square value of ( $\chi^2$ 13.467, p=0.004). This means

the place of residence influenced the number of food groups eaten with rural children being fed better than urban. Children who received minimum acceptable diet of  $\geq$ 4 food groups the previous day and night were at 38.6% /n=34, rural and 23.2%/n=42, urban. More of the urban children were fed between 2 and 3 food groups at 29.3%/n=53 and 42.0%/n=76 respectively. (Table 9)

Table 10: Severity of stunting and dietary diversity score

Urban				Rural				
	Moderate	Severe	Chi square	Stunted	Severe	Chi square		
	Stunted	stunting	results		stunting			
DDS	n=139	n=76	P=0.05	n=79	n=37	P=0.05		
	n (%)	n (%)		n (%)	n (%)			
DDS=1	5(4.3)	5(7.6)		5(8.3)	5(17.9)			
DDS=2	35(30.4)	18(27.3)		8(13.3)	5(17.9)			
DDS=3	50(43.7)	26(39.4)	p=0.707	20(33.3)	11(39.3)	0.266		
DDS=4	25(21.7)	17(25.8)	_	27(45.0)	7(25.0)			

The relationship between severity of stunting and dietary diversity score was determined and no relationship was observed for both urban and rural children. (Table 10)

# 4.3.2 Caregiver knowledge on infant and young child feeding

Caregiver's knowledge on feeding children was analysed for children 0-23 months. Knowledge aspects analysed included caregivers understanding on types of foods to be consumed by children less than 6 months and children 6-23 months, age at which a child is introduced to other foods, frequency of feeding children of different ages and quantity of foods for different age groups. Food measurements determining quantity were estimated against a standard measure of a 250 ml cup.

Table 11: Caregivers knowledge on feeding children less than 6 months

Knowledge		Urban	Rural	Chi s	quare
area				res	ults
		n=215	n=116		P value
		n (%)	n (%)	$\chi^2$	$\alpha = 0.05$
Timely Initiation of	Within 1 hour	184 (85.6)	87 (75.0)		
breast feeding	Till milk comes	20 (9.3)	19 (16.4)	5.692	0.058
	Don't know	11 (5.1)	10 (8.6)		
Foods for children	Breast milk only	174 (80.9)	91 (78.4)		
0-5 Months	Breast milk and semi- solid foods	30 (14.0)	13 (11.2)	3.460	0.177
	Don't know	11 (5.1)	12 (10.3)		
Introduction of	At 6 months	95 (44.2)	85 (73.3)		
complimentary	0-5 months	42 (19.5)	12 (10.3)		
Foods	> 6 months	68 (31.6)	8 (6.9)	38.469	0.000*
	Don't know	10 4.7)	11 (9.5)		

<sup>\*</sup>Significant value

Results on caregiver's knowledge on types of foods for children below 6 months and initiation of breastfeeding indicated no difference in understanding what food to feed this age group (breast milk), and when to initiate breastfeeding (within one hour after birth). There was a significant difference on understanding the right age to introduce foods between urban and rural residence. (Table 11)

Table 12: Caretaker's knowledge on frequency of feeding children 6-23 months

Age in	Knowledge on minimum	Resid	ence			
months	acceptable	Urban	Rural	Total	Chi	Chi
	frequency	n=215	n=116		square	square
					value	P=0.05
6-8	Yes	71(33.0)	38(32.8)	109(32.9)	0.044	0.835
0-8	No	144(67.0)	78(67.2)	222(67.1)		
9-11	Yes	64(29.8)	48(41.4)	112(33.8)	4.358	0.033*
9-11	No	151(70.2)	68(58.6)	219(66.2)		
12.22	Yes	55(25.6)	44(37.9)	99(29.9)	5.482	0.019*
12-23	No	160(74.4)	72(62.1)	232(70.1)		

<sup>\*</sup>Significant value

Minimum acceptable frequency is the number of times children from different age groups are expected to consume food in a day. Children 6-8 months (2 times), 9-23 (3 times) and 6-23 months non-breastfed children (4 times), Source: Indicators for assessing IYCF, WHO 2008.

Results on caretakers understanding on frequency of feeding children indicated most caretakers did not know the minimum acceptable frequency for feeding children from

different age groups. There was a significant difference in understanding the minimum number of times to feed a child 9-11months ( $\chi^2$  4.358, p=0.033) and 12-23 months ( $\chi^2$ 5.432, p=0.019) between rural and urban caregivers. Rural caregiver is having a better understanding than urban caregivers. (Table 12)

Table 13: Knowledge on food groups for feeding children 6-23 months

	Urban n=215		Ru n=1			
Food groups	Yes n (%)	No n (%)	Yes n (%)	No n (%)	Chi square value	P value P=0.05
Flesh foods	114(53.0)	101(47.0)	52(44.8)	64(55.2)	2.024	0.155
Legumes, nuts	144 67.0)	71(33.0)	84(72.4)	32(27.6)	1.039	0.308
Milks	165(76.7)	50(23.3)	93(80.2)	23(19.8)	0.515	0.473
Fruits	193(89.8)	22(10.2)	99(85.3)	17(14.7)	1.418	0.234
Vegetables	192(89.3)	23(10.7)	84(72.4)	32(27.6)	15.511	0.000*
Carbohydrates	208(96.7)	7(3.3)	111(95.7)	5(4.3)	0.240	0.624
Eggs	8(3.7)	207(96.3)	5(4.3)	111(95.7)	0.069	0.793

<sup>\*</sup>Significance value

Caregivers understanding on food groups to be fed to children for both rural and urban had energy rich foods scoring highest. Eggs had the least score. There was no significant difference between urban and rural understanding of food groups to be fed to children except for vegetables, ( $\chi^2$ 15.511, p<0.001), with more urban caregivers listing vegetables as one of the foods that should be fed to children than rural caregivers. (Table 13)

# 4.3.2 Relationship between stunting, food availability and consumed

This section gives results on how stunting in children 6-23 months relates to foods produced and consumed in terms of the dietary diversity score.

Table 14: Relationship between food groups produced and consumed

	Number		Food	groups prod	Fisher			
Reside	of food	No	1	2	3	4	S-	P
nce	groups	foods	n(%)	n(%)	n(%)	n(%)	freema	value
	consumed	produce					n	p=0.0
		d					halton	5
							exact	
							test	
							value	
Urban	1	6(5.6)	1(5.0)	3(7.9)	0(0.0)	0(0.0)		
	2	35(32.7)	4(20.0)	8(21.1)	6(40.0)	0(0.0)		
	3	45(42.1)	9(45.0)	18(47.4)	4(26.7)	0(0.0)	10.276	0.627
	4	21(19.6)	6(30.0)	9(23.7)	5(33.3)	1(100)		
	Total	107	20	38	14	1		
	n=181							
Rural	1	3 (23.1)	1(6.7)	3 (18.8)	1(7.1)	2 (6.7)		
	2	3 (23.1)	2(13.3)	4(25.0)	3(21.4)	1 (3.3)	115	0.210
	3	2(15.4)	8(53.3)	5(31.2)	5(35.7)	11(36.7)	14.5	0.219
	4	5(38.5)	4(26.7)	4(25.0)	5(35.7)	16(53.3)	88	
	Total	13	15	16	14	30		
	n=88							

Key: WHO recommends seven food groups to be used in assessing IYCF practices? 1. Grains, roots and tubers, 2.Legumes, nuts, 3. Dairy products, 4. Flesh foods, (meats, fishes, poultry, organ meats), 5. Eggs, 6. Vitamin A rich foodsand 7. Other fruits and vegetables

The findings show the relationship between food groups produced and dietary diversity score in respondents indicated that there was no significant relationship between number of food groups produced and consumed by children in the urban and rural area. The fishers exact test value for this relationship was ( $\chi^2$ 10.276, p=0.627) for urban children and ( $\chi^2$ 14.588, p=0.219) for rural children. (Table 14)

Table 15: Individual food groups produced in relation to consumption

			Urban		Rural			
		Food group consumed n=181			Food group consumed n=88			
Food produced				Fisher's			Fisher's	
		Yes n (%)	No n (%)	exact test value P =0.05	Yes n(%)	No n(%)	exact test value P =0.05	
Grain,	Yes	66(95.7)	3(40.3)		68(94.4)	4(5.6)		
roots and tubers	No	110(98.2)	2(1.8)	0.371	15(93.8)	1(6.2)	1.000	
Pulses	Yes	8(16.7)	40(83.3)		9(18.8)	39(81.2)		
	No	23(17.3)	110(82.7)	1.000	10(25.0)	30(75.0)	0.604	
Milks	Yes	1(50.0)	1(50.0)		22(84.6)	32(15.4)		
	No	101(56.4)	78(43.6)	1.000	4(51.6)	30(48.4)	0.004*	
Flesh	Yes	2(100.0)	0(0.0)		5(26.3)	14(73.7)		
food	No	38(21.2)	,	0.048*	10(14.5)	59(85.5)	0.300	
			141(78.8)					
Eggs	Yes	1(100.0)	0(0.0)		2(12.5)	14(87.5)		
	No	12(6.7)		0.072	9(12.5)	63(87.5)	1.000	
			168(93.3)					
Fruits and	Yes	14(58.3)	10(41.7)		37(77.1)	11(22.9)		
Vegetable	No	112(71.3)	45(28.7)	0.235	27(67.5)	13(32.5)	0.345	

\*Significant value

An analysis on relationship between foods produced and consumed indicated no relationship between food groups produced and consumed except for milk in the rural area and flesh foods in urban area. Milk production and consumption in rural area had a Fisher's exact test significance value at (p=0.004) for milk implying that families producing milk feed it to their children. Relationship between production and consumption of flesh foods for urban residence had a Fisher's exact test significance value at (p=0.048) for flesh foods with few families that produced flesh foods feeding the same to their children. (Table 15)

Table 16: Stunting and food group produced.

Reside	e Food groups produced						Fisher	P	
nce		No food produced n(%)	1 Food group n(%)	2 Food groups n(%)	3 Food groups n(%)	≥4 Food groups n(%)	n	s exact test	value p=0.0 5
Urban	Stunted Severe stunted	70(60.9) 37(56.1)	10(8.7) 10(15.2)	23(20.0) 15(22.7)	11(9.6) 4(6.1)	1(0.9) 0(0.0)	115 66	3.018	0.561
	Total	107(59.1)	20(11.0)	38(21.0)	15(8.3)	1(0.6)	181		
Rural	Stunted Severe	8(13.3)	8(13.3)	11(18.3)	13(21.7)	, ,	60 28		0.189
	stunted	5(17.9)	7(25.0)	5(17.9)	1(3.6)	10(35.7)	20	6.107	0.109
	Total	13(14.8)	15(17.0)	16(18.2)	14(15.9)	30(34.1)	88		

A relationship seen between severity of stunting and number of food groups produced for both urban and rural was determined. The results show no relationship was seen between severity of stunting and groups of food produced. (Table 16)

#### 4.4 Discussion

The study in children less than two years indicated that there were stunted children in Turbo Sub County. There was a strong significant difference in the child's gender distribution with the study having more females than males in both urban and rural areas. This agrees with a study carried out in Baringo Kenya that found more females than males to be stunted, (Walingo,&Sewe., 2015). This findings differ with an analysis of demographic survey data which indicated Kenya had stunting prevalence more in males than females, (Jonah, et al., 2018). Most of the stunted children were between eighteen to twenty three months and least seen in children zero to six months with a large difference in their distribution between urban and rural which concurs with the demographic health survey results, (KDHS., 2014). Stunting in these children can be attributed to the cumulative effect of lack of nutrients and lack of correct interventions when children present with wasting earlier. These results also agree with Ekpo et al. (2008) study that found that rates of stunting were found to be highest in

children twelve to twenty three months. A similar observation was made by Herrador et al., (2014), where the probability of being stunted in children increased with age with more wasting seen at 6-11 months and stunting as children progressed in age.

A majority of the caregivers were the children's biological mothers. Most of them had reached primary level with few having attained college level education. A similar observation was made where low level of education resulted in reduced income and thus inability to provide diverse diet resulting in stunting, (KDHS 2014). A relationship was observed between level of education and stunting. Nevertheless, this remained true only when other factors like socio economic status were not controlled. This is so since with education can lead to an economic means to provide food that is basis to reducing stunting, (Miller,& Rodgers, 2009). In addition to this other studies observed that the level of education of both mothers and father positively correlated with child's tallness with mothers years of education showing a very strong correlation indicating girl child education may be attributed to improved child tallness in future, (Germany, & Burchi, 2012). Since a majority of caregivers in this study were children's biological mothers, promotion of girl child education could positively contribute to reduction of stunting in future.

Child nutrition status can largely be affected by a family's ability to provide food. A determination of who provides for the family, ownership of residence, income generating activities, land ownership and involvement in farming activities was investigated. Most respondents indicated families' food was largely provided for by the fathers. Mothers accounted for two out of ten families. Families provided for by both parents reported least stunted children. This observation agrees two studies where one observed there was reduced stunting in households when women were

empowered in agriculture and other economic activities, Miller and Rodgers (2009), adding to the number contributing to the families diet. This reduction in stunting maybe due to the fact that dietary diversity was seen to improve when women were let to actively participate in agricultural activities, (Sraboni, et al., 2014). This implies provision by both parents to families food basket can contribute to reduced stunting rates in families. Furthermore, empowering the female parent with knowledge and resources can reduce stunting since biological mothers cared for most children in this study. Furthermore, care by biological mothers can positively contribute to good nutrition especially through breastfeeding if done optimally. Therefore, women empowerment is critical in ensuring improved child nutrition.

Multiple sources of family income determine access to food and nutrition supply for children and families. The study demonstrated no significant relationship between the most practiced income generating activities, (dairy farming and business) with severity of stunting. This can be explained by the fact that stunting is as a result of chronic hunger or lack of nutrient supply that can occur at any time within the first 1000 days of life, (Bogard, et al., 2015). The children in this study did not completely lack food but their diet was less diverse. Fewer families had savings with urban households reporting more savings than rural. This indicates that most of the families with stunted children did not plan for future, which may include nutrition planning. These, is seen in this study with most children not receiving the required minimum acceptable diet in day. This finding disagrees with Lindsay and Jessica(2015),in a review of studies looking at children and youth, found out that participating in saving groups did not show positive impact on child's welfare including provision of nutritious food although this study only focused on children below two years of age. But Abate and Belachew (2017), found out that child care practices such as

breastfeeding, frequency of meals, early initiation of breast feeding and providing a diverse diet had more impact on child growth in height than the socio economic status of households. On the contrary, Sraboni et al.(2014) argued that higher levels of income influenced health choices individuals make for their children. This view was also supported by (Thorne-lyman, et al., 2010) who found out that a families expenditure and provision of a diverse diet positively correlate. Since most families had little or no savings, only a few children received diverse foods promotion of savings, and education on how to achieve diet diversity would help reduce stunting in children.

This study had some children less than 6 months with stunting. This can be attributed to poor feeding of children within this age group since exclusive breastfeeding rates were low in this group. This observation agrees with findings of a longitudinal study in developing countries that observed growth faltering in length in some children occurred in the first few months after birth as a result of poor feeding, (Prendergast, et al., 2017). This could be due to poor breastfeeding techniques that include wrong positioning and attachment of the baby to the mother's breast. When breastfeeding is correctly done, a child gets enough breast milk, which has been found to supply all required nutrients. Breast milk changes composition from colostrum, transitional and mature milk that occurs within the first weeks after birth meeting the different physiological needs as the child grows, (Sundekilde, et al., 2016). Other studies also show exclusive breastfeeding benefits a child by increasing colonisation of a child's gut with beneficial microorganisms, which is less seen in mixed fed children. This ensures maintenance guts structural integrity, controlling of a child's immune reaction and protections against harmful microbes, (Martin, et al., 2016; Walker, 2013). Since mixed feeding was practiced for children below six months in this study,

it implies that they are not receiving required nutrition for growth in length and the other benefits of exclusive breastfeeding.

Although exclusive breastfeeding contributes to increase in length in children 0-6 months, it has also seen to be positively associated length for age z scores of children 6-11 months than predominant breastfeeding and mixed feeding, (Kamudoni, et al, 2014). In addition to this, a child's gastro intestinal system has been found not ready to digest other foods other than breast milk or breast milk substitutes when necessary at this age. Thus, early introduction of food to children less than 6 months as observed in this study and use of liquids in addition to breast milk for the predominantly breastfed children interferes with intake of sufficient breast milk, optimal nutrient digestion and absorption affecting child growth as indicated by (Martin, et al., 2016). Therefore, interventions focused towards promotion of exclusive breastfeeding are required for children 0-6 months to reduce stunting.

Comparing dietary diversity scores by residence, there was a significant difference between rural and urban scores with rural children fed better than urban children. This may be attributed to rural families easily accessing some foods from their farms and neighbourhood at a cheaper price as compared to urban areas that mainly rely on purchasing foods. In addition to this continued breastfeeding was low with one third of the children were not receiving breast milk at one year two thirds not receiving breast milk at two years. In a systematic review of studies on complimentary feeding, breast milk was found to provide about half of energy requirements for children 6-11 months and a third of the energy requirements for 12-23 months, therefore lack of this supply as observed in this study denies a child required nutrients for growth, (Dewey, & Brown, 2003). Other studies further observed that sub optimal

breastfeeding and early cessation of breastfeeding increased morbidity in children especially diarrhoea and pneumonia that hamper nutrient intake and absorption, leading to stunting in the long run, (Sankar, et al., 2015). Kasai and Republic (2009)agrees with that early stoppage of breastfeeding was found to be one of the causes of stunting in food secure areas. Since the place of this study is classified as food secure in terms of access with most households consuming at least six food groups, CFSVA Report (2016), poor breastfeeding practices could be a contributor to stunting.

In addition to early cessation of breastfeeding, about two thirds of the children six to twenty three months did not receive a minimum acceptable diet. Studies have shown that lack of enough nutrient supply between ages 6-11 months leads to repeated wasting occurrences, that later result to stunting, (Briend, et al., 2015). This is further explained by Motbainor et al. (2015) who found out that children above six months who were exclusively breastfed became stunted if they consumed a less diverse diet. A dietary diversity score that was used in this study that recall food groups taken with 24 hours has been found to be a good measure of nutrient adequacy and affect a child height and weight, (Steyn,et al., 2017). Yet the study found most of children had dietary diversity score of less than four food groups. This therefore, shows inadequate nutrient supply in the study group resulting to stunting has been linked more to food diversity than food security as the later was seen to contribute more to wasting in children, (Motbainor, et al., 2015).

Intake of certain foods have been linked to higher increase in children's height which includes eggs, fish, chicken liver and milk. This is because these foods supply essential amino acids, provide iron, calcium and zinc, (Dewey,& Adu-afarwuah,

2008). Zinc has also been found to be an important growth component for height where children with low height had low plasma zinc concentrations and other micronutrients such as calcium, magnesium, and iron, (Hess, 2017). Results from this study indicated low intake of animal source foods with eggs being the least consumed food. However, there was a significant difference on milk consumption between urban and rural children with rural children consuming more milk than urban. This could be due to the fact that most rural households produce milk as part of their economic activities and milk is more available at low cost in the rural area than urban. Therefore, most children in this study did not receive enough food that supplies essential nutrients needed for linear growth and this could be one of the explanations for stunting.

Vitamin A is an important nutrient in boasting immunity, improving sight and cell regeneration. From the study, about two thirds of the children from both urban and rural areas did not receive vitamin A rich foods such as yellow-fleshed sweet potatoes, carrots, mangoes and pumpkins among others. Therefore they miss the potential benefit of vitamin A in the body of reducing morbidity and mortality, (Stevens, et al., 2015). Although vitamin A is an important nutrient its effect on length of children gave both positive and no correlation, but had a shown a proven effect in reducing disease, (Kimani, et al., 2012). Since frequent illness leads to wasting and recurrent wasting has been observed to, result to stunting then lack of Vitamin A may indirectly be contributing to increased rates of stunting in this study group.

Caregiver's knowledge on infant and young child feeding that include groups of food to be fed to children, frequency of feeding, and quantity of feeds, can affect how they plan and feed children. The study found that caregiver's had a better understanding on when to initiate breastfeeding. This is recommended to be within one hour after birth unless the child is orphaned or the mother is unable to breastfeed due to various reasons, (MOH Nutrition Division, 2013 & MIYCN Guidelines, 2012). Urban caregivers demonstrated a better understanding on the right age to introduce complimentary foods to children than the rural caregivers. Since mixed feeding was practiced in this study, it implies that caregivers did not put in practice the knowledge on type of food for children less than six months. Although most respondents correctly identified breast milk as the only food for children below six months and the age for starting complimentary foods to children to be at six months, exclusive breastfeeding rates were low for children less than six months. According to Fairbrother and Stanger-Ross (2009), insufficient production of milk has been given as the most common reason for introducing foods before the age of six months. They further observed that lack of clear understanding of benefits of exclusive breastfeeding led to mixed feeding and stoppage of breastfeeding before children attained the age of two years.

Besides giving the right food for age, optimal nutrient intake for different age groups can only be achieved with intake of enough food. This is achieved when the caregivers adhere to the correct frequency of feeding and provision of the right quantity of food for the different age groups. Therefore, caregiver's knowledge on feeding frequency and quantity of feeds is paramount to child growth. In this study, most caregivers did not know minimum acceptable number of times for feeding children in different age groups. Most urban caregivers had poor understanding on frequency of feeds than rural caregivers for ages 9-23 months. This indicates that knowledge flow to the community is more effective in rural than urban caregivers but

the exact source of knowledge in child nutrition was not investigated in this study. Since about half of the caregivers did not know the quantity of food for children in the different age groups this shows poor monitoring of a child's intake at caregiver level. This could be leading to underfeeding of children explaining why these children have stunting. This is important because children can only eat a particular amount of food relative to their age and stomach size,(WHO,& UNICEF, 2006). Furthermore inadequate quantity of food has been identified as one of the causes of malnutrition in Kenya, (MIYCN Guidelines, 2013&WHO,& UNICEF, 2006).

Intake of varied foods ensures supply of different nutrients to a child. Caregivers were aware of the different food groupings a child should consume. Carbohydrate rich foods had the highest score while animal source were least mentioned with eggs scoring least. Although egg have been found to supply high quality protein as they contain high levels of essential amino acids, B vitamins, iron, selenium and zinc, it is fed less to children due to allergy concerns, (Shapira., 2009). Despite this concerns some studies have indicated early introduction of eggs in children 6-9 months in a randomized control trial showed no signs of instant allergic reaction and there was improved length in those who were given one egg per day compared to those who did not receive eggs, (Lora, et al., 2017). The data on carbohydrates as the main type of foods that caregivers indicated should be fed to children and eggs as the least food to be fed, explains the findings in this study where children consumed more of carbohydrates and less of protein rich foods especially eggs. This gap in knowledge therefore seems to be influencing what children are fed on resulting to stunting as Negash et al. (2015)commented that lack of information on infant and young child nutrition was found to contribute to stunting in children.

Food produced and consumed by families ensures steady supply of nutrients. Most rural families typically produce and consume their own food. However, this study found out that there was no relationship between individual food groups produced and consumed and the dietary diversity score of children, except for milk in the rural area. The significant relationship between milk production and consumption in the rural area indicates that an increase in number of families producing milk could increase milk intake among children. This agrees with a study in Kapseret, Uasin Gishu that found, families who practiced dairy farming gave to their children fresh milk and fermented milk, (Kirui, 2017). Although cow's milk helps fill the calcium nutrient gap for children above six months cow's milk allergy (CMA) is seen in a few children and breastfeeding should be encouraged when no other option is feasible, (Hochwallner, et al., 2014). The age for introduction of cow's milk to children has been suggested to be safe at twelve months of age by some researchers, (Fewtrell et al., 2017)

Investigating relationship between producing a food and consuming it, studies have shown that producing particular foods does not necessarily translate to the same foods being fed to children. But where education on nutrition was given accompanied by messages on types of food crops families should plant, an improvement in growth in height was observed in intervention groups than the control groups, (Kerr, et al., 2010). It is also true in this study where most foods produced were not fed to children. Despite this finding, other studies have shown showed a positive correlation between food crop diversity and dietary diversity even where nutrition education was not conducted,(Kerr, 2016and Herrador, et al., 2014). This means that interventions should be area or region specific to address their specific knowledge gaps.

## **CHAPTER FIVE**

## SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

## **5.1 Summary**

The study on stunting in children less than two years most caregivers were biological mothers with primary level education. Fathers provided food for the households and most were self-employed. Business activities and dairy farming were the most practiced economic activities in urban and rural respectively. Infant and young child breastfeeding practices indicated exclusive breastfeeding was below the national average and mixed feeding was the most practiced mode of feeding in children below 6 months. Cessation of breastfeeding was as early as one year of age. The dietary diversity score for children 6-23 months was low with more than two thirds of the children having a dietary diversity score of less than four food groups. Caregiver knowledge on infant and young child nutrition was good for children 0-5 months but aspects of complimentary feeding as timely introduction of complimentary foods, meal frequency and variety of foods. There was no association between the number of food group produced and consumed in both rural and urban areas. Production of milk in rural areas was positively associated with milk consumption by stunted children

## **5.2 Conclusion**

The findings on stunting in children less than two years indicate most stunted children received less diverse foods and exclusive breastfeeding rates were low. Stunting was also observed in children less than six months. This can be linked sub optimal breastfeeding that was observed in this study and possible maternal factors not investigated in this study. Knowledge on quantities and frequencies of foods was low suggesting no or poor monitoring of sufficient food intake by the caretakers.

Furthermore, provision of food by father could be low due to other responsibilities and female support in family provision would improve a family's dietary diversity score. Dairy farming and business were the most practiced income generating activities. Since there was no significant relationship between foods produced and consumed by stunted children in rural, families could be getting foods from other sources such as food markets.

## 5.3 Recommendations

Findings from this study on stunting in children less than two years shows stunted children received suboptimal nutrition. This was observed from both farming and non-farming households in rural and urban areas. The study suggests the following measures to address the above issues:

- 1. Since most caregivers were children's biological mother's therefore community involvement in women empowerment projects to help women contribute to household food provision would improve child nutrition.
- 2. Health workers, community health volunteers, caregivers and should be educated on child nutrition. Education should also address complimentary feeding practices, how to achieve a dietary diversity score of at least four through sample menu preparation using available local foods. This will help the county to achieve SDG 2 that targets good nutrition for all.
- 3. Promotion of exclusive breastfeeding and continued breastfeeding of children to at least 2 years of age. Gaps in caregiver practices on feeding children 0-23 months should be identified since most caregivers they were knowledgeable on feeding children in this age group.

4. The ministry of agriculture in collaboration with ministry of health should promote growth of variety of foods in rural areas and promote use of homegrown foods for complimentary feeding. This will ensure food security aspect of ensuring food is available is met in line with the big four agenda of achieving food security and nutrition for all Kenyans.

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#### **APPENDICES**

## **Appendix i: Consent explanatory form**

I am Nancy Mdoga Imali, a Masters student in Human Nutrition and Dietetics at Kabarak University. I am carrying out a research that will help inform better how feeding of children should be improved in our county. Whenever a research on children is done, researchers talk to caretakers about the research and seek permission to get information from the children. I will explain the details of the study and afterwards if you agree with the study I will your daughter or son for their permission before I begin.

You do not have to participate in the study today, you can take your time and call us when you are ready within this the specified time we will give you. You are free to talk to anyone about your participation and you are free to withdraw from the study at any point. We have selected this child because he/she is short for their age and is still in the age range where growth in required height can be achieved. There may be some words that you do not understand. Feel free to ask me to stop and explain any information and I will take time to explain.

A child's growth includes increase in weight, height. The study wants to identify what issues can hinder this growth and suggest to the caretakers and leaders the best way to ensure children grow well. This study involves checking how tall your child is in comparison to their age. Because the child is below two years, he/she will lie flat on the board with numbers. To make the child more comfortable your will firmly hold the head and look at him/her so that your child is reassured. I will hold the lower legs firmly and move the sliding board so that till it sits firmly on the feet of the child.

Afterwards I will ask you questions about the foods you fed the child in the last 24 hours, and when you do not remember or the child was left in the care of someone else we will give you time to enquire. If you practice farming, we will ask you to list for us the types of food you grow and which foods from your farm are eaten by your child and also sold. We will also ask questions about the things you own as land, livestock, houses and your source of income. If you wish not to answer some of the questions, you are free to ask us to skip. This will take approximately 15 minutes and we are asking you about 15 minutes of your time. Incase anything comes up that requires your urgent attention we will allow you to attend to it then we continue.

The child could cry or feel uncomfortable when put on the board and will need you to reassure them by holding their head and looking into their eyes. You may feel uncomfortable giving us information on how you feed your child if you personally feel you have not met the standards. You may also not feel secure giving us information on your assets and income. However, we will not share this information or identify you as the source of the information. There will be no benefits immediately to you or your child, but your participation will help us to find out why some children are short than children of their similar age. There will be no payments or gifts given for your participation but your involvement.

Appendix ii: Informed consent form

Stunting in Children less than Two years in Rural and Urban Households in

Turbo Sub County, Uasin Gishu County

Nancy Mdoga Imali

P.O Box 33037-30100

Eldoret.

Mobile no. 0724 830 837

Email: 4819nancy@gmail.com

I am Nancy Mdoga Imali, a student of Masters of Science in Human Nutrition and

Dietetics Kabarak University. I am conducting a study on stunting in Turbo Sub

County, Uasin Gishu, in children less than 2 years. You are requested to be a

participant in this study. Your participation in this study will be voluntary and if you

wish to withdraw from this study at any time, it will not affect in anyway how we

offer health services to you.

This study will be carried out in selected villages from two wards in Turbo Sub

County of Uasin Gishu County. If you decide to participate in this study, it will

involve taking your child's height I will ask questions about his/her feeding from

yesterday during the day and night. We will also ask questions about your knowledge

on child nutrition, crops planted if you practice agriculture and your socio economic

status.

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This study does not inflict on you and the child at any bodily harm. There are no incentives or payments for your participation. Kabarak University Institutional Review and Ethics Committee has approved the research.

If you have any questions about the res	search call, Nancy	Mdoga Imali a	nt 0724 830
837.			
Participants	Sign	Da	te//

# **Appendix iii: Assent form**

I am Nancy Mdoga Imali. I am doing a study that involves taking your height, and finding out what foods you have eaten in the last 24 hours. I will also inquire about the foods planted by your caretakers. Taking height is simple, quick and it does not hurt. Taking measurements will require you to lie down firmly on this height board and we measure how tall you are.

Your participation in this study is voluntary and you can stop any time you want. There are no rewards and gifts given for participating. The information we get from you will not be shared by anyone else.

Name of witness	
Signature of witness	Date

Declaration by researcher: I have explained verbally all that is involved in this research and I believe the participant has understood the explanations

# Appendix iv: Researcher administered questionnaire

## **Identification Information**

Respondent	R//
Code	
Interview	//
date	
Administrativ	Ward
e Division	
	Unit
	Village

## Introduction

You have been selected to participate in the research on stunting in children less than two years in a food secure county: a study of Uasin Gishu, Kenya. Imali Nancy Mdoga is carrying out this study with permission from Kabarak University Ethics and Review board. It is part of the fulfilment for the attainment of Masters of Science in Human Nutrition and Dietetics. Although your participation is voluntary, it is important for the purpose of the study that you answer all questions. Thank you for accepting to participate in this study.

## **Demographic information**

Chi	ld Information					
1	Child's sex	Male[]	Female[]			
2	Child age		Months	0-1[] 2-3[]	4-6[]	6-11[]

3a	Child's height		• • • • •	cm						
	(cm)									
С	HAZ score		• • • • •	••••						
Cai	retakers informati	ion								
4	Residence	Urban [	]	Rura	1[]					
5	What is your age	in years:	[	]						
6	Highest level of		N	lone []	Primary	[] S	econd	ary [	] Co	llege [ ]
	education									
7	What is your ethn	ic		[		• • • • • • • •	]			
	background									
8	Religion Christi	an [ ] N	Iusli	m [ ] Ot	her					
	[		• • • • •			]				
9	Number of persor	ns per			persons					
	House Hold									
10	What is your relat	tionship					•••••		• • • • • • • •	
	to child?									
Тур	pes of food									
No	Questions (Foods	s eaten ye	stero	lay durin	g the day	or	Yes	No	DK.	Skip
	night)									
11	Has the child eve	r been br	eastf	ed?			[]	[]	[]	If no
										go to
										12b

(months)

12-17[]

18-23[]

[]

12a Was the child breastfed yesterday day or at night?

b	Sometimes babies are fed breast milk, by spoon, cup	[]	[]	[]	
	or bottle when the mother is away from her baby.				
	Sometimes babies are breastfed by another woman, or				
	given breast milk from another woman by spoon, cup				
	or bottle or some other way. This can happen if a				
	mother cannot breastfeed her own baby. Did the child				
	consume breast milk in any of these ways yesterday				
	during the day or at night?				

No	Question	(tick as it may apply)				
13	Next I would like to ask you about some				How many	
	liquids that the child may have had yesterday				times yesterday	
	during the day or at night. Did the child have				during the day	
	any (ITEM FROM LIST)?: (Read the list of	Yes	No	DK	or at night did	
	liquids starting with 'plain water)				for question b, c,	
					and f	
a	Plain water?	[]	[]	[]		
b	Infant formula such as [insert local	[]	[]	[]	b. Times	
	examples]?					
С	Milk such as tinned, powdered, or fresh milk?	[]	[]	[]	c. Times	
d	Juice or juice drinks?	[]	[]	[]		
e	Clear broth?	[]	[]	[]		
f	Yoghurt?	[]	[]	[]	f.	
					Times	

g	Thin porridge?	[]	[]	[]				
h	Any other liquids as (list)	[]	[]	[]				
14	Questions	l	1	l	]	Yes	No	DK
a	Porridge, bread, rice, noodles, or other foods ma	de fro	n grai	ns		[]	[	[]
							]	
b	Pumpkin, carrots, squash, or sweet potatoes that	are ye	llow o	r		[]	[	[]
	orange.						]	
С	White potatoes, white yam, cassava, or any other	r foods	made	from		[]	[	[]
	roots						]	
d	Leafy dark green vegetables ()					[]	[	[]
							]	
e	Ripe mangoes, ripe papayas, or (insert other loc	cal vita	amin /	A-rich	1	[]	[	[]
	fruits)						]	
f	Other fruits and dark green vegetables					[]	[	[]
							]	
g	Liver, kidney, heart, or other organ meats					[]	[	[]
							]	
h	Any meat, such as beef, pork, lamb, goat, chicke	en, or c	luck			[]	[	[]
							]	
i	Eggs from different birds					[]	[	[]
							]	
j	Fresh or dried fish, shellfish, or seafood					[]	[	[]
							]	
k	Any foods made from beans, peas, lentils, nuts,	or seed	ls			[]	[	[]

			]	
1	Milk products as yogurt, cheese, others	[]	[	[]
			]	
m	Any oil, fats, or butter, or foods made with any of these	[]	[	[]
			]	
n	Any sugary foods: chocolates, sweets, candies, pastries, cakes,	[]	[	[]
	biscuits		]	
0	Condiments for flavour, such as chillies, spices, herbs, or fish powder	[]	[	[]
			]	
p	Grubs, snails, or insects	[]	[	[]
			]	

# **Knowledge on infant and young child nutrition** (this section applies to what they know about child feeding)

No	Questions	Yes	No	DK
15	What foods should be given to a child less than 6 months			
a	Breast milk only	[]	[]	[]
b	Breast milk plus other foods	[]	[]	[]
С	Other foods	[]	[]	[]
16	When should initiation of breastfeeding begin after delivery			
a	Within 1 hour after birth	[]	[]	[]
b	Until mother's milk comes (any time milk comes)	[]	[]	[]
17	At what age should other food be introduced?	[]	[]	[]
a	At six months	[]	[]	[]

b	Less than six months	[]	[]	[]
c	More than six months	[]	[]	[]

18. How much food and frequency should be given to children (use a home measure to estimate)

	Age	Amount(250ml	DK	Number of times	DK
		cup)			
b(i)	6 to 8 months			b(ii)	
	9 to 11 months			c(ii)	
c(i)					
d(i)	12 to 23 months			d(ii)	

19. What types of food should be fed to children 6 -23 months? (List mentioned foods in appropriate food group)

	Type of Food	List
a	Animal meats	
b	Plant protein	
	(pulses)	
С	Milks	
d	Fruits	
e	Vegetables	
f	Carbohydrates	
g	Eggs	

# Family socio economic status

20a	Who provides food for the family	Mother []	Father []	Other [	Don't know
	(tick)			]	[]
b	If mother what kind of	[]	[] Self	[]	[]
	economic activity is she	Employed	employed	Farmer	Other (List)
	involved in (tick)				
С	If father what kind of economic	[]	[] Self	[]	[]
	activity is he involved in (tick)	Employed	employed	Farmer	Other (List)
d	If other what kind of economic	[]	[] Self	[]	[]
	activity is he/she involved in	Employed	employed	Farmer	Other (List)
	(tick)				

				•	T.
			Yes	No	Skip
21a	Do you live in your own house		1[]	2[]	If no go to 21b
	Have you rented the house	you live in	1[]	2[]	If no go 21c
b					
С	Has it been lend to you to li	ive in without	1[]	2[]	
	paying				
22	Do you have any of these	a. Rentals	1[]	2[]	
	that generate income?	b. Dairy	1[]	2[]	
		c. Business (any	1[]	2[]	
		type)			
23	Savings can be in different forms, money,		1[]	2[]	
	insurance, property. Do you have any?				
24	Do you own land?		1[]	2[]	

Do you practice farming?		2[]	If yes (go to
			26)
J	o you practice farming?	o you practice farming?	o you practice farming?

# Foods types produced

26	How many acres of land do you plant	<5[]	5-10[]	>10 [ ]
	crops?			

27. Can you tell us the foods you produce on your farm? (List in the appropriate food group)

	Food type	List
a	Cereals	
b	Nuts and pulses	
С	Vegetables	
d	Eggs	
e	Chicken	
f	Milk	
g	Fruits	
h	Root and tubers	
i	Any other	

Thank you for taking part in this research.

# **Appendix v: Introductory letter**



# INSTITUTE OF POST GRADUATE STUDIES

Tel: 0773265999

Fax: 254-51-343012

www.kabarak.ac.ke

Private Bag - 20157 KABARAK, KENYA E-mail: directorpostgraduate@kabarak.ac.ke

12th July, 2018

Ministry of Higher Education Science and Technology, National Council for Science, Technology & Innovation, P.O. Box 30623 - 00100,

Dear Sir/Madam,

# RE: RESEARCH BY IMALI NANCY MDOGA-GMND/M/1664/09/16

The above named is a student at Kabarak University taking Masters Degree in Science in Human Nutrition and Dietetics. She is carrying out research entitled "Stunting in Children Less than Two Years in Food Secure County: A Study of Uasin Gishu Kenya."

The information obtained in the course of this research will be used for academic purposes only and will be treated with utmost confidentiality.

Please provide the necessary assistance.

Thank you

BARAK UNIVERS

WOUNTSTANDINGSTON 9 n AUG 2018

Dr. Betty Tikoko

DIRECTOR - (POST GRADUATE STUDIES)

Kabarak University Moral Code

As members of Kabarak University family, we purpose at all times and in all places, to set apart in one's heart, Jesus as Lord. (1 Peter 3:15)



Kabarak University is ISO 9001:2015 Certified

# Appendix vi: IREC letter



## KABARAK UNIVERSITY

## INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE

P.O. Private Bag – 20157 Kabarak M: +254 724 887 431 F: +254 51 343 529 www.kabarak.ac.ke/irecsecrétariat.html E: irecsecretariat@kabarak.ac.ke

7th August 2018

Reference: KABU01/IREC/003/VoL1/2018
Formal Approval Number: KABU/IREC/009

Ms Nancy Imali Mdoga Reg GMN/M/1664/09/16, Department of Human Nutrition and Dietetics School of Medicine and Health Sciences, Kabarak University

Dear Nancy

## FORMAL APPROVAL OF RESEARCH PROPOSAL

The Institutional Research and Ethics Committee reviewed your research proposal titled:

"Stunting in children less than two years in food secure county: A study of Uasin Gishu, Kenya."

Your proposal has been granted a Formal Approval Number: **KABU/IREC/009** on 6<sup>th</sup> August 2018. You are therefore permitted to start your study.

Note that this approval is for 1 year, it will thus expire on 6<sup>th</sup> August 2019. If it is necessary to continue with this research beyond the expiry date, a request for continuation should be made in writing to KABU IREC secretariat two months prior to the expiry date.

You are required to submit progress report(s) regularly as dictated by your proposal. Furthermore, you MUST notify the committee of any proposal change(s) or amendment(s), serious or unexpected outcomes related to the conduct of the study, or study termination for any reason. The committee expects to receive a final report at the end of the study.

ours faithfully

Prof. Wesley Too, PhD, MPH

Chairman, Institutional Research and Ethics Committee.

C.C: Registrar- Academic Affairs and Research
Dean School of Medicine and Health Sciences
Director, Institute of Post Graduate Studies

KABARAK UNIVERSITY
INSTITUTIONAL RESEARCH ETHICS COMMITTEE

0 7 AUG 2018

P 0. PRIVATE BAG - 20157, KABARAK

## Kabarak University Moral Code

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Kabarak University is ISO 9001:2015 Certified

# Appendix vii: NACOSTI permit



# NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone:+254-20-2213471, 2241349,3310571,2219420 Fax:+254-20-318245,318249 Email: dg@nacosti.go.ke Website: www.nacosti.go.ke When replying please quote NACOSTI, Upper Kabete Off Waiyaki Way P.O. Box 30623-00100 NAIROBI-KENYA

Ref: No. NACOSTI/P/18/82354/25274

Date: 3rd November, 2018

Nancy Imali Mdoga Kabarak University Private Bag - 20157 KABARAK.

## **RE: RESEARCH AUTHORIZATION**

Following your application for authority to carry out research on "Stunting in children less than two years in a food secure County: A study of Uasin Gishu, Kenya" I am pleased to inform you that you have been authorized to undertake research in Uasin Gishu County for the period ending 1<sup>st</sup> November, 2019.

You are advised to report to the County Commissioner and the County Director of Education, Uasin Gishu County before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

BONIFACE WANYAMA

FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner Uasin Gishu County.

The County Director of Education Uasin Gishu County.

National Commission for Science. Technology and Innovation is ISO9001:2008 Certified