FACTORS ASSOCIATED WITH UNDER NUTRITION AMONG CHILDREN UNDER FIVE YEARS (6-59) MONTHS IN NGORONGORO DISTRICT, ARUSHA REGION

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MSc. (Applied Epidemiology) Dissertation

Muhimbili University of Health and Allied Sciences

October, 2017

Muhimbili Universityof Healthand Allied Sciences

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By

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A Dissertation/Thesis Submitted in (partial)Fulfillment of the Requirement for the Degree of Master of Science (Applied Epidemiology) of

Muhimbili University of Health and Allied Sciences

October, 2017

CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Science a dissertation entitled**, *Factors associated with under nutrition among children under five years (6-59 months) in Ngorongoro district, Arusha region***in (partial) fulfillment of the requirement for the degree of Master of Science Applied Epidemiology of Muhimbili University of Health and Allied Sciences

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Date …….

DECLARATION AND COPYRIGHT

I, **Ester Mdimu** declare that this **dissertation** is my own original work and that it has not been presented and will not be presented to any other university for similar or any otherdegree award.

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ACKNOWLEDGEMENT

This work would not be successfully accomplished without the help and blessings from the Almighty God. I have the honour to pay tribute to Him for his kindness and blessings.

My extraordinary gratitude is articulated to my supervisor, Dr. Germana Leyna whose tireless efforts and support, patience, commitment and professional guidance during the design, implementation and writing of this dissertation can never be overlooked. I thank her for contribution and constructive criticism, which made this work the way it appears.

Special appreciation is also expressed to Dr. Ahmed Abade, FELTP resident advisor for his professional advice from the proposal development, data collection, analysis and final report writing.

I am also deeply grateful to the Tanzania Field Epidemiology and Laboratory Training Program (TFELTP) under the Ministry of Health, Community Development, Gender, Elderly and Children for sponsoring my training and funding this dissertation.

Much gratitude to the School of Public Health and Social Sciences for accepting this work to be done as part of fulfillment of the Masters of Science in Applied Epidemiology degree. I also appreciate the assistance from all members of staff who directly or indirectly supported me during my two years study.

I also appreciate the research assistants for their tireless effort in collecting the study data, which forms the backbone of the whole research project.

Lastly but not least I am intensely grateful for the support and assistance from my colleagues in the Applied Epidemiology and Laboratory Management Training Course cohort 8 during the entire course.

DEDICATION

To my lovely family,

Mr. Samweli Eliezery - my husband and my lovely children, **Ebenezer and Penuel Samweli** for their understanding and patience all the time. Also to man of God prophet **KINUNDA BN.** and his wife **Amabilis** for encourages and prayers. Lastly I would like to dedicate this work to my parents my father **Thomas Lucas** and my lovely mother **Cecilia Raphael** who have always inspired me in education.

Thank you all.

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ABBREVIATIONS

ARIs	Acute respiratory infections
BCG	Bacille Calmette-Gue-‘rin
BMI	Body mass index (kg/m²)
$DHIS_2$	District Health Information System2
FAO	Food and Agriculture Organization of the United Nations
FP	Family Planning
GDP	Gross Domestic Product
LBW	Low Birth Weight
MOHCDGEC	Ministry of Health, Community, Development Gender, Elderly, and Children
MUAC	Mid-Upper Arm Circumference
NBS	National Bureau of Statistics
NGOs	Non-Governmental Organizations
RCHS	Reproductive and Child Health Section
SD	Standard Deviation
TDHS	Tanzania Demographic and Health Survey
UNICEF	United Nations Children’s Emergency Fund
WHO	World Health Organization

OPERATIONAL DEFINITION OF TERMS

Malnutritionrefers to deficiencies, excesses or imbalances in intake of energy, protein and/or other nutrients. Contrary to common usage, the term ′malnutrition′ correctly includes both

Under nutrition and over nutrition

Under nutrition will be defined using the World Health Organization anthropometric indicators as follows:

Stunting: Height-for-age Z-scores (HAZ) reflects linear growth and is used to describe long-term nutritional status. In our study stunting will be defined as HAZ < -2 Z-scores.

Underweight: Weight- for –age Z-scores (WAZ) represent a global measure of weight loss, commonly defined as WAZ<-2Z-score

Wasting: Weight-for-height Z-score (WHZ) reflects currents nutritional status thus. Measures degree of thinness to a child. Wasting will be defined as WHZ < -2 Z-scores.

A Z-score (or standard deviation score) is an international reference used to measure growth in children based on height and weight of the child.

Complementary feeding is when a child starting other foods and liquids instead of breast milk alone to meet nutritional requirements of infants after 6 months of life

Exclusive breastfeeding is when a child feed breast milk alone, no other food or drink, not even water, except breast milk for the first 6 months of life

Weaning is when a child stops breastfeeding and involve in adult diet minimum age are 24 months of age

ABSTRACT

Background: Childhood under-nutrition isa multi-dimensional problem in developing countries, where inappropriate child caring and feeding practices have been strongly associated with it. In spite of the huge Government investments to reduce childhood under-nutrition, Ngorongoro district still prevalence of under-nutrition in children under-five years of age is fluctuate. This study aims to identify factors associated with under-nutrition in children under-five years of age in Ngorongoro district, Arusha region.

Methodology:Hospital-based unmatched case-control study was conducted from 22 march to 25 April 2017 .Cases are all children aged 6-59 months with under nutrition by WHO anthropometric indicators of weight-for-height < -2SD or weight-for-age < -2SD or height-for-age < -2SD or MUAC <12cm, and simple randomly sampling was used to **select the case.** Controls were children within the normal range, were selected systematic. Ethical clearance was obtained from the Muhimbili University of Health and Allied Sciences Institutional Review Board. Mother/caregivers gave informed consent before the study. Structured questioner and anthropometric measurement was used to collect the data moreover Epi-info version 3.5.1 was used to analyze the data.

RESULT: 400 (100 cases and 300 controls) were recruited into the study. Under-nutrition was associated with young age of mother/caregiver (aOR=38.8, 95% CI: 15.38-98.03); early age of initiation of complementary food (aOR=13.6, 95%CI: 3.15-59.06);a child having diarrhoea in past one month (aOR = 4.8; 95%CI: 1.76-12.85); a large family size (aOR = 6.0, 95% CI: 2.16-16.90); frequency of feeding per day (aOR= 3.9, 95%CI: 1.59-9.58); low birth weight (aOR= 7.3, 95%CI: 1.15-46.70); well (aOR=16.3, 95%: CI: 1.85-147.05) or surface such as dams, livers and lakes (aOR=16.2, 95%CI: 1.85-141.71) as a source of drinking water.

CONCLUSION: Household, individual characteristics of child and mother/caregiver are important predictors of under-nutrition in this community. Interventions should be designed to address these factors to mitigate and eliminate childhood under-nutrition in Ngorongoro.

Keywords: Under nutrition, Children, Under-five, Factors, Tanzania

CHAPTER ONE

1.0 INTRODUCTION

1.1 Back ground

Insufficient balanced diet leads to under nutrition, this condition occurs when the body receives inadequate nutrients, under-nutrition is one of the leading causes of morbidity and mortality in children below five years of age particularlyin developing countries (1,2). Children under-five years of age were the most vulnerable because of their high nutritional requirements for growth and development as well as immunity building (2,3).

Globally in 2015, about 162 million children under-five years of age were stunted, 99 million underweight, 51 million wasted. Between 8 to 11 million children under-five years of age die each year and more than 35% of these deaths were attributed to under-nutrition, these deaths were mostly preventable through economic development and public health measures translating into the unnecessary loss of about 3 million young lives a year (3,4)

Under-nutrition had long been the main concerned in developing countries where one in every fourth child was considered to malnourished this created a potentially lethal cycle of worsening illness and deteriorating poor nutrition.(3). In Tanzania, stunting, underweight, wasting and micronutrient deficiency disorders like iron deficiency anaemia, and goitre were among the major nutritional problems affected children under-five years. In 2015 it was estimated that about 42% of children were stunted, 16% were underweight and 5% were wasted (2,5)

There are many factors contributed to malnutrition in children under-five years of age, but these factors vary from one country to another. The most mentioned factors were those related to inadequate diet, inadequate water supply, and inadequate hygiene as well as sanitation practices (6) . Furthermore poor maternal nutrition, low birth weight may lead to stunting and other forms of under-nutrition. Resistance infection such as ARIs**,** urinary tract infection**,** diarrhea,and malaria can occur in early stage for the child Under-nutrition. (3)Children who were under nourished have a greater than nine-fold increased risk of dying compared to a well-nourished child. Under nutrition also decreases mental development including inadequate cognitive achievement.(7–9)

A Z-score (or standard deviation score) is an international reference used to assess growth in children based on weight-for-height wasting, height-for-age stunting and weight-for-age under weigh of the children as expresses the anthropometric it's used to value children growth and nutritional status. Z-score as an index of severity for health and nutrition problems results in increased awareness that, if a condition is severe, an intervention is required for the entire community. Z-score used to classify level of under nutrition. Children with<-3 z-score for severe under nutrition,<-2 Z-sore acute under nutrition and >-2 Z-score normal (10).

In order to reduce under-nutrition for children under-five years old many strategies are needed to be implement based on SDGs goals especially those supported with health-related, public awareness on practices of food preparation for infants and children under-fives years of age and better nutritional education may contribute to reducing the problem (11).

Other strategies that have been introduced include "breastfeeding week" to promote early initiation of Breast-feeding (within one hour of birth) and continued exclusive breast feeding for six months. Birth interval and use of family planning are emphasizing so as mother to got a chance for caring the baby at least for two years. Also immunization for children under five years is important for building immunity and to prevent diseases that may result in under-nutrition (10,11)

.

1.2 Problem statement

Globally the prevalence of under nutrition is 35% with variations across regions and countries, but concentrated in developing countries. Tanzania is among developing countries reported to have a high prevalence of under-nutrition. In Tanzania demographic health survey 2015 estimated the prevalence of under-nutrition was about 42% with geographical variations across regions and districts in the country. Many strategies have been introduced and implemented to reduce the prevalence of malnutrition in children including health education on exclusive breast-feeding, immunization and public deworming campaigns

However, under nutrition among under five children still persists in certain areas in the country. Ngorongoro district located in Arusha is one of the districts described as having a high prevalence of under-nutrition. According to the district DHS2 records of January to September 2016 there was 50% increase in cases of under-nutrition in children under five years of age in the district (from ten to fifteen per month). This rate was higher than what has been reported in other regions.

Therefore, this study aims to identify the factors associated with under-nutrition among children under-five years of age in Ngorongoro district.

1.3 Rationale of the study

The results obtained from this study will help Ngorongoro community to develop strategies to address the problem of under-nutrition among children under-five years of age. Also the information will support the local Government to re-think and prioritize strategic areas that need extra attention to reduce the number of children with under-nutrition in their community.

The findings will empower members of the community and the health management team and hospital staff with evidence to advocate and lobby for more resources, as well as intensify screening and health education to reach all the community members especially those with children under-five years of age. More attention will be paid to assessing routine growth and development data of children to monitor and evaluate progress of interventions introduced or rolled out in the district.

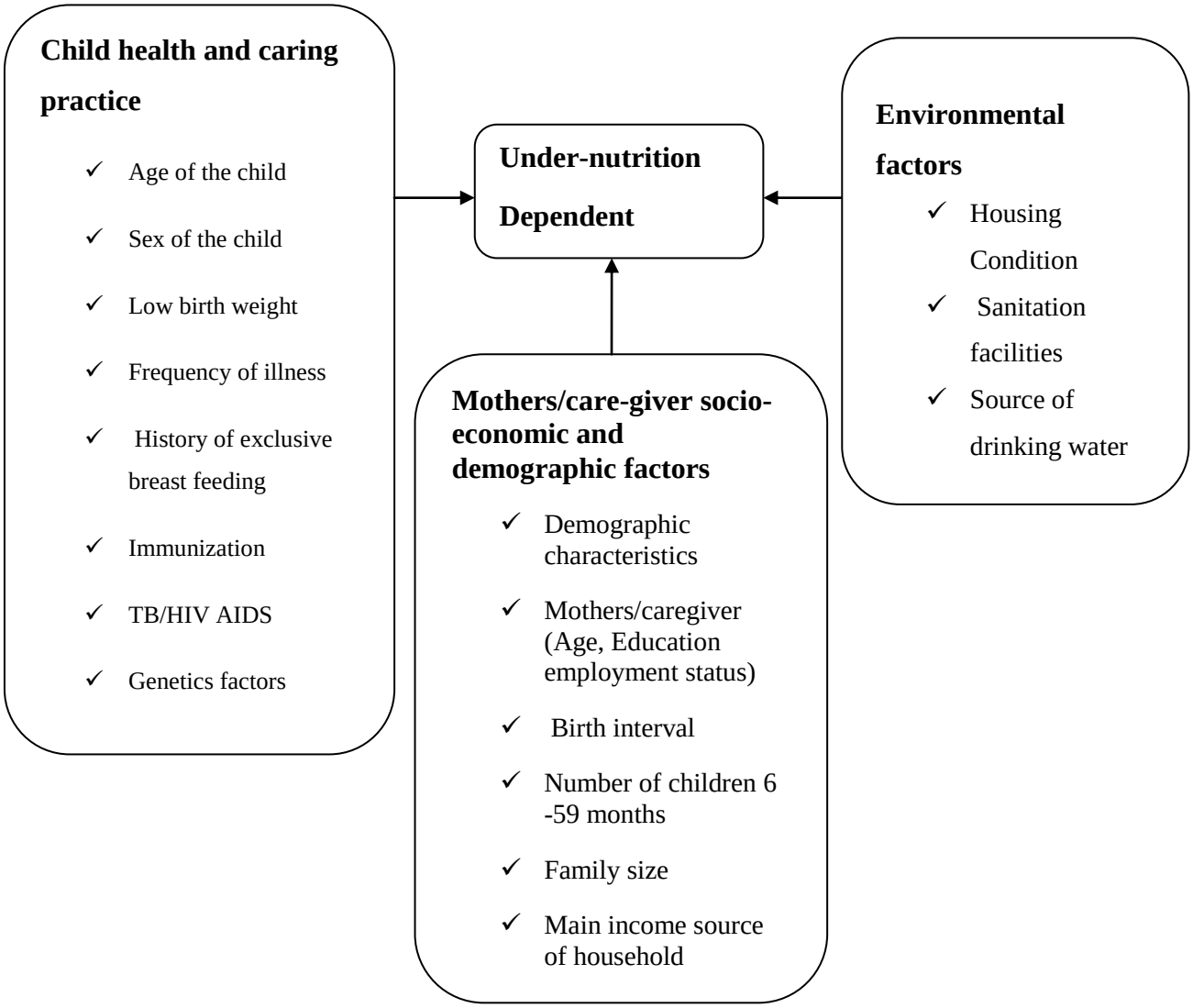


Fig 1:- Conceptual framework of factors contributing to under-nutrition

This framework, developed by UNICEF, under nutrition among children under five years followed on none communicable diseases model with three potential factors. First child health and caring practice based on inappropriate dietary intake, frequency of illness and low birth weight this are possible leads to under nutrition. Secondly is environmental factors base on insufficiency of safe drinking water and inadequate cleanness of sanitation in house hold this is probable causes of under nutrition for children under five. Third is socio-economic and demographic factors this include large family size of family, young age of mothers/caregiver and main income source of household also is a possible**.**(19,20)

1.4 Research questions

1. What are the socio-economic factors associated with under-nutrition among children under-five years of age living in Ngorongoro district, Arusha region.

2. What are the child-care practices contributing to under-nutrition among children under-five years of age living in Ngorongoro district, Arusha Region.

3. What are the environmental factors associated with under-nutrition among children under-five years of age living in Ngorongoro district, Arusha region.

1.5 Objectives of the Study

1.5.1 Broad objective

To determine factors associated with under-nutrition among children under-five years of age living in Ngorongoro district, Arusha Region.

1.5.2 Specific objectives

1. To assess the socio-economic factors associated with under-nutrition among children under-five years of age living in Ngorongoro district, Arusha region.

2. To identify child-care practices associated with under nutrition among children under-five of age living in Ngorongoro district, Arusha region.

3. To determine environment factors associated with under-nutrition among children under-five years of age living in Ngorongoro district, Arusha region.

CHAPTER TWO

2.0 LITERATURE REVIEW

Inadequate macronutrients and micronutrients in children under five years was the one of the most serious health problems in the world.The burden was varied from one county to another country although most was occurred in developing nations.(2,5)In 2015 under nutrition in children under five years of age contributed to over two-third of deaths for children in this age category.In developing countries nearly one-third of children were underweight or stunted.(2,6,8) In India out of 150 surveyed children, 46% were underweight, 52% were stunted and 20.7% were wasted.(10). Similar findings had been reported in Africa; for instance a study done in Ghana on Nutritional status of children 6–59 months in selected intervention communities from the Africa rising project in 2012 revealed stunting, underweight and wasting were 27.2%, 17.6% and 8.2%, respectively (10), while in Nigeria among settled pastoral communities38.7% of surveyed children were stunted, 38.7% underweight and 13.6% wasted (12).'

In East Africa under nutrition in children under five years of age can be contrasted from county to county .For example , in Kenya 48% of children under-five years of age were stunted while there with big differences between one districts and another. Busia District had 42% stunting, while Kisumu District had 33% and Siaya 40%.In Uganda under nutrition also differs from district to district but nationally the range was from 48% to 50% (7,13).Similarly in Tanzania by using the demographic and health survey data of 2005 the national prevalence was decreased to 38% also during 2015 it had increased to 42% this means that variation change in each year(2,3,5)

2.1 Mother/ care giver Socio–Economic and demographic factors

Illiteracy rate was associated with malnutrition Study done in Nigeria shown that those mothers who not complete primary school was associated with under nutrition for their children than those who finished primary school and conclude that lack of education especially among women was a strong determinant of malnutrition among children. Mother education was found to be the most powerful significant factor associated with malnutrition. Thus, up to 90% of the children was whose mothers were illiterate found to be under malnourished.(14,15)

Study done in Nairobi shown that Mothers that had at most primary level of education have 43% of their children stunted compared to 37% for mothers with at least secondary level of education.(16) . Age of mothers also associated with under nutrition, study done in Tanzania shown that stunting was associated with belonging of households where the head of family was young (17,18). Female head households also were more likely to had moderately and mildly stunted children(15).Another study done in southern region Ethiopia identified that Stunting was more common among children born to single mothers and older mothers with 45% and 46%, respectively (19,20)

Birth interval also associated with under nutrition mother who gave birth within two year their children under five had a four time chance to develop malnutrition than those who gave birth with interval of two years. study done in Zambia identify that mother who use family planning method had less likely to had malnourished children than those didn't use.(21). Another studies done in Ghana and Bangladesh explained that use of family planning method it help to reduce number of under nutrition children and mothers who didn't use family plan give birth within two years had a higher risk of their children to develop under nutrition therefore its concluded that mother who used family planning methods had a greater chance to utilize health care services ,better health promoting ,and more child centered caring practice than mothers who did not used a family planning (22,23)

Large family size , polygamous family also contribute to under nutrition for children under five years of age, study done in Nigeria shown that large family size was the main factors for increasing under-nutrition within the family, also family with more than four children area more like to develop under nutrition compared to those families with less children and explained that quality of child care in the presence of many siblings was weaken due to the limited time available for the mothers to give care of each child that leads to under nutrition(12) .Study done in Tanzania reported that households with less than 6 person stunted was 21.6% compared to households with 6 persons or more stunted was 29.9% (24,25)

Income source was important for reducing under nutrition ,families with higher monthly per capital income had significantly lower prevalence of underweight children based on house hold economic, mother control resource, and parent education had high prevention of under nutrition and mothers who educated was less likely to had under nutrition children.study done in Ethiopia showed that under nutrition status for under five of age result was the majority of the mothers/care givers (71.8%) were not employed, as they remained mothers were employed (19,20,26)

2.2 Child health and caring practice

Child health is an important factor associated with nutritional status. Children who suffered from infection had poor intake of food, poor absorption and inadequate nutrients as well as increased frequency of prolonged illness had an increased chances to have under nutrition. Common childhood illness (acute respiratory infections, diarrhoea, malaria, pneumonia and measles) had a nine times more increased chance of suffering from under nutrition. Similar observations had reported for malaria (3,23,25)

Breastfeeding was considered one of the most important interventions to improve child health in the 21st century. The world health organization (WHO) recommends that infants should exclusively breastfed for the first 6 months of life to achieve optimal growth as well as breast feeding should initiated within one hour after birth Inadequate breast feeding practices leads to under nutrition.(4,16,18,27)

Breast feeding play a vital role in child health .Studies had shown that infant weight and height gains during early postnatal life were influenced by breast feeding practices also WHO recommend that during first six months of live the infant need exclusive breast feeding (10). Study observed that children whose breastfeed less than six to eight times per day had higher risk to develop under nutrition, because their body required nutrients through breast feeding (9,18). Complementary feeding should be timely, adequate and consistency so as to reduce the risk of under nutrition, all infants should started received foods in addition to breast milk from 6 months onwards, in this time children under five years of age need to using a variety of foods covered by nutritional, that needed for growing of child (11) . Study shown that in Tanzania complementary foods until six months of age was 37% a lot of children under five of age receive complementary of food

before reach the age of six months and it contributes six times to under gone under malnourish among children under five (2,3,25)

2.2.1 Child demographic characteristics

The age of the child was associated with under nutrition with peek ages described as when the child starts to sit and crawl where they have access to unclean things that may cause diarrhoea which leads to under nutrition. Most studies show that under nutrition was common in children between 6-12 months (57.7%),although the age below 3 months (3-12 months) 60% (28). Sex of the child also contributed to under nutrition for children under five years of age where, male children are more affected with both severe and moderate nutritional problems compared to female children. This might suggest that boys are more vulnerable to health inequities than their female counterparts in the same age groups. Similar observations had been observed in a number of studies from Zambia and Nigeria (12,21)

2.2.2 Immunization

Immunization is the administration of a vaccine to stimulate the body's own immune system to protect the individual against subsequent infections or diseases. In children immunization protected from common childhood diseases such as Diptheria, Pertusis, Tetanus, Polio Hemophilus Influenza (Hib), Hepatitis A, Measles, and Rubella. Unimmunised children were more likely to acquire these diseases and may end up with under nutrition(2,28)

Different studies had consistently found that improving access to immunization services to children under-five years of age can prevent under nutrition as well as have significant impact in preventing these childhood diseases (10)

A study among Nigeria children showed a nine-fold increased to under nutrition for children who did not complete their immunization schedule compared to children who completed it (91.1% vs. 28%). Also Ngorongoro is one of the districts with low immunization uptake (%) due to inadequate knowledge on the importance of child vaccination (3,15)

Deworming

Regular deworming helps mitigate the negative effects of parasitic worms which were endemic in sub-Saharan Africa. A Deworming World Initiative had introduced to eliminate the public health threat of worms in children under five years and those in pre-primary school because they were the most vulnerable groups to get Intestinal worms that lead to under nutrition (28). Mother who attended RCH clinic to assess their child's growth and development also got deworming and other services to their children were less likely to suffer from under nutrition than those who do not attend RCH.(5)

A study done in Kenya showed that hookworms, roundworms, and whipworms were common worms in the children under five of age as a whole, while deworming substantially prevents the transmission of infection, those who were not dewormed were 1.5 times more likely to develop under nutrition compared to those who were dewormed (7,16).

2.3. Environmental factors

Environments were ineffective unless they used effectively. As a result, the absence of proper care of the households and communities was the third necessary element of the underlying causes of under nutrition this means a close link between safe water, sanitation and hygiene. (21). WHO estimates that 50% of under nutrition was associated with diarrhoea and worm infections as a result of unsafe water, inadequate sanitation and insufficient hygiene. Diarrhoea remains the second leading cause of deaths among children under-five globally that link to under nutrition for children under five years old (20,23). Insufficient safe water hygiene practice including ,hands washing practice, house condition and sanitation leads indirect to under nourished among children under five of age, some study suggest that public encouragement on good practice of personal hygiene and proper environment sanitation practices its reduced under nutrition for children under five of age Illnesses also contributed to the high prevalence of malnutrition in Tanzania, which in turn impacts on the growth and development of children .In addition, one-quarter of children under five of age deaths were due to infections, which affected by an unclean environment and poor hygiene at delivery (3,9,29).

Inadequate water supply caused in direct to under nutrition when the mother used more time fetch water instead to care their children, inadequate of water were most in rural areas than urban their fore the under nutrition for under five years old were more like to occur in rural area than urban.(28) . In Tanzania shown that under nutrition for children under five of the ages were most occurred in rural area than urban area, for rural area under nutrition range from 50% up to 45% while in urban area range from 32% up to 19%. Another study done in Tabora explain that inadequate of water supply had associated with non-improve cleanness of latrine facilities in the households as a results leads to water borne diseases last contributed to under nutrition in children under five years of age(2,18,24). Hygiene practice had associated with under nutrition to children under five of the age, the study done in Kenya shown that prevention of under nutrition were associated with good hygiene practice such as hands washing practice, washing of raw food, boiling of drinking water, protected well and use of toilet facilities moreover those who didn't boiling drinking water were 1.5 times to develop under nutrition than those who boiling are drinking and whose family didn't practice hands washing were 1.3 time to develop under nutrition . Another study done in Uganda shows 57% of the households got drinking water from unprotected well, are more risk to undergo under nutrition to their children under five years of age (16,30)

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study area

This study was conducted in Ngorongoro district, which was located in Arusha region, Tanzania. It is one of the five districts of Arusha Region. It borders with Kenya to the North,Monduli district to the East, Karatu District to the South and Mara Region to the West. Ngorongoro district spans an area of approximately 14,036 km^2**.** The district is divided into 3 Division and 20 wards 72 villages (2,31)

The Serengeti Plain and the Ngorongoro conservation area cover a large part of the district, which was also inhabited by wild animals. The district is predominantly inhabited by pastoralists who had a semi-nomadic lifestyle, usually moving in clans from one place to another in search for grazing pastures for their cattle. The district has two seasons - its dry season is in May, November and December and short rains in June - October. It receives an average rainfall per annum of 884.6 mm and temperatures range from 20 to 27 degrees Celsius. The district has a total of 22 health facilities including 2 hospitals, 3 health centres and 17 dispensaries. The average travelling distance to a health facility is 22 km, range: 0 - 162 km (31) Waso hospital is the district hospital which give the health services in all three division which are Loliondo, Sale and Ngorongoro ,including twenty wards and seventy two villages

3.2 Study design

An unmatched case-control study was conducted at the Waso district hospital. A case-control study was selected to assess the cause-effect relationship between selected independent factors and under-nutrition. No matching was done to enable assessment of all factors.

3.3 Study population

The study population was all children under-five years of age (6-59 months) residing in Ngorongoro district. Mothers/caregivers were interviewed as proxies for the enrolled children to provide the needed information. Residence was defined as having a permanent address in the district and having lived in the district for at least the past three months preceding data collection.

3.4. Sample size and sampling method

3.4.1 Sample size

The sample size was computed using Epi info Statcalc 7 software by using case control study Kelsey formula of 2007 with the following explanation below(32).

$$n_1 = \frac{\left[z_{\alpha/2}\sqrt{(r+1)\bar{p}\bar{q}} + z_{1-\beta}\sqrt{rp_1q_1 + p_2q_2} \right]^2}{r(p_1 - p_2)^2}$$

Where:

n_1 = Number of cases

r = Ratio of controls to case 3:1

$\bar{p} = \frac{p_1 + rp_2}{r+1}$ and $\bar{q} = 1 - \bar{p}$

p_1= Proportion of cases exposed, calculated from $p_1 = \frac{p_2(OR)}{1 + [p_2(OR - 1)]}$

p_2= for controls exposed. Children experiencing an illness in the last month who does not have under nutrition was 41.5% (29)

OR= Minimum odds ratio to be detected, 2.0

Z 1-β= Percentage point of the normal distribution corresponding to the (two-sided) significance level, 95%.

$Z\alpha/_2$= One sided percentage point of the normal distribution corresponding to 100% - the power, 80%

N_{Cases} – Sample size for cases using Kelsey formula = 354

$N_{controls}$–Sample size for controls using Kelsey formula = 265

Therefore the computed minimum sample size was 354 (89 Cases and 265 Controls). After adjusting for a 5% non-response the minimum sample size was 384 (96 cases and 288 controls) ~ 100 Case and 300 Control

3.4.2. Sampling technique

Simple random sampling was employed to select children under-five years of age (6-59 months) presenting with signs and/or symptoms of under-nutrition admitted in the pediatric ward or attending RCH clinic at Waso district hospital as cases, while controls were selected using systematic random sampling from the same district hospital. Selection of controls involved a ballot process where a box with folded papers written numbers one, two or three was given to mothers/caregivers with children aged 6-59 months who did not present any signs and/or symptoms of under-nutrition admitted in the pediatric ward or attending RCH clinic to pick one piece of paper. Mothers/caregivers who selected a paper with the number one or three were recruited as controls.

3.4.2.1. Case definition

A case was defined as any child diagnosed with moderate-to-severe under-nutrition according to the WHO anthropometric indicators regardless of the type of malnutrition The indicators used were a z-score < -2SD from the median of WHO reference as described below:

Underweight: weight-for-age z score < -2SD

Stunting: Height-for-age z score < -2SD

Wasting**:** weight-for-height z score < -2SD

Mid-upper arm circumference (MUAC) of less than 12cm

Oedema with any of the above

3.4.2.2. Control definition

Controls were children identified as having a normal anthropometric reading of the above indicators admitted at Waso hospital. Children considered as overweight or obese were excluded.

3.4.2.3 Inclusion criteria

- Children aged 6–59 months
- Resident of Ngorongoro district for the past 3 months
- Mothers/caregivers gave informed consent

3.4.2.4 .Exclusion criteria

Children with critical illness

3.5. VARIABLES MEASURED

3.5.1 Dependent Variable

Under-nutrition - A composite binary variable was created where Anthropometric Z-scores for weight-for-age (WAZ) Z score < -2SD or height-for-age (HAZ) z score <2SD or weight-for-height(WHZ) z score < -2SD and mid upper circumference < 12cmwere calculated on the basis of the WHO growth standards for children,5 year of age.

3.5.2 Independent Variables

3.5.2.1 Child health and caring practice

- ✓ Age of the child (in months)
- ✓ Sex of the child (Male/Female)
- ✓ Frequency of illness (number of episodes in past one month)
- ✓ Exclusive breastfeeding (Yes /No)
- ✓ Age complementary foods were introduce (in months)
- ✓ Deworming status - both ever and current (Yes / No)
- ✓ Immunization status (Never / Incomplete /Complete)

3.5.2.2 Environmental factors

- ✓ Sanitation facilities – Type (categorical) and sharing (Yes/No)
- ✓ Source of drinking water (categorical)
- ✓ Distance to fetch water (in hours)

3.5.2.3 Mother/ care giver socio–economic and demographic factors

- ✓ Age of mother (in year)
- ✓ Educational status (None/primary/secondary +)
- ✓ Mother Employment status (None/petty/business/pastoralists/farmer/house wife/others)
- ✓ Birth interval (in years)
- ✓ Number of under-five children household (number)
- ✓ Family size (Number)

3.5.2.4 Anthropometric measurement

The anthropometric variables used in this study are weight, height and mid-upper arm circumference (MUAC). Weight of a child was measured with minimal clothing and recorded to the nearest 0.1kg using Salter scale (Zhezhong, China).The weight was recorded as soon as the pointer on the scale had stabilized. Height of the child was measured to the nearest 0.1cm with the child in the upward upright position, with legs stretched to a full extent and feet at right angles with legs and for those who could not stand recumbent length of the child on a measuring board was measured. The child's mid-arm circumference was measured to the nearest 0.1cm using a non-stretchable tape placed around the arm at the midway point. Care was taken to make sure that the tape fitted comfortably around the child's arm.

3.6. Data Collection

Mothers/caregivers of eligible children were informed about the study objectives, and a written informed consent sought prior to recruiting their child in the study. A thumbprint was obtained for those who did not know how to write. Face-to-face interviews using an interview schedule were conducted with mothers. Anthropometric measurements were then taken. The questionnaire was developed in English and translated into Swahili then back translated to English to ensure correct transfer of meanings. The Swahili version was used to interview mothers/caretakers of study participants Pre-test was done in Tanga region in January 2017 to test the validity of the questionnaires because that's place I was in regional field for long period from December 2016 to August 2017 **.** Research assistants and the Principal Investigator collected all data for this study. Questionnaires Research assistants and the Principal Investigator collected all data for this study. One-day training

was conducted for the four research assistants recruited. All research assistants were health workers from the study area. The training covered: objectives of the study, data collection and ethical issues. To be selected a research assistant had to have:-

- ✓ Experience in research activities or health interventions in rural areas.
- ✓ Ability to read and write in Swahili
- ✓ Ability to communicate with natives in their local language (Maasai) was an added advantage.

3.6.1 Data management

The principal investigator was responsible for quality checks of all questionnaires. Inconsistencies were identified each day during data collection and if any error or missing information was recorded, immediate follow up were made.

3.6.2 Data analysis

Data was entered, cleaned and analyzed using Epi info version 3.1.5. The graphic work was done using MS Excel. Frequency distribution tables were constructed. The outcome variable under-nutrition in children under-five years was associated with predictor variables (age of the mother/caregiver, age initiation of feeding, low birth weight , diarrhoea disease in the past on month, Home delivered, family with two to three under five children , marital status of the mother /caregiver, level of education of the mother/caregiver, occupation etc.).

In this comparison the measure of association (odds ratio) and its statistical significance were estimated using the Chi-square test at the significant level of 95%. Multivariable logistic regression was performed to identify the significant predictors contributing to under-nutrition while controlling for other factors. During the stepwise modeling for regression analyses, all variables with a p -value ≤ 0.1 in the bivariate analysis were considered for inclusion.

3.7. Ethical consideration

Ethical approval was obtained from the Research and publication committee of Muhimbili University of Health and Allied Sciences. Permission to conduct the study was obtained from the Ngorongoro district Authority, village leader and local tribal

leaders. Participation in the study was voluntary, and every participant was free to withdraw from the study at his/her will without any penalty. A written or thumb print informed consent was sought from all caregivers/mothers. Confidentiality was maintained in the study by assuring that all questionnaires collected were kept in bags and no name of the mother, caregiver, child or any other identifying information on the records of the information were kept together.

3.8. Strengths and limitation of the study

This study is an analytical study that is able to infer causality between studied factors and under-nutrition. However, our results should be considered with the following limitation.

1. **Recall bias**

The participants may have had difficulty to remember occurrence or severity of some of the factors enquired in the study. This bias is likely to be non-differential as both cases and controls were admitted or visiting the health facility for a health reason. The effect of this bias would thus underestimate the association observed. However, question were arranged to stimulate recall and the reference time was reduced to five years.

- **Selection (Berksonian) bias**

All children admitted or visiting the health facility categorized as under-nutrition were recruited. This eliminated traditional sampling bias. However, these cases may not represent experiences of all children with under-nutrition in Waso Hospital at Ngorongoro district, also the information on disease that affected their children in last past month before data collect could be one of hindrance since not all study participants known the disease.

CHAPTER FOUR

4.0 RESULTS

4.1. Demographic characteristics of the study population

A total of 400 children participated in this study about (49%) of cases and controls were boys. Cases (46%) and controls (43%) were children between 12 - 23 months. The median age for cases was 19 months (range: 14-30.3 months) while the median age for controls was 23 months (range: 15-33 months). A significantly smaller proportion of cases were born with ≥ 2.5kgs than controls (cases 71.9% vs. controls 95.3%; p<0.001) while (42%) cases had 3 siblings who were under-five compared to 6.7% controls (p<0.001) **shown in Table 1.**

Table 1: Demographic characteristics of the study population

Demographic characteristics	**Cases (n=100) n (%)**	**Controls (n=300) n (%)**	**P Value**
Sex of the child			
Male	49 (49.0)	147 (49.0)	
Female	51 (51.0)	153 (51.0)	1.0
Age of child in month			
6-11	20 (20.0)	27 (9.0)	
12-23	46 (46.0)	129 (43.0)	
24-35	16 (16.0)	76 (25.3)	
36-47	14 (14.0)	57 (57.0)	
48-59	4 (4.0)	11 (3.7)	<0.001
Child's birth weight if(born at Hospital)			
< 2.5	9 (28.1)	8 (4.7)	
≥ 2.5	23 (71.9)	164 (95.3)	< 0.001
Number of under five children in house hold			
1	4 (4.0)	96 (32.0)	
2	54 (54.0)	184 (61.3)	
3	42 (42.0)	20 (6.7)	<0.001
Children lives with			
Mother and Father	95 (95.0)	262 (87.3)	
Mother only	5 (5.0)	38 (12.7)	0.03

4.2. Socio-demographic characteristics of mothers/caregivers of the study participants

The median age of mothers/caregivers of the respondents was 26 years (range: 17-49 years). Mother/caregivers of cases were younger than those of controls (71%) of cases were 17-22 years compared to only 8.7% of controls; $p < 0.001$. Mothers/caregivers of cases had no formal education than those of control (45% of cases as compared to 39.3% of control). Mother/caregiver of cases was reported less on attaining secondary and tertiary education as compared to control (3% of cases and 21.7% of control). Fathers of cases reported to have no education as compared to control (37% of cases and16.3% of control). Father of cases were less likely to report completed secondary and tertiary education as compared to control (10% of cases and controls 34.3%)**Shown in Table: 2.**

Table 2: Socio-demographic characteristics of mother/caregiver of the study participants

Socio-demographic characteristics	Case (n=100)	Control (n=300)	P Value
	n (%)	n (%)	
Age of mother/caregiver Years			
17-22	71 (71.0)	26 (8.7)	
23-28	26 (26.0)	148 (49.3)	
29+	3 (3.0)	126 (42.0)	<0.001
Husband with more than one wife			
Yes	57 (57.0)	165 (55.0)	
No	43 (43.0)	135 (45.0)	0.73
Married/Cohabiting			
Yes	99 (99)	300 (100)	
No	1 (1.0)	0 (0)	0.08*
Mother/caregiver Education			
None	45 (45.0)	118 (39.3)	
Primary	52 (52.0)	117(42.3)	
Secondary and Above	3 (3.0)	65(21.7)	0.5
Father Education			
None	37 (37.0)	49 (16.3)	
Primary	53 (53.0)	148 (49.3)	
Secondary and Above	10 (10.0)	103 (34.3)	0.5
Mother/caregiver Occupation			
Pastoralist	66 (66.0)	147 (49.0)	
Peasant	23 (23.0)	41 (13.7)	
Others	11 (11.0)	112 (37.3)	0.5
Father Occupation			
Pastoralist	65 (65.0)	76 (25.3)	
Peasant	13 (13.0)	40 (13.3)	
Others	22 (22.0)	184 (61.4)	0.9
Family size			
<7People	11(11.0)	177 (59.0)	
≥ 7People	89 (89.0)	123 (41.0)	<0.001

*Fisher-exact

4:3 Distribution of children according to type of under-nutrition - wasting, under-weight or stunting

Among cases 11 children were stunted only, 14 children were wasted only, and 6 children were underweight only. The rest had more than one type of under-nutrition where 12 children were stunted and underweight; 3 children were stunted and wasted and 52 children were underweight and wasted. There were no children with all three indicators types of under-nutrition i.e. stunting, underweight and wasting at the same time (Figure. 2)

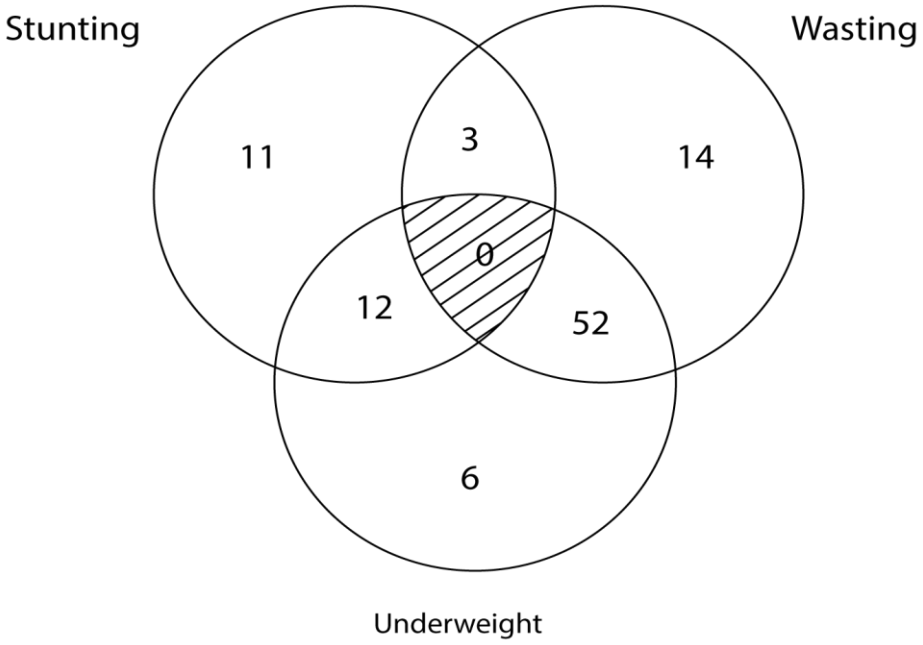


Fig: 2 Venn diagram of the distribution of children according to different types of under-nutrition (wasting, underweight and stunting).

4.4 Child health and caring practices factors

Majority of cases 69 (69%) were delivered at home than controls 114 (47%; p<0.001). All cases (100%) and majority of controls (98%) were not practising exclusive breastfeeding. Majority of cases (93%) and half of control were introduced to complementary feeding at the age of less than four months. About 50% of cases and controls were still breastfeeding during the study. Most cases were weaned ≤ 12 months compared to controls (46% cases and 11.7% controls). More cases significantly reported suffering from pneumonia (56%), diarrhoea (82%) and urinary tract infection (23%) in the past one month compared to 37%, 41% and 14% of controls, respectively. Fewer cases (79%) reported being dewormed over the last three months compared to 92% controls (P<0.001). A family size <7 was reported by 11 (11%) cases and 177 (59%) controls while 89% of cases lived in households with 7 or more members compared to 41% controls (P < 0.001) **(Table 3).**

Table 3: Child Health and Caring Practice factors among cases and controls

Child Health and Caring Practice	Case (n=100)	Control (n=300)	P value
	n (%)	n (%)	
Place of birth			
Home	69 (69.0)	141 (47.0)	
Hospital	31 (31.0)	159 (53.0)	< 0.01
Not practicing exclusive breast feeding			
< 6 months	100 (100.0)	294 (98.0)	
≥ 6 months	0 (0.0)	6 (2.0)	0.15*
Age of initiate complementary feeding (months)			
<4	93 (93.0)	151 (50.3)	
≥4	7 (7.0)	149 (49.7)	< 0.001
Weaning age			
≤12	23 (46.0)	18 (11.7)	
13-23	21 (42.0)	58 (37.7)	
≥24	6 (12.0)	78 (50.6)	<0.001
Still breastfeeding			
Yes	52 (52.0)	152 (50.7)	
No	48 (48.0)	148(48.3)	0.8
Frequency of Feeding			
<6 times per day	71 (71.0)	55 (18.3)	
≥6 times per day	29 (29.0)	245(81.7)	<0.001
Illness in the past one month			
Malaria			
Yes	8 (8.0)	17 (5.7)	
No	92 (92.0)	283 (94.3)	0.5
Pneumonia			
Yes	56 (56.0)	112 (37.3)	
No	44 (44.0)	188 (62.7)	< 0.001
Diarrhoea			
Yes	82 (82.0)	123 (41)	
No	18 (18.0)	177 (59.0)	<0.001
Urinary Tract Infection			
Yes	23 (23.0)	43 (14.3)	
No	67 (67.0)	257(85.7)	0.04
Deworming of the child in last 3month			
Yes	79 (79.0)	277 (92.3)	
No	21 (21.0)	23 (7.7)	<0.001

* **Fisher - Extract**

4.5 Environmental health and sanitation factors

Table 4 summarizes environmental and sanitation factors associated with under-nutrition, in the study. Only 1 case reported using pipe water for drinking compared with 36% controls. Majority of cases (66%) reported using surface water (such as streams, rivers) as a source of drinking Water compared to 40% controls (p<0.001) . More mother /caregiver's of cases (72%) reported Taking 1 hour or more to fetch water compared to controls (32.3%) and (cases 22% vs. controls 52.3%; p <0.001) reported treating water to make it safe . Only one third (35%) of mothers/caregiver's of cases reported having latrine in household compared to 61.7% of controls (p<0.001) as shown in Table 4.

Table 4: Environmental and sanitation factors

Environmental and sanitation factors	**Case (n=100)**	**Controls (n=300)**	**P value**
	n (%)	**n (%)**	
Source of drinking water			
Well	33 (33.0)	72 (24.0)	
Surface water	66 (66.0)	120 (40.0)	
Pipe water	1 (1.0)	108 (36.0)	<0.001
Time for searching a water (in minutes)			
1-30	4 (4.0)	126 (42.0)	
31-59	24 (24.0)	77 (25.7)	
60+	72 (72.0)	97 (32.3)	<0.0001
Do you treat the water to make it safer to drink			
Yes	22 (22.0)	157 (52.3)	
No	78 (78.0)	143 (47.7)	<0.001
Availability of a latrine			
Yes	35 (35.0)	185 (61.7)	
No	65 (65.0)	115 (38.3)	< 0.001

4.6. Multivariate analysis of under nutrition among under five children

Multivariable logistic regression analysis of under-nutrition among under five children was done to all variables that shown significant in bivariate regression. Age of the child, Low birth weight, Place of birth, Number of under five in household, Age of a mother/caregiver, Family size, Age of complementary feeding, Weaning age, Frequency of feeding per day, Pneumonia and diarrhoea disease in last one month before data collection, source of drinking water, unavailability of toilet in household, Untreated drinking water and under five children whose didn't deworming in three month. In the final multivariate logistic regression, the following were identified as factors independently associated with under nutrition among under five.

The odds of under nutrition almost were thirty-nine times more among under five children whose mothers /caregiver had an age of less than 25 years compared to under five children whose mothers /caregiver had an age of 25 years or more (AOR=38.9;95% CI:15.38-98.03, p-value<0.001). The likely hood of under nutrition it's fourteen times more among under five children who had early initiation of complimentary feeding (< 4 months) compared to under five children who had initiation of complimentary feeding at(≥ 4) four months or more (AOR = 13.6; 95% CI:3.15-59.06,p-value <0.01). Under five children who had diarrhoea in the past one month were almost five times more likely to have under nutrition compared to under five children who had no diarrhoea in the past one month (AOR = 4.8;95% CI:1.76-12.85, p value <0.01). Under five children who belonged to families with seven or more people were six times likely to have under nutrition compared to under five children who belonged to families with less than seven people (AOR=6.0:95% CI 2.16-16.90, p-value <0.01). The odds of under nutrition were approximately four times greater among under five children who had feeding frequency of less than six times per day compared to under five children who had feeding frequency of six times or more per day (AOR =3.9,95% CI;1.59-9.58; p value<0.001). The likelihood of under nutrition were seven times more among under five children who born with low weight less than 2.5kg compared to under five children who born with 2.5 kg and above (AOR =7.3; 95% CI: 1.15-46.70, p value < 0.05). The odds of under nutrition were sixteen times to the household use well as a source of drinking water compared to those household use pipe as a source of drinking water (AOR = 16.3; 95% CI: 1.81-147.05, p value < 0.05) . Under

nutrition were sixteen times more to household use surface such as river, dams, as a source of drinking water compared to those household use pipe as a source of drinking water (AOR = 16.2; 95% CI: 1.85-141.71; p value <0.05).**(Table: 5).**

Table 5: Crude and Adjusted Odds Ratios for factors associated with under-nutrition among under-five children

Factors associated with under-nutrition	Number (%)	Adjusted OR (95%CI)
Age of Mother/care giver		
< 25 years	250 (62.5)	38.8*** (15.38-98.03)
≥ 25years	150 (37.5)	1.0
Age of initiated complementary feeding		
< 4months	244 (61)	13.6** (3.15-59.09)
≥ 4 months	156 (39)	1.0
Child who had diarrhoea in the past one month		
Yes	205 (51.2)	4.8** (1.76-12.85)
No	195 (48.8)	1.0
Family size		
≥ 7 people	212 (52)	6.0** (2.16-16.90)
< 7 people	188 (47)	1.0
Frequency of Feeding		
< 6 times per day	274 (68.5)	3.9** (1.59-9.58)
≥ 6 times per day	126 (31.5)	1.0
Birth weight if (born at Hospital)		
< 2.5kg	17 (4.8)	7.3* (1.15-46.70)
≥ 2.5 kg	187 (95.2)	1.0
Well as a source of drinking water		
Yes	105 (26.2)	16.3* (1.81-147.05)
No	109 (27.3)	1.0
Surface such as rivers, dams, lakes as a source of drinking water		
Yes	186 (46.5)	16.2*(1.59-141.71)
No	109(27.3)	1.0

Odds Ratio, *= p < 0.05, ** =p < 0.01,* = p < 0.001 (%) = percentage .C. I. = Confidence Interval**

Adjusted for under nutrition: Age of Respondent, age of initiate complementary feeding, child who had diarrhoea in the past one month, large family size, frequency of feeding per day, low birth weight and source of drinking water

CHAPTER FIVE

5.0 Discussion

The aim of this study was to determine factors associated with under-nutrition among children under-five years (6-59 months) at Ngorongoro district, Arusha region. Age of the mother/caregiver, age of initiated complimentary food, diarrhoea in past one month, family size, frequency of feeding per day, low birth weight and source of drinking water were shown the significant associated with under nutrition among children under five age.

5.1 Socio economic factors

In this study we found that young mother/caregiver were more likely to have children with under nutrition as compared to older mother/caregiver. This is hypothesized that probably due to improper care of children or inability of handling the family. These findings were in line with findings reported in study conducted in Kenya and India (7,29).

Our study found that families with seven or more people were more likely to have a child with under nutrition as compared to the family with less than seven numbers of people in the family. This could be due to increased sharing of resources in household including food which resulted to inadequate food intake to the under five children and accessibility of health care. The findings were similar to findings reported in Nigeria and Kenya (14,16)

5.2 Child-care practices

This study found that children who were initiated complementary diet before four month of age associated significantly with under nourished compared to those children who were initiated complementary feeding in their four months and above. This perhaps was due to poor food preparation that cause inadequate absorption of nutrients or child's stomach was not exposed to other food than breast milk. This results were similar to other studies done in Botswana and Ethiopia (13,33).

The findings shown that, children who were fed less than six times per day were more likely to be under nutrition as compared to children fed more than five times per day, this could be due to the fact that, fewer mealsper day reduces nutrient intake as children have small stomach as well as require nutrients to build their own immunity and growth development therefore needs to feed six to eight per day These findings are in line with findings reported in study done in Congo and Tanzan**ia** (18,34) .But also the findings was

not the same with others reported in Nigeria perhaps this was due to type of food that used to feed the child per day (14)

Our study found that whose children born with low birth weight less than 2.5kg were likely to have under nutrition as compared to the children born at 2.5 kg and above, this was possible due to low birth weight children gain slow therefore continuous to below weight, but this result was different to other study done in Kenya (16,36)

5.3 Environmental factors

Our study found those households used well as source of drinking water were more likely to have children with under nutrition as compared to household used pipe water. This probably was associated with untreated drinking water this result was contrast with other result from Ethiopia and Bangladesh (20,23).

Previous studies have shown a significant association between house hold used surface water such as rivers, dams, lakes as a source as drinking water and under nutrition among under five children compared to those household used a pipe ware as a source of drinking water this may be due to contaminated with human and animals faeces that's leading to diarrhoea which ends to under nutrition among children therefore, the finding in this study corroborate to these Previous study done in Malawi, India and Ethiopia (4,27,37)

The study found that children who had diarrhoea in the past one month before data correction were more likely to be under nutrition as compared to children who didn't have diarrhoea disease in the past one month. This would be due to improper care of children or biological mechanism of diarrhoea disease whichprobablyincreasesweakening of immunity. This findings was similar to other reported found in Uganda (30,38).

CHAPTER SIX

6.0. CONCLUSION AND RECOMMENDATION

6.1 Conclusion

Age of mothers/caregivers, age of starting complementary feeding, having a history of diarrhoea disease in past one month, large family size, frequency of feeding per day, two to three number of under five children in family, home delivery child, well and surface as source of water were determinants of under-nutrition in children under-five years of age in Ngorongoro district. Strategies to address these factors need to be strengthened or introduced into the ongoing RCH campaigns to mitigate the persistent high prevalence of under-nutrition reported in the district.

6.2 Recommendations

We recommend the following to mitigate the occurrence ofunder-nutrition among children under-five years (6-59 months) in Ngorongoro district, Arusha region.

1. Strengthen education campaigns on proper child care with special attention to children among under five years of age. Emphasis on proper feeding practices during illness, especially diarrhoea disease and proper seeking of hospital advice and care during illness should be made.

2. Patient-centered and where possible individualized health education to mothers/caregivers on child feeding practice and proper timing of complementary feeding should be made during RCH clinic.

3. Awareness programs on affordable nutritious foods that are locally available should be introduced by the local government through community participation and involvement of NGOs in attempts to combat malnutrition.

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APPENDICES

Appendix 1a: INFORMED CONSENT FORM- English Version

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES - DIRECTORATE OF RESEARCH & PUBLICATIONS.

ID-NO _____

Consent to participate in this study

A greeting, my name is Ester Lucas Mdimu from Muhimbili University of Health and Allied Sciences, Dar es Salaam. We are carrying out a study to identify factors associated with malnutrition among children under five years of age in Ngorongoro district, Arusha region

Purpose of the study

This study has the purpose of collecting information on Factors associated with malnutrition in children in Ngorongoro district. You are being asked to participate in this study because you have experiences and information that may be important to the study

What participation involved

If you agree to participate in this study, you will be required to answer a series of questions and allow your child to be measured their weight, height and arm circumference.

Confidentiality

I assure you that all the information collected from you will be kept confidential. Only people working in this research will have access to the information. We will be compiling a report, which will contain responses from all participants without any reference to any individual. We will not put your name or your child's name or any other identifying information on the records of the information you provide.

Risks

You will be asked questions about yourself and the child and on how you care for your child. You may refuse to answer any particular question and stop the interview at any time. We do not expect any harm to happen to you or your child because of participation in this study.

Right to withdraw and alternatives

Taking part in this study is completely voluntary. You can stop participating in this study at any time, even if you have already given your consent. Refusal to participate or withdrawal from the study will not involve penalty or loss of any benefits to which you are otherwise entitled**.**

Benefits

The information you provide will help to increase our understanding on factors influencing levels of malnutrition in children under-five years of age ngorongoro district. We will communicate the findings to policy makers in the council and ministry to support improvement of nutrition services in the district. There is no direct benefit to you or your child.

Responsibility of Investigator

In the case where the child will be found to have malnutrition parent/caretaker will be counselled and advised to visit the health facility.

In case of injury

We do not anticipate that any harm will occur to you or your family as a result of participation in this study.

Who to contact

If you have questions about this study, please don’t hesitate to contact:

ESTER MDIMU, The Principal Investigator Muhimbili University of Health and Allied Sciences (MUHAS), P.O. Box 65001, Dar es Salaam (Tel. no. 0713082151or 0687380806).

OR

Dr. Joyce Rose Masalu, Acting Chairperson of Senate Research and Publications committee P. O. Box65001, Dar es Salaam. Tel: 2150302-6

Do you agree?

☐ **Yes**

☐ **No**

I …….have read the content in this form, my questions have been respond, I agree to participate in this study

Signature (or thumb print) of participant…….……

Date (dd/mm/yyyy)

Signature of Research assistant……

Date (dd/mm/yyyy) ……

Appendix 1b: INFORMED CONSENT FORM- Swahili version

CHUO KIKUU CHA AFYA NA SAYANSI YA TIBA CHA MUHIMBILI KURUGENZI YA UTAFITI NA UCHAPISHAJI

FOMU YA RIDHAA

ID-NO _____

Ridhaa ya kushiriki

Habari?Ninaitwa Ester Lucas Mdimu Nina fanyakazi ya kutafiti sababu zinazo sababisha utapia mlo Kwa watoto wenye umri chini ya miaka mitano kwenye wilaya ya Ngorongoro.

Madhumuni ya utafiti

Utafiti huu wa kusudia kuchunguza sababu zinazo sababisha tatizo la utapia mlo kwa watoto wenye umri chini ya miaka mitano kwenye wilaya ya Ngorongoro Una ombwa kushiriki kwenye utafiti huu kwa sababu unao ujuzi ama unafahamu matukio ambayo ni ya muhimu.

Nini kinahitajika ili kushiriki

Ili kushiriki katika utafiti huu inabidi kukubalina akujiunga kwa kujibu maswali toka kwenye dodoso wa kwa ajili ya utafiti huu. Pamoja na kuruhusu mwanao kupima uzito na urefu Pamoja na mzuunguuko wa mkono.

Usiri

Nina kuhakikishia kuwa taarifa zitakazokusanywa kutoka kwako kupitia dodoso hili zitakua siri na hakuna mtu yeyote ambaye hafanyi kazi kwenye utafiti huu atakaye ambiwa ulichosema. Ita andaliwa taarifa ya utafiti huu ambao hauta mtaja mshiriki yeyote.Jina lako wala utambulisho mwingine wowote hautawekwa .Kwenye taarifa unazo zitoa. Taarifa zako zitaingizwa kwenye ngamizi Kwa kutumia namba za mfululizo au utambulisho.

Hatari

Hakuna hatarimn yeyote itakayo tokea kwako kutokana na ushiriki wako kwenye utafiti huu.

Haki ya kujitoa au vinginevyo

Ushiriki katika utafiti huu nihiari kujitoa kutoka kwenye utafiti hakutakua na adhabu yeyote endapo utaona ni vyema kufanya hivyo.

Faida

Kama utakubali kushiriki kwenye utafiti huu itakua ni fanasa kwa vile utafiti huu unalengo la kuboresha huduma za kiafya kwa kuchunguza sababu zinazo sababisha utapia mlo kwa watoto wenye utapia mlo kwenye wilaya ya Ngorongoro.

Waajibu wa mtafiiti

Endapo mtoto atakutwa na utapia mlo elimu ita tolewa juu ya sababu zinazo sababisha utapia mlo na atafuatiliwa kwa karibu ili kuboresha afya yake

Endapo utapata madhara au la

Hatutegemei kupata madhara yoyote kutokana na ushiriki wako katika utafiti huu.

Nani wa kuwa siliana naye

Kama kuna swali kuhusiana na utafiti huu wasiliana na mtafiiti mkuu Ester Mdimu Chuo Kikuu cha Afya na Sayansi ya Tiba Muhimbili, S.L.P. 65001 DSM. Simu (0713082151) au

Dr. Joyce Rose Masalu Kaimu Mkurugenzi wa Kamati ya Utafiti na Uchapishaji, Chuo Kikuu cha Muhimbili simu: 2150302-6.

Je, Umekubali?

Ndio-------- Hapana…….

Mimi…….. Nimesoma / nimesomewa na kuelekezwa maelezo ya fomu hii, maswali yangu yame jibiwa nanimeridhika. Nakubali kushiriki katika utafiti huu.

Sahihi ya Mshiriki……..

Sahihi ya mtafiti msaidizi……

Tarehe ya kutia Sahihi ya kushiriki…….

Appendix 2: Questionnaire English version

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

SCHOOL OF PUBLIC HEALTH AND SOCIAL SCIENCES

FACTORS ASSOCIATED WITH UNDER NUTRITION AMONG CHILDREN UNDER FIVE YEARS IN NGORONGORO DISTRICT, ARUSHA REGION

S/No.	Question	Response	Code
SECTION A. SOCIO-DEMOGRAPHIC CHARACTERISTICS In this section we are going to ask you questions about yourself. Please feel free to tell us the truth. As I told you earlier, this information will be treated confidentially and no one outside the study team will have access to it.			
Q1	Questionnaire No _____		**ID**
Q2	Ward _____		**WARD**
Q3	Village_____		**VILL**
Q4	How old were you at your last birthday?	_____ Years	**AGER**
Q5	What is the sex of the respondent	1. Male 2. Female	**SEXR**

S/No.	Question	Response	Code
Q6	What is your current marital status?	1. Single 2. Married 3. Cohabiting 4. Divorced/Separated 5. Widowed	**MARITAL**
Q7	If married or cohabiting, does your (husband/partner) have other wives or does he live with other women as if married?	1. Yes 2. No □ Go to Q9 3. Don't know □ Go to Q9	**OTHWIFE**
Q8	Including yourself, in total how many wives or live-in partners does he have?	Total number of wives or live-in partners	**NUMWIFE**
Q9	Who does the child usually live with?	1. Mother and Father 2. Mother only 3. Father only 4. Others,…… (Specify)	**CHILDL**
Q10	What is the highest level of school attended by the child's mother/caregiver?	1. None 2. Primary not completed 3. Primary completed 4. Secondary not completed 5. Secondary completed 6. College/university 7. Others,..…….....… (Specify)	**MOEDU**

S/No.	Question	Response	Code
Q11	What is the highest level of school attended by the child's father?	None 1. Primary not completed 2. Primary completed 3. Secondary not completed 4. Secondary completed 5. College/university 6. Others,……..…… (Specify)	**FAEDU**
Q12	What is the child's mother/caregiver's occupation?	1. Unemployed 2. Pastoralist 3. Peasant 4. Employed 5. Business 6. Housewife 7. Others,..... (Specify)	**MOOCC**
Q13	What is the child's father's occupation?	1. Unemployed 2. Pastoralist 3. Peasant 4. Employed 5. Business 6. Others, ... (Specify)	**FAOCC**
Q14	Including you, how many are you in the household?	_____	**MEMBH**
Q15	How many children under five years live in the household?	_____	**UNDER 5**

S/No.	Question	Response	Code
Q16	What is the Age (in months) of the child before *[Name of child]*	…….. Months **(Fill '00' if child is firstborn)**	**OLDERSIB**
Q17	What is the Age (in months) of the child after *[Name of child]*	…….. Months **(Fill '00' if only child)**	**YOUNSIB**
Q18	Are you currently doing something or using any method to delay or avoid getting pregnant?	1. Yes 2. No □ Go to Q21	**USEFP**
Q19	Which method are you using?	1. Pills 2. Condom 3. Injectable 4. Norplant 5. Loop (IUD) 6. Others,…….. Specify	**TYPEFP**
Q20	For how long have you been using this family planning method?	……. Months **(If less than 12 Months)** …… Years	**DURFPM** **DURFPY**
Q21	For this child where did you give birth? *(Check in RCH card)* Name of facility ……	1. Home 2. Health facilities. 3. Others… (Specify)	**PLCB**

S/No.	Question	Response	Code
Q22	What type of health insurance are you covered by?	1. None 2. Community-based 3. Through employer 4. Social security 5. Other private 6. Others ... (Specify)	**TYPEHI**
Q23	Does this household own any livestock, herds other farm animals or poultry?	1. Yes 2. No □ Go to Q25	**LSTOCK**
Q24	How many of the following animals does the household own?		
	Animal — **Yes** — **No** — **Number** Cows/bulls — 1 — 2 Chicken or other poultry — 1 — 2 Goats — 1 — 2 Sheep — 1 — 2 Pigs — 1 — 2 Donkeys/mules/horses — 1 — 2 Others ... — 1 — 2 (Specify)		**COWS** **CHICK** **GOAT** **SHEEP** **PIG** **DONKEY** **OTHERLIV**
Q25	What kind of transport is often used by the household to go to the hospital?	1. Car/motorcycle 2. Public transport (bus, taxi) 3. Animal cart 4. Walking 5. Bicycle 6. Others… (Specify)	**TRANSP**
Q26	Does your household have?		

S/No.	Question	Response		Code
	Item	**Yes**	**No**	
	Electricity	1	2	**ELECTR**
	A radio	1	2	**RADIO**
	A television	1	2	**TV**
	A computer	1	2	**COMPU**
	A refrigerator	1	2	**FRIDGE**
	A car	1	2	**CAR**
	A bicycle/motorcycle/scooter	1	2	**BIKE**
	An animal-driven cart	1	2	**CART**

SECTION B. Environmental health and sanitation

I will now ask you questions about your environment and some hygiene practices. Please answer truthfully. This information will not be shared with anyone outside the study team.

Q27	What is the main source of drinking water for members of your household?	1. Piped water 2. Borehole 3. Well 4. Spring 5. Rainwater 6. Cart/tanker 7. Surface water (river, lake, dam) 8. Other ... Specify	**SOURCEW**
Q28	How long does it take you to go there, get water, and come back including waiting time?	..... Hours	**TIMEWAT**
Q29	Do you do anything to the water to make it safer to drink?	1. Yes Go to Q31 2. No	**TREATWA**

S/No.	Question	Response	Code
Q30	Why?	.... □ Go to Q32	**NOTTREA**
Q31	What do you do to make the water safer for drinking?	1. Boil 2. Add bleach/chlorine 3. Strain through a cloth 4. Settle /sedimentation 5. Others, Specify	**TYPETRE**
Q32	Do you have a latrine?	1. Yes 2. No IF No □ Go to Q34	**HAVELAT**
Q33	What kind of toilet do members of your household usually use?	1. Flush latrine 2. Piped sewages system latrine 3. Pit latrine 4. Field latrine 5. Others, Specify	**TYPELAT**
Q34	What material was used to build the roofof the house you live in?	1. Iron sheets 2. Mud 3. Grass/thatch. 4. Others… (Specify)	**ROOFH**

S/No.	Question	Response	Code
Q35	What material was used to build the wallsof the house you live in?	1. Bricks/cement blocks 2. Bamboo/stone with mud 3. Cane/trunks 4. Others. ……. (Specify)	**WALLH**
Q36	What material was used to build the floorsof the house you live in?	1. Tiles/cement 2. Wood 3. Mud/dung 4. Others ... (Specify)	**FLOORH**

SECTION C. CHILD HEALTH AND CARING PRACTICE

I am now going to ask you some questions about your Child. This information will be treated confidentially and no one outside the study team will have access to it. Please answer truthfully.

Q37	Sex of the child	1. Male 2. Female	**SEXCHILD**
Q38	What is the date, month and year your child was born **(Check RCH card)**	____/____/_____ (dd/mm/yyyy)	**DOB**
Q39	What was the birth weight of this child?	_____ Kilograms	**BWT**
40	For how long did you exclusively breastfeed your child *(Breast feeding your child without giving them any liquid such as tea, water or herbal medicine)*	…….. Months	**EBF**
Q41	At what age did you introduce other foods to your child?	_____ Months	**COMPL**
Q42	How many times did you feed your child yesterday?	_____ Number per day	**FREQFEED**
Q43	Are you still breastfeeding your child	1. Yes □ Go to Q45 2. No 3.	**BREFEED**
Q44	At what age did you stop breastfeeding your child?	_____Months	**STOPBF**
Q45	Has your child received any vaccinations?	1. Yes 2. No □ Go to Q47	**IMMUNE**

Q46	Circle the correct box indicating if they have received the vaccination and write the date the named vaccination was received in the space provided. (*NB: Verify the information in the table with the child's RCH card*.)				
		Yes	No	Date (mm/dd/ yyyy)	**BCG**
	BCG	1	2		**POLIO0**
	ORAL POLIO VACCINE (OPV) 0 (BIRTH DOSE)	1	2		**POLIO1**
	ORAL POLIO VACCINE (OPV) 1	1	2		**POLIO2**
	ORAL POLIO VACCINE (OPV) 2	1	2		**POLIO3**
	ORAL POLIO VACCINE (OPV) 3	1	2		**DPT1**
	DPT-HEP.B-HIB (PENTAVALENT) 1	1	2		**DPT2**
	DPT-HEP.B-HIB (PENTAVALENT) 2	1	2		**DPT3**
	DPT-HEP.B-HIB (PENTAVALENT) 3	1	2		**PNEUMO1**
	PNEUMOCOCCAL 1	1	2		**PNEUMO2**
	PNEUMOCOCCAL 2	1	2		**PNEUMO3**
	PNEUMOCOCCAL 3	1	2		**ROTA1**
	ROTAVIRUS 1	1	2		**ROTA2**
	ROTAVIRUS 2	1	2		**MEASLES1**
	MEASLES VACCINE 1	1	2		**MEASLES2**
	MEASLES VACCINE 2	1	2		**VITAMINA**
	VITAMIN A (MOST RECENT)	1	2		
Q47	If a child becomes ill suddenly where is she/he taken for treatment	1. To the health facility 2. To traditional healer 3. Others,…….....			**SICKTRE**

<table>
<tr><td>Q48</td><td colspan="2">Has your child suffered from any of the following diseases in the past one month?</td></tr>
<tr><td></td><td colspan="2"><table>
<tr><td>Disease</td><td>Yes</td><td>No</td></tr>
<tr><td>Malaria</td><td>1</td><td>2</td></tr>
<tr><td>Pneumonia</td><td>1</td><td>2</td></tr>
<tr><td>Diarrhoea</td><td>1</td><td>2</td></tr>
<tr><td>UTI</td><td>1</td><td>2</td></tr>
<tr><td>Others, ...</td><td>1</td><td>2</td></tr>
</table></td><td>MALARIA
PNEUMON
DIARR
UTI
OTHERDIS</td></tr>
<tr><td>Q49</td><td>Does your household own any mosquito nets that can be used while sleeping?</td><td>1. Yes
2. No Go to Q51</td><td>OWNNET</td></tr>
<tr><td>Q50</td><td>Where did you get the net?</td><td>1. Government health facility
2. Private health facility
3. Pharmacy</td><td>PLACENET</td></tr>
<tr><td>Q51</td><td>Has your child received deworming drugs in last three months</td><td>1. Yes
2. No</td><td>DEWORM</td></tr>
</table>

SECTIN D. Anthropometric measurements

I am now going to measure your child's weight, height and mid-upper Arm circumference to assess his/her nutritional status. The process is not invasive and no harm is anticipated to your child.

Q52	Weight of the child (in kg)	Reading1. _____ Kgs Reading 2. _____ Kgs	**WEIGHT1** **WEIGHT2**
Q53	Height of child /Length (cm) *(Measure length for a child less than 2 years)*	Reading 1. _____ Cm Reading 2. _____ Cm	**HEIGHT1** **HEIGHT2**
Q54	Mid-upper Arm circumference	Reading 1. _____ Cm	**MUAC**

Thank you very much and have a good day

Appendix 3: Dodoso la Utafiti (Swahili version)

CHUO KIKUU CHA AFYA NA TIBA MUHIMBILI

KITIVO CHA SAYANSI YA AFYA YA JAMII

SABABU ZINAZOWEZA ZINAZO SABABISHA UTAPIA MLO KWA WATOTO WA CHINI YA MIAKA MITANO WILAYA YA NGORONGORO, MKOA WA ARUSHA

N/S	Swali	Majibu	Kificho
SEHEMU A. TABIA ZA KIJAMII, KIGEOGRAFIA NA TAARIFA KUHUSU MAKAZI Katika sehemu hii nitakuuliza maswali kuhusu jamii, makazi na wewe binafsi. Tafadhali jisikie huru kutuambia ukweli. Kama tulivyo kuaambia hapo awali, taarifa hizi ni siri kati yetu na wewe na hakuna mtu yeyote nje ya timu hii ya utafiti atakuwa na taarifa hizi			
Q1	Dodoso namba _____		**ID**
Q2	Kata_____		**WARD**
Q3	Kijiji_____		**VILL**
Q4	Je ulikuwa na miaka mingapi siku yako ya kuzaliwa iliyopita?	_____Miaka	**AGER**
Q5	Jinsia ya anaejibu ni	1. Mme 2. Mke	**SEXR**

N/S	Swali	Majibu	Kificho
Q6	Hali yako ya ndoa kwa sasa ikoje?	1. Sijaolewa 2. Nimeolewa 3. Naishi kinyumba 4. Nimeachika/tumetengana 5. Mjane/mgane	**MARITAL**
Q7	Kama umeolewa au unaishi kinyumba, je (mume/mpenzi) wako ana mke mwingine au anaishi na mwanamke mwingine kama vile wameoana?	1. Ndio 2. Hapana □*Nenda Q9* 3. Sijui □*Nenda Q9*	**OTHWIFE**
Q8	Pamoja na wewe, kuna jumla ya wake au wanawake wanaoishi naye kinyumba wangapi?	Jumla ya wake au wanawake wanaoishi naye kinyumba	**NUMWIFE**
Q9	Kwa kawaida mtoto anaishi na nani	1. Baba na Mama 2. Mama peke yake 3. Baba peke yake 4. Wengine,..... *(Taja)*	**CHILDL**

N/S	Swali	Majibu	Kificho
Q10	Mama/mlezi wa mtoto ana kiwango gani cha juu cha elimu?	1. Sijasoma 2. Sijamaliza shule ya msingi 3. Nimemaliza shule ya msingi 4. Sijamaliza shule ya sekondari 5. Nimemaliza shule ya sekondari 6. Chuo 7. Nyingine, *(Taja)*	**MOEDU**
Q11	Baba wa mtoto ana kiwango gani cha juu cha elimu?	1. Sijasoma 2. Sijamaliza shule ya msingi 3. Nimemaliza shule ya msingi 4. Sijamaliza shule ya sekondari 5. Nimemaliza sekondari 6. Chuo 7. Nyingine,…… *(Taja)*	**FAEDU**

N/S	Swali	Majibu	Kificho
Q12	Je mama/mlezi wa mtoto anafanya kazi gani?	1. Hana kazi 2. Mfugaji 3. Mkulima 4. Ameajiriwa 5. Mfanyabiashara 6. Mama wa nyumbani 7. Nyingine,..... *(Taja)*	**MOOCC**
Q13	Baba wa mtoto unafanya kazi gani?	1. Hana kazi 2. Mfugaji 3. Mkulima 4. Ameajiriwa 5. Mfanyabiashara 6. Nyingine,..... *(Taja)*	**FAOCC**
Q14	Pamoja na wewemko watu wangapi katika nyumba unayoishi?	_____	**MEMBH**
Q15	Je, wapo watoto wa ngapi wenye umri chini ya miaka mitano ndani ya nyumba mnayoishi?	_____	**UNDER5**
Q16	Je kaka/dada yake na huyu mtoto ana umri gani? (katika miezi)	……..……. Miezi *(Jaza '00' kama ni mtoto wa kwanza)*	**OLDERSIB**
Q17	Je, mdogo wake na huyu mtoto ana umri gani? (katika miezi)	……..…..Miezi *(Jaza '00' kama ni mtoto wa pekee)*	**YOUNGSIB**

N/S	Swali	Majibu	Kificho
Q18	Je unatumia njia yeyote ya uzazi wa mpango?	1. Ndio 2. Hapana Nenda Q21	**USEFP**
Q19	Unatumia njia gani ya uzazi wa mpango?	1. Vidonge 2. Mpira (kondomu) 3. Sindano 4. Kijiti 5. Kitanzi 6. Nyingine,..... *(Taja)*	**TYPEFP**
Q20	Kwa muda gani umekua ukitumia njia hii ya uzazi wa mpango?	…….....…….....…. Miezi *(Kama chini ya miezi 12)* …….....…… Miaka	**DURFPM** **DURFPY**
Q21	Kwa mtoto huyu, ulijifungulia wapi? (Angalia kwenye Kadi ya clinic) …….....…… *Taja kituo*	1. Nyumbani 2. Kituo cha afya 3. Nyingine,..... *(Taja)*	**PLCB**
Q22	Je, wewe unatumia aina gani ya bima ya afya?	1. Sina bima 2. Bima ya jamii (CHF) 3. Kupitia mwajiri 4. Mifuko ya kijamii 5. Nyingine binafsi 6. Nyingine,..... *(Taja)*	**TYPEHI**

<table>
<tr><td>N/S</td><td>Swali</td><td>Majibu</td><td>Kificho</td></tr>
<tr><td>Q23</td><td>Je, kaya hii inamiliki mifugo, au wanyama wengine wanaofugwa majumbani?</td><td>1. Ndio
2. Hapana □ Nenda Q25</td><td>LSTOCK</td></tr>
<tr><td>Q24</td><td colspan="3">Je mnamiliki mifugo ya aina gani na kiasi gani katika nyumba yenu?</td></tr>
<tr><td></td><td colspan="3"><table>
<tr><th>Mifugo</th><th>Ndio</th><th>Hapana</th><th>Idadi</th></tr>
<tr><td>Ng'ombe</td><td>1</td><td>2</td><td></td></tr>
<tr><td>Kuku au ndege wengine</td><td>1</td><td>2</td><td></td></tr>
<tr><td>mbuzi</td><td>1</td><td>2</td><td></td></tr>
<tr><td>Kondoo</td><td>1</td><td>2</td><td></td></tr>
<tr><td>Nguruwe</td><td>1</td><td>2</td><td></td></tr>
<tr><td>Punda / nyumbu / farasi</td><td>1</td><td>2</td><td></td></tr>
<tr><td>Wengine,.....…….....
(Taja)</td><td>1</td><td>2</td><td></td></tr>
</table></td><td>COWS
CHICK
GOAT
SHEEP
PIG
DONKEY
OTHERLIV</td></tr>
<tr><td>Q25</td><td>Ni aina gani ya usafiri ambao hutumiwa mara nyingi na kaya kwenda hospitali?</td><td>1. Gari/pikipiki
2. Usafiri wa umma kama (mabasi, teksi)
3. Mkokoteni unaovutwa na wanyama
4. Kutembea kwa miguu
5. Baiskeli
6. Nyingine,.....
(Taja)</td><td>TRANSP</td></tr>
<tr><td>Q26</td><td colspan="2">Je, kaya yako inamiliki vitu vifuatavyo</td><td></td></tr>
</table>

N/S	Swali	Majibu	Kificho

Vitu/asseti	Ndio	Hapana	
Mna umeme	1	2	**ELECTR**
Redio	1	2	**RADIO**
Runinga	1	2	**TV**
kompyuta	1	2	**COMPU**
Friji	1	2	**FRIDGE**
Gari	1	2	**CAR**
Baiskeli / pikipiki	1	2	**BIKE**
Mkokoteni unaovutwa na wanyama	1	2	**CART**

SEHEMU B. MAZINGIRA YA AFYA NA USAFI

Sasa nitakuuliza maswali juu ya mazingira unayoishi na tabia ya usafi kwa ujumla. Tafadhali jibu ukweli. Taarifa hizi ni siri kati yetu na hakuna mtu nje ya timu ya utafiti atakayehusika nazo.

Q27	Je, chanzo kikuu cha maji ya kunywa katika kaya yako ni kipi?	1. Maji ya bomba 2. Kisima kirefu 3. Kisima kifupi 4. Chemchem 5. Maji ya mvua 6. Maji ya gari/mkokoteni 7. Mto, ziwa, bwawa 8. Nyingine,..... *(Taja)*	**SOURCEW**
Q28	Je, unatumia muda gani kwenda hadi kwenye chanzo cha maji, kuchota maji na kurudi?	..... Masaa	**MEWAT**
Q29	Je una chochote unachofanya ili maji yako ya kunywa yawe salama?	1. Ndio □ Nenda Q31 2. Hapana	**TREATWA**
Q30	Kwa nini?	.... □ Nenda Q32	**NOTTREA**

N/S	Swali	Majibu	Kificho
Q31	Je, unatumia njia gani kufanya maji ya kunywa kuwa salama?	1. Chemsha 2. Weka dawa 3. Chuja na kitambaa 4. Acha yatuame 5. Nyingine,..... *(Taja)*	**TYPETRE**
Q32	Je kaya yako mna choo?	1. Ndio 2. Hapana Nenda Q34	**HAVELAT**
Q33	Kwa kawaida ni choo cha namna gani wanakaya hutumia?	1. Kuflush kwenda kwenye mfumo wa maji taka 2. Kuflush kwenda kwenye shimo la choo 3. Choo cha shimo 4. Kutengeneza mbolea 5. Nyingine,..... *(Taja)*	**TYPELAT**
Q34	Je, nyumba mnayoishi paa lake limetengenezwa na nini?	1. Mabati 2. Matope 3. Nyasi 4. Nyingine,…….....….. *(Taja)*	**ROOFH**
Q35	Je, nyumba mnayoishi kuta zake zimetengenezwa na nini?	1. Matofali ya simenti/ kuchoma 2. Miti/mawe na udongo 3. Miti peke yake 4. Nyingine,..... *(Taja)*	**WALLH**

N/S	Swali	Majibu	Kificho
Q36	Je, sakafu ya nyumba mnayoishi imetengenezwa na nini?	1. Marumaru/sementi 2. Mbao 3. Udongo / samadi 4. Nyingine,..... *(Taja)*	**FLOORH**

SEHEMU C. HALI YA MALEZI YA MTOTO

Katika sehemu hii nitakuuliza maswali yanayohusu malezi ya mtoto. Kama tulivyoongea mwanzo mazungumzo haya ni siri hakuna mtu yeyote nje ya sisi atakaye fahamu.

Q37	Jinsi ya Mtoto wako ni	1. Mme 2. Mke	**SEXCHILD**
Q38	Taja tarehe, mwezi na mwaka mtoto wako aliyozaliwa *(Angalia kwenye kadi ya clinic)*	____/____/_____ (siku/mwezi/mwaka)	**DOB**
Q39	Mtoto wako alizaliwa na kilo ngapi? *(Angalia kwenye kadi ya clinic)*	_____ Kilogram	**BWT**
Q40	Je, mtoto wako ulimnyonyesha maziwa peke yake kwa muda gani? *(Kunyonyesha mtoto wako bila kumpa vimiminika vingine kama vile maji, chai au dawa za miti shamba)*	…….. Miezi	**EBF**
Q41	Mtoto wako ameanza kula chakula kingine zaidi ya maziwa akiwa na miezi mingapi?	_____ Miezi	**COMPL**
Q42	Mtoto ulimlisha chakula mara ngapi jana?	_____ Namba kwa siku	**FREQFEED**

N/S	Swali	Majibu	Kificho
Q43	Je, bado unamyonyesha mtoto wako?	1. Ndio □ Nenda Q45 2. Hapana	**BREFEED**
Q44	Je, mtoto wako aliacha kunyonya akiwa na umri gani?	_____Miezi	**STOPBF**
Q45	Je, mtoto wako amepata chanjo yeyote?	1. Ndio 2. Hapana □ Nenda Q47	**VACCINE**
Q46	Zunguushia mduara kwenye kisanduku sahihi ikionyesha kama mtoto amepata chanjo, andika tarehe aliyopata chanjo. *(NB: Hakikisha taarifa na kadi ya cliniki ya mtoto)*		

<table>
<tr><th>N/S</th><th>Swali</th><th colspan="3">Majibu</th><th>Kificho</th></tr>
<tr><td></td><td colspan="4"><table>
<tr><th></th><th>Ndio</th><th>Hapana</th><th>Tarehe (tar/mw/mk)</th></tr>
<tr><td>BCG</td><td>1</td><td>2</td><td></td></tr>
<tr><td>ORAL POLIO VACCINE (OPV) 0 (BIRTH DOSE)</td><td>1</td><td>2</td><td></td></tr>
<tr><td>ORAL POLIO VACCINE (OPV) 1</td><td>1</td><td>2</td><td></td></tr>
<tr><td>ORAL POLIO VACCINE (OPV) 2</td><td>1</td><td>2</td><td></td></tr>
<tr><td>ORAL POLIO VACCINE (OPV) 3</td><td>1</td><td>2</td><td></td></tr>
<tr><td>DPT-HEP.B-HIB (PENTAVALENT) 1</td><td>1</td><td>2</td><td></td></tr>
<tr><td>DPT-HEP.B-HIB (PENTAVALENT) 2</td><td>1</td><td>2</td><td></td></tr>
<tr><td>DPT-HEP.B-HIB (PENTAVALENT) 3</td><td>1</td><td>2</td><td></td></tr>
<tr><td>PNEUMOCOCCAL 1</td><td>1</td><td>2</td><td></td></tr>
<tr><td>PNEUMOCOCCAL 2</td><td>1</td><td>2</td><td></td></tr>
<tr><td>PNEUMOCOCCAL 3</td><td>1</td><td>2</td><td></td></tr>
<tr><td>ROTAVIRUS 1</td><td>1</td><td>2</td><td></td></tr>
<tr><td>ROTAVIRUS 2</td><td>1</td><td>2</td><td></td></tr>
<tr><td>SURUA 1</td><td>1</td><td>2</td><td></td></tr>
<tr><td>SURUA 2</td><td>1</td><td>2</td><td></td></tr>
<tr><td>VITAMIN A (Hivi karibuni)</td><td>1</td><td>2</td><td></td></tr>
</table></td><td>BCG
POLIO0
POLIO1
POLIO2
POLIO3
DPT1
DPT2
DPT3
PNEUMO1
PNEUMO2
PNEUMO3
ROTA1
ROTA2
MEASLES 1
MEASLES 2
VITAMIN A</td></tr>
<tr><td>Q47</td><td>Mtoto wako akiumwa ghafla una mpeleka wapi kupata matibabu?</td><td colspan="3">1. Kwenye kituo cha afya
2. Kwa mganga wa jadi
3. Kwingine,.....…….....
(Taja)</td><td>SICKTRE</td></tr>
<tr><td>Q48</td><td colspan="5">Je, katika mwezi mmoja uliopita mtoto wako ameugua ugonjwa wowote kati ya haya yafuatayo</td></tr>
</table>

<table>
<tr><th>N/S</th><th>Swali</th><th>Majibu</th><th>Kificho</th></tr>
<tr><td></td><td>
<table>
<tr><th>Ugonjwa</th><th>Ndio</th><th>Hapana</th></tr>
<tr><td>Malaria</td><td>1</td><td>2</td></tr>
<tr><td>Kifua</td><td>1</td><td>2</td></tr>
<tr><td>Kuharisha</td><td>1</td><td>2</td></tr>
<tr><td>UTI</td><td>1</td><td>2</td></tr>
<tr><td>Mwingine,.....
(Taja)</td><td>1</td><td>2</td></tr>
</table>
</td><td></td><td>MALARIA
PNEUMON
DIARR
UTI
OTHERDIS</td></tr>
<tr><td>Q49</td><td>Je, katika kaya/nyumbani kwako mna chandarua kinachoweza kutumika wakati wa kulala?</td><td>1. Ndio
2. Hapana Nenda Q51</td><td>OWNNET</td></tr>
<tr><td>Q50</td><td>Mlikipata wapi hii/hizo chandarua?</td><td>1. Kituo cha afya cha serikali
2. Kituo cha afya cha mtu binafsi
3. Duka la dawa
4. Kwingine,.....
(Taja)</td><td>PLACENET</td></tr>
<tr><td>Q51</td><td>Je, mtoto amepata dawa za minyoo katika kipindi cha miezi mitatu iliyopita?</td><td>1. Ndio
2. Hapana</td><td>DEWORM</td></tr>
</table>

SEHEMU D. UPIMAJI WA HALI YA UTAPIA MLO Sasa nitakwenda kumpima mtoto wako urefu, uzito na mzuunguuko wa mkono. Hakuna madhara yeyote atakayo pata mtoto.			
Q52	Uzito wa sasa wa mtoto (kwa kg)	Soma mara1 _____Kilogram Soma mara 2 _____Kilogram	**WEIGHT1** **WEIGHT2**
Q53	Urefu wa sasa wa mtoto (kwa cm) (Pima urefu wa mtoto chini ya miaka miwili kwa kutumia ubao wa mlazao. Zaidi ya miaka miwili tumia mchoro wa sentimita uliopo ukutani)	Soma mara 1 _____Cm Soma mara 2 _____Cm	**HEIGHT1** **HEIGHT2**
Q54	Mzuunguuko wa mkono wa mtoto (kwa cm)	Soma mara1 _____ cm	**MUAC**

Appendix 4: Consent Form

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR OF POSTGRADUATE STUDIES

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E-mail: dpgs@muhas.ac.tz

Ref. No. MU/ PGS/SAEC/Vol. XVIII/

24th February, 2017

Ms. Ester Mdimu
MSc. Applied Epidemiology
MUHAS.

RE: APPROVAL OF ETHICAL CLEARANCE FOR A STUDY TITLED: FACTORS ASSOCIATED WITH UNDER NUTRITION AMONG CHILDREN UNDER FIVE YEARS (6-59 MONTHS) IN NGORONGORO DISTRICT, ARUSHA REGION

Reference is made to the above heading.

I am pleased to inform you that, the Chairman has, on behalf of the Senate, approved ethical clearance for the above-mentioned study. Hence you may proceed with the planned study.

The ethical clearance is valid for one year only, from 24th February, 2017 to 23rd February, 2018. In case you do not complete data analysis and dissertation report writing by 23rd February, 2018, you will have to apply for renewal of ethical clearance prior to the expiry date.

Prof. Andrea B. Pembe
DIRECTOR OF POSTGRADUATE STUDIES

cc: Director of Research and Publications
cc: Dean, School of Public Health and Social Sciences