PREVALENCE OF CHILDHOOD MALNUTRITION AND ASSOCIATED FACTORS AMONG CHILDREN AGED 6-59 MONTHS IN BUSIA DISTRICT.

DR. JELA NAKHABI PHOEBE

H58/69039/2013

MBChB

UNIVERSITY OF NAIROBI

A DISSERTATION PRESENTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF MEDICINE IN PAEDIATRICS AND CHILD HEALTH IN THE UNIVERSITY OF NAIROBI

2016

DECLARATION

This dissertation is my original work and has not been published elsewhere or presented for a degree in any other university.

Dr. Jela Nakhabi Phoebe, MB.ChB (UON)

Signed: ..... Date: .....

This dissertation has been submitted for examination with our approval as supervisors:

Dr. Ahmed Laving, MBChB, MMed. Gastroenterologist
Senior Lecturer, Department of Pediatrics and Child Health, University of Nairobi

Signed: ……..... Date: ……....……

Dr. Daniel Njai, MB. ChB, MMed.
Senior Lecturer, Department of Pediatrics and Child Health, University of Nairobi

Signed: ……..... Date: ……....……

ACKNOWLEDGEMENT

Special thanks to my lecturers and supervisors, Dr. Ahmed Laving and Dr. Daniel Njai for your invaluable support, guidance and insights during the course of this work. You have patiently and consistently imparted in me principles of research for current and future work.

Special thanks to County Health Director Busia County Dr. Melsa Lutomia, Sub-County MOHs, and my study assistants for their exceptional work. Thanks to Mr. Phillip Ayieko the statistician for assisting in data management.

Special appreciation to Partnerships in Innovative Medical Education for Kenya Linked Maternal, Neonatal and Child Health program (PRIME-K) under the objective of "***promoting implementation science research at the community level in collaboration with the Ministry of Health***," for fully funding the project and also providing technical expertise.

DEDICATION

This book is dedicated my loving husband Dr. Daniel Somba and my lovely children Davis and Dennel, you are my inspiration. Your encouragement, love and moral support have been great indeed.

Glory to the Almighty God for allowing me to complete this work.

ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
DEFF	Design effect
EPI	Expanded Program of Immunization
FAO	Food and Agricultural Organization
GAM	Global acute malnutrition
GIP	Geographical Information System
GPSG	Global Positioning System
HFA	Height for age
IQ	Intelligence Quotient
KDHS	Kenya Demographic Health Survey
KFSSG	Kenya Food Security Steering Group
KIHBS	Kenya Integrated Household Baseline Survey
KNBS	Kenya National Bureau of Statistics
MDG	Millennium Development Goals
MUAC	Mid-Upper Arm Circumference
NCHS	National Center for Health Statistics
PEM	Protein Energy Malnutrition
PRIME-K	Partnerships in Innovative Medical Education for Kenya
SAM	Severe acute malnutrition
SD	Standard deviation
UNICEF	United Nations International Children's Fund.
WFA	Weight-for-age
WFH	Weight-for-height
WHO	World Health Organization

OPERATIONAL DEFINITIONS

Stunting: Moderate and severe; height-for-age Z-score between-2SD to -3 SD and <−3 SD, respectively from the median of WHO reference population

Stunting is a form of chronic under nutrition during the most critical periods of growth and development in early life.

Wasting: Moderate and severe; weight–for-height between -2SD to -3 SD and <−3 SD, respectively from the median of WHO reference population. Wasting results from acute under nutrition**.**

Underweight: Weight-for-age Z-score between -2SD to -3 SD and <−3 SD, respectively from the median of WHO reference population.

Z-SCORE (or SD score); It is defined as the deviation of an individual's value from the median value of a reference population divided by the standard deviation of the reference population.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Child malnutrition remains a major public health problem in developing countries and major contributor to global disease burden. Hunger and malnutrition among children in developing countries continue to impair health, quality of life, and survival. Malnutrition due to macro and micronutrients deficiencies has remained a major public health problem in Kenya, especially among children below five years and women of reproductive age (KDHS 2008 2009). Malnutrition is often a part of a vicious cycle of poverty, illiteracy and infections.

Childhood malnutrition is as a result of several factors that are often related to inadequate dietary intake, poor food quality and recurrent infectious diseases like diarrhea, and lower respiratory tract infections.

Objectives: To determine the prevalence of childhood malnutrition and its associated factors among children age 6-59 months in Busia district.

Methodology: This was a descriptive cross sectional community based survey conducted in the 6 divisions of Busia District from 1st December to 31st December 2015. Multistage random sampling was used to select the villages, and households. The study also incorporated use of Global Positioning System (GPS) to capture the locations of the study respondents at the house hold level. Garmin eTrex 10, a hand-held GPS gadget was used. The spatial analysis carried out showed that 500 points were mapped in total which is an equivalent of the number of households.

Data was collected from 493 children aged 6-59 months using pretested structured questionnaire and measurement of weight, height and MUAC was done. Stepwise logistic regression was used to relate underlying factors to the odds of malnutrition indices.Data was analyzed using SPSS version 21.0 and EPI-Info software program version 7 was used to determine anthropometric indices: Height for age, Weight for Height and Weight for age.

Results: The various forms of malnutrition were considered in a parallel fashion such that the overall malnutrition, wasting and stunting were assessed out of 100 independently of each other. The overall prevalence of malnutrition was 14.8 %(95% CI 11.8 – 18.3) with Underweight at 15.5%, while wasting and stunting were 14.8% and 13.3% respectively. The prevalence of underweight was significantly associated with number of under-fives in the households. The risk of underweight was two times higher

in a child from a household which had more than 2 under-fives compared to a child from a household with less than two under-fives (OR = 2.17, 95% CI 1.12-4.2, p = 0.02).

Higher birth order was also significantly associated with prevalence of underweight with the risk of underweight being 1.9 times greater in children of third or higher birth order compared to first borne children (OR = 1.9, 95% CI 1.02-3.57, p = 0.045).

There were no significant associations between child's age, sex (p = 0.054), age of introduction of solid foods (p = 0.232), or caretaker feeding the child and the prevalence of underweight.

Conclusion: High prevalence rate of malnutrition (wasting, stunting and underweight) among the under five children were observed, with variations among the divisions, indicating that the nutrition situation in study area needs to be addressed. The prevalence of malnutrition was significantly associated with number of under-fives in the households (p=0.02) and the child's birth order (p=0.045).

BACKGROUND

INTRODUCTION

Malnutrition encompasses both ends of the nutrition spectrum, from under nutrition (underweight, stunting, wasting, and micronutrient deficiencies) to overweight. It occurs when there is an imbalance between supply of nutrients and energy and the body's demand for them to ensure normal growth, maintenance, and specific functions.

Child malnutrition remains a major public health problem in developing countries and major contributor to global disease burden.[1] It is the underlying cause of more than 2.6 million child deaths each year worldwide, a third of child deaths globally.[2] It is recognized as the underlying cause of related deaths of childhood disease such as measles, diarrhea, and acute respiratory infectious diseases.[3] Many affected children indeed survive but suffer lifelong physical and cognitive impairments due to early macro and micronutrient deficiencies. Children with poor cognitive development in early life especially the first a thousand days are at risk of developing poor neurological functions, poor school performance, early school dropout , low skilled employment and poor care of their own children, thus creating a vicious cycle of intergenerational transmission of poverty.[4,5]

Malnutrition due to both macro and micronutrient deficiencies has remained a major public health problem in Kenya, especially among children below five years and women of reproductive age (KDHS 20008 2009). It is often a part of a vicious cycle of poverty illiteracy and disease.[6]

Childhood malnutrition results from several factors, that are often related to inadequate dietary intake, poor food quality and recurrent infectious diseases like diarrhea, and lower respiratory tract infections .(UNICEF 2013)[7]

Growth assessment is the best way of defining the health and nutritional status of a child, because disturbances in health and nutrition, regardless of their etiology, invariably affect child's growth. It also provides an indirect measurement of the quality of life of the entire population sampled.[8]

GLOBAL EPIDEMIOLOGY OF MALNUTRITION

Stunting

Globally, 161 million under-five year olds were estimated to be stunted in 2013. About half of these stunted children lived in Asia and over one third in Africa.

The global trend in stunting prevalence has declined from 33% to 25% and numbers affected declined from 199 million to 161 million between 2000 and 2013.

Wasting and severe wasting

It was estimated that 51 million under-five year olds were wasted and 17 million were severely wasted in 2013. One third of both wasting and severe wasting lived in Africa.

Underweight

Globally, 99 million under-five year olds were underweight in 2013. One third of the underweight children lived in Africa.

The global trend in underweight prevalence continues to decline; going from 25 % to 15 % between 1990 and 2013. Africa has experienced the smallest relative decrease, with underweight prevalence of 17% in 2013 down from 23% in 1990. [9]

NATIONAL EPIDEMIOLOGY OF MALNUTRITION

In Kenya, according to KDHS 2008 35%, 6.7% and 16.1% of under-fives were stunted, wasted and underweight respectively .Western province values were 28.4%, 2.6% and 14.8% for stunting, wasting and underweight respectively. Most recent KDHS 2014, released in 2015 showed that 26%, 4% and 11% of under-fives were stunted, wasted and underweight respectively. Though there has been a progressive decline in the levels of malnutrition within the country, the levels are still on the higher margin.[10]

High prevalence levels of malnutrition have a negative impact on the general survival, growth and development of children under-five and slows down progress towards attaining the overall national development and Sustainable Development Goals: SDG2 which aims at ending hunger, achieving food security and improving nutrition and promoting sustainable agriculture by 2025.[11]

The estimated cost of stunting to Kenya's economy in 2010 was over US$1 billion. Over 20 years it would result in deaths of 700,000 people. The new Kenya Constitution recognizes the right to quality and quantity of food as a basic right for all children.[12]

Summary of Prevalence Rates of Malnutrition in children under-five: Community based studies

Studies done locally and in various countries have shown varying rates of malnutrition. Table 1 below summarizes the prevalence rates of malnutrition in some of these countries. The rates of malnutrition were higher in the countries of low socioeconomic status than in those of higher socioeconomic status. A local study done by Rhoda Azikoyo et al, carried out to assess the nutritional status of under-five child population within cassava consuming community in Nambale of western Kenya, showed nutrition status of children to be poor (<−2 SD), 26.6% were stunted, 13.9% underweight, and 10.1% were wasting as shown below.

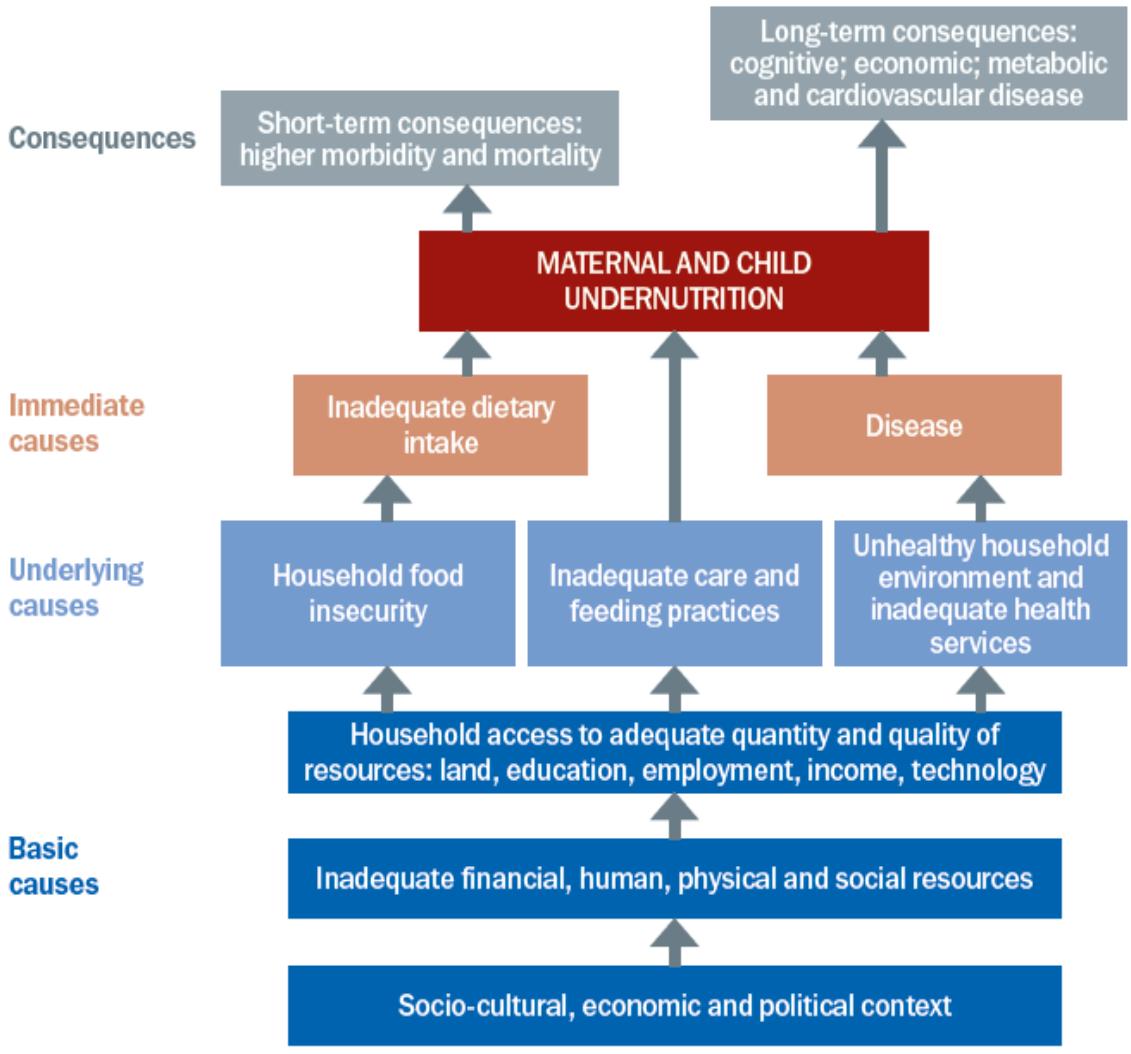
Study site	Year	Age (Months)	Sample size	Stunting %	Wasting %	Underweight %
Nambale,Busia District[13]	2012	0-59	232	26.6	10.1	13.9
Lalibela,North Wollozone,Northern Ethiopia[14]	2013	6-59	844	47.3	8.9	25.6
Dollo Ado District, Somali region Ethiopia[15]	2013	6-59	600	34.4	42.3	47.7
Fars Province, Iran [16]	2012-2013	0-60	15408	9.53	8.19	9.66

CAUSES OF MALNUTRITION

The causes of malnutrition are numerous and multifaceted. The key factors that contribute to childhood malnutrition include high child morbidity, inadequate maternal and child care (including infant and young child feeding practices), poor water and sanitation, household food insecurity, poor access to health care, low socio-economic background including, female/child headed households, poor family status, low level of education of the head of household and lack of good income.[17]

Figure 1:Conceptual Framework of the determinants of child under nutrition

[18]



Reference

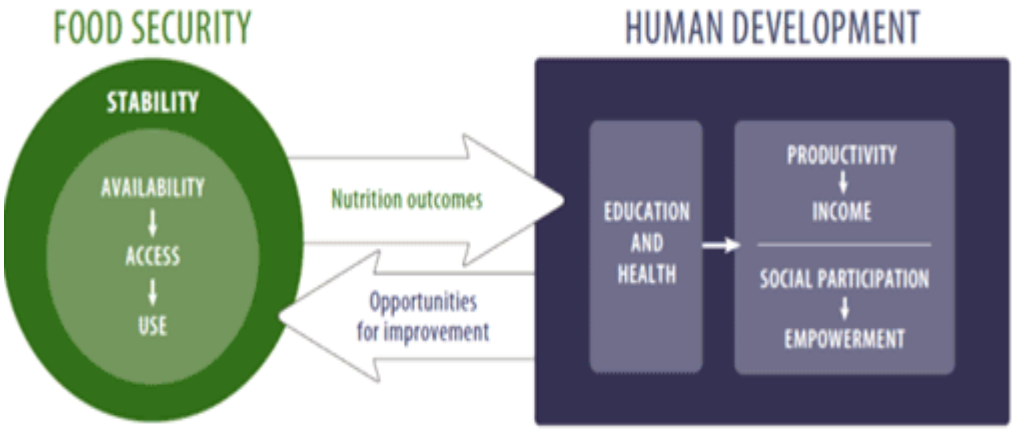
UNICEF. Improving Child Nutrition. New York, United Nation's Children's Fund (UNICEF), 2013.

FOOD SECURITY

Food security exists when, at all times, everyone has access to and control over sufficient quantities and quality of food needed for an active and healthy life. (World Food Summit, 1996)[19].

For a household, food security means the ability to secure adequate food to meet the dietary requirements of all its members, either through their own production or through food purchases. Food production depends on a wide range of factors, including access to fertile land, availability of manpower, appropriate seeds and equipment and climatic conditions. Factors affecting food purchases include household income and assets as well as food availability and price in local markets.[20]

Figure 2: Nutritional Outcomes are at intersection of Food security and Human Development[21]



Source: 'Africa Human Development Report 2012: Towards a food secure future', UNDP, 2012.

FAO estimates released in 2014 indicate that global hunger reduction continues: about 805 million people were estimated to be chronically undernourished in 2012–14, 23.8% of the undernourished being found in Sub Saharan Africa.[22] According to Kenya Food Security Steering Group (KFSSG) 2015 report, the food insecure population has increased to 1.6 million people, 7% more than the estimates of August 2014.[23]

SOCIOECONOMIC AND DEMOGRAPHIC STATUS

Poverty and food shortage are the main catalysts of food insecurity in the world. Poverty also constrains the ability of farming households to invest in productive assets and agricultural technologies, resulting in insufficient agricultural productivity. Poverty is compounded by factors such as conflicts, disease epidemics for example cholera and climatic changes, such as droughts and floods.

Experts agree that nutrition has a significant impact on child health, growth, and development in the first two years of a child's life.

Cesar G. Victoria et al, recently published Lancet article that showed the effect of early childhood nutrition not only on the health of children, but also on their productivity as they grow to adults. It was noted that improved childhood nutrition was associated with higher hourly wages for Guatemalan men in the same study[24, 25]

CHILD HEALTH AND CARING PRACTICES

Caring practices are the ways in which the vulnerable, such as children, are fed, nurtured, looked after, taught and guided. This is the responsibility of the caregiver. Caring practices are determined by cultural factors and by resources, such as income, time and knowledge.

Attitudes to modern health services including immunization, deworming, water supplies and sanitation also affect caring practices.

The care of children is particularly linked with the status, responsibilities, power and education of women, which may be culturally dependent.

Children and other vulnerable people are at particular risk as they are dependent and unable to care for themselves.[26]

ENVIROMENTAL FACTORS

An unhealthy household environment refers to the lack of enough safe water, lack of effective sanitation systems and unhygienic conditions. Such an environment will increase the likelihood of the spread of infectious diseases.

An unhealthy household environment can lead to an increased incidence (new cases) of disease.

ILLNESSES/INFECTIONS

A study done in early 1990's on malnutrition showed that malnutrition potentiated the effects of infectious diseases on child mortality at population level (Pelletier, Frongillo & Habicht, 1993).[27]It has been implicated in causation of related deaths of childhood disease such as measles, diarrhea, and acute respiratory infectious diseases. [3]

Malnutrition can increase the risk of infection, while infection can cause malnutrition, thus creating a vicious cycle. A malnourished child, whose resistance to illness is poor, falls ill and becomes more malnourished, and reduces his capacity to fight against illness. Malnutrition predisposes the child to severe forms of diarrhea, acute respiratory tract infections, measles and malaria.[28]

IMPACT OF MALNUTRITION

In terms of economic consequences, food insecurity debilitates society by increasing mortality, disease and disability. It inflates the direct economic costs of coping with the health impacts and enormous reduction in human potential and economic productivity brought about by hunger and malnutrition. Similarly, "hungry children make poor students and are prone to drop out of the educational system. Hungry and malnourished adults are unable to be fully productive workers and are more likely to be ill, increasing the burden on often overstretched health systems. [29]

ANTHROPOMETRIC MEASUREMENTS OF NUTRITIONAL STATUS

Since body dimensions reflect the overall health and welfare of individuals and populations, anthropometry is widely used as an inexpensive and non-invasive measure of the general nutritional status and health of an individual or a population group.

Anthropometry is also used to predict performance and survival of individuals as well as determining the economic and social well-being of populations.

Three indices are commonly used in assessing the nutritional status of children; weight-for-age; length-for-age or height-for-age; and weight-for-length or weight-for-height.

WEIGHT-FOR-AGE

Low weight-for-age index identifies the condition of being underweight for a specific age. The advantage of this index is that it reflects both past (chronic) and/or present (acute) undernutrition (although it is unable to distinguish between the two). Underweight, based on

weight-for-age, is a composite measure of stunting and wasting and is recommended as the indicator to assess changes in the magnitude of malnutrition over time [31].

HEIGHT-FOR-AGE

Height-for-age reflects skeletal growth and is the best indicator of **stunting**. It is an indicator of linear growth retardation and cumulative growth deficits. Children whose height-for-age Z-score is below -2 SD from the median of the WHO reference population are considered short for their age (stunted) and are chronically malnourished. Stunting reflects failure to receive adequate nutrition over a long period of time and is affected by recurrent and chronic illness. For children below 2 years of age, the term is length-for-age; above 2 years of age, the index is referred to as height-for-age

WEIGHT-FOR-HEIGHT

The weight-for-height index measures body mass in relation to body height or length and describes current nutritional status. Children with Z-scores below -2 SD are considered thin **(wasted)** and are acutely malnourished. Wasting represents the failure to receive adequate nutrition in the recent past and may be the result of inadequate food intake or a recent episode of illness causing loss of weight and the onset of malnutrition.

It is usually expressed as Global Acute Malnutrition (GAM) and Severe Acute Malnutrition (SAM):

Global Acute Malnutrition is the total number of children 6-59 months whose weight-for-height/length is less than -2 SD and/or has bilateral edema.

Severe Acute Malnutrition is the total children 6-59 months whose weight-for-height/length is less than -3 SD and/or has bilateral edema.

MUAC

It is a good predictor of the risk of death in 6-59 month old children, probably because of its relationship with the muscle mass. It is, therefore, a very useful screening tool that rapidly identifies children likely to die unless provided with nutritional and medical treatment.

In children 6-59 month old, MUAC < 110 mm is recommended as a criterion of admission to therapeutic feeding programs.

It is particularly recommended for the detection of severely malnourished 6-59 month-old children at community-level.

CLINICAL INDICATORS OF MALNUTRITION

Key aspects of clinical assessment include: nutritional history, features seen in hair, angles of mouth, gums, nails, bones, skin, eyes, tongue, muscles and thyroid. Edema of both feet is an important clinical indicator.

Edema is the presence of excessive amounts of fluid in the intracellular tissue. Edema can be diagnosed by applying moderate thumb pressure to the dorsum of the foot. Edema is diagnosed only if both feet show the impression for some time.

Bilateral edema (pitting edema) on both feet is the sign of kwashiorkor and its presence is a condition for classifying a child as severely malnourished even if the WFH z-score or percent of median is "normal".

STUDY JUSTIFICATION

Busia district was purposively selected as the study area due to the high poverty levels, persistent floods, high illiteracy levels and malnutrition. Repeated disasters like drought and floods can have serious impacts on health, and wellbeing of children.

According to the Kenya Human Development Report (2009) report, poverty level in Busia District was 64.2%, compared to national poverty level of 45.9 per cent. In addition literacy level was found to be 56.7%.The same report indicated that 39.3 % of children between 6-60months in Busia were below adequate weight for their respective age.[32, 33] Under 5 mortality rates in Western Kenya stands at 64 deaths per 1000 live births, which is higher than the national average which stands at 52 deaths per 1000 live births. (KDHS 2014)

Estimates of the burden of malnutrition, including estimates for childhood malnutrition, provide vital information on preventable ill-health, and indicate the health gains possible from interventions to prevent the risk factor.

Identifying and understanding of the associated factors for childhood malnutrition in Busia will aid in planning and budgeting for the nutritional needs of children by the policy-makers.

It will also serve as a baseline for other future studies geared towards monitoring secular trends in nutritional states in the study area

RESEARCH QUESTION

What is the prevalence and the factors associated with malnutrition among children aged 6-59 months in Busia District?

OBJECTIVES

Primary objective

To estimate the prevalence of malnutrition among children aged 6-59 months in Busia District.

Secondary objective

To determine factors associated with malnutrition among children aged 6-59 months in Busia District

METHODOLOGY

STUDY DESIGN

This was a descriptive cross-sectional community based survey

STUDY AREA

The study was carried out in Busia District which is part of the larger Busia County in Western Kenya.

Busia County measures 1,628km^{2}with predominantly North South elongation. It borders Uganda to the West, Bungoma County to the north, Kakamega County to the east and Siaya County to the south as shown on the map 1. The divisions forming the districts are Budalang'i, Funyula, Butula, Nambale, Matayos and Busia Township.

The district has a total population of 743,946 (2009 census). The population of the under 5 is 157,588.[35]

Area and Administrative units by Divisions

Division	Locations	Sub-locations	Area Km^2
Budalangi	6	18	306.5
Butula	6	21	245.2
Funyula	7	29	281.2
Matayos	5	15	173.7
Nambale	5	14	232.5
Township	1	2	22.2
Total	30	39	1,261.3

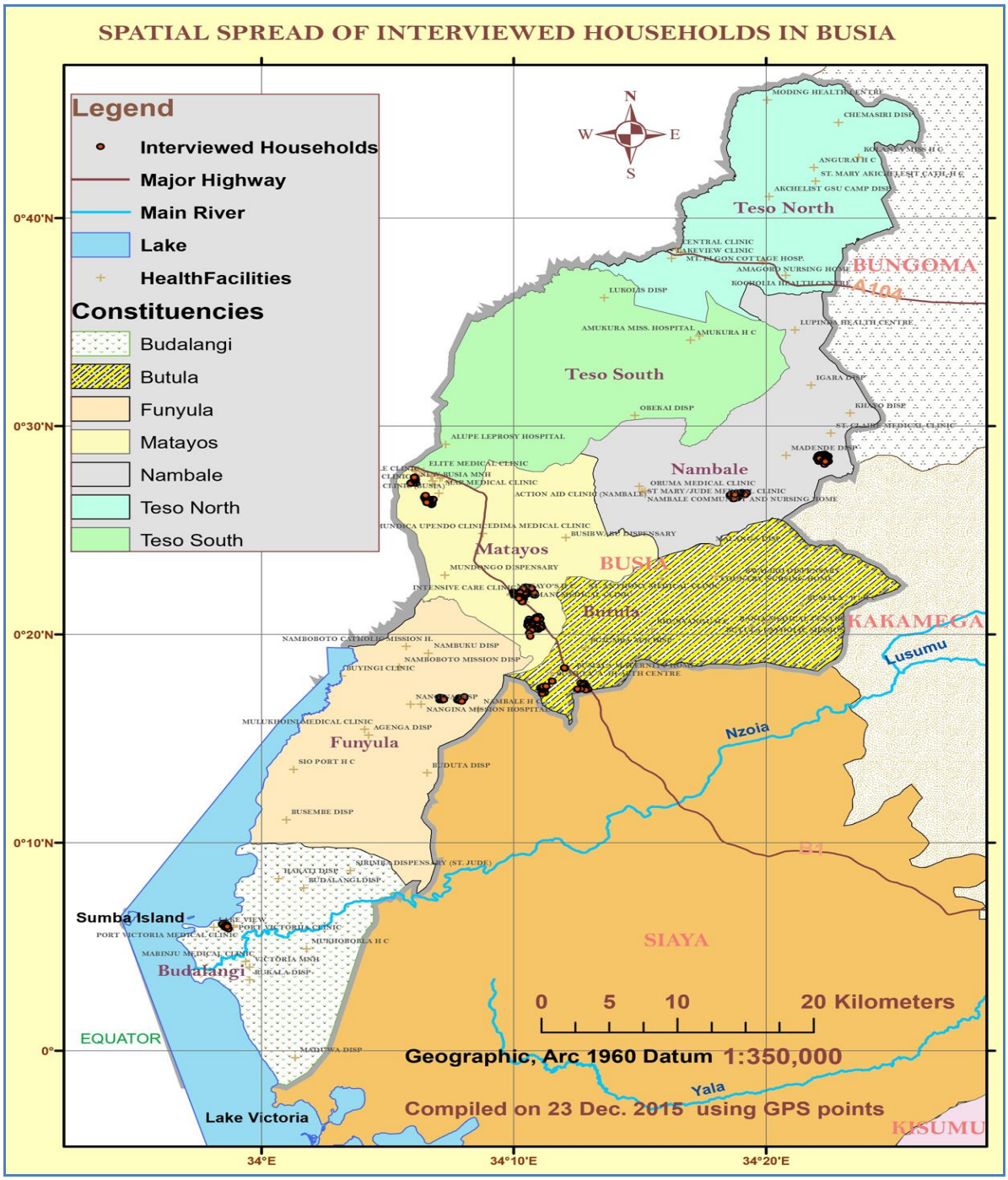
Source: Busia District Development Plan 2002 – 2008.

34

The main economic activity is trade with neighboring Uganda, with Busia town, the district headquarters, being a cross-border center. Away from town, the district economy is heavily reliant on fishing and agriculture.

Lake Victoria is an important resource for the people living in Busia district. Their livelihoods revolve around goods and services from the Lake.

Figure 3:Spatial Spread of Interviewed Households in Busia



There are two rainy seasons in the district, the long rains and the short rains. The long rain season starts in March and continues into May, while the short rain season starts in late August and continues into October. The dry spells are from December through February and June/July.

The food crops grown include maize, finger millet, sorghum, sweet potatoes, legumes, groundnuts, and traditional vegetables among others.

Livestock farming is done in small scale with most residents rearing Zebu cattle, poultry indigenous, ducks, quills, and sheep among others.[32]

The dominant source of energy in the district is biomass particularly firewood and charcoal is the most prominent.

The main water sources in the district are surface water, ground water and run-off water. There are two main rivers in the district, namely Nzoia and Sio. Other sources include protected springs, dug wells or rural piped schemes.

Urban sewage system has a lower coverage level of about 25%. This implies that the unconnected population uses either septic tanks or pit latrines which have serious implications on ground water quality[32]

According to the Busia District Development Plan 2002-2008, there are four frequent recurrent forms of disasters in the district namely floods, fires, lightening and drought. Floods mainly occur in Budalangi Division while drought mainly affects Budalangi and Funyula divisions.[34]

STUDY POPULATION

The study population comprised children aged 6 to 59 months in the selected house holds

INCLUSION CRITERIA

All 6 to 59-month- old children in the selected households for whom informed written consent was obtained from the parent(s) or legal guardian(s)

EXCLUSION CRITERIA

Children for whom informed consent was not given.

Children who were not residents of the household (those visiting)

SAMPLE SIZE DETERMINATION

Since stunting is more common than other forms of malnutrition like wasting and underweight, prevalence of stunting was used as (P) in the calculation of the sample size.

The following formula was used

$$\mathbf{n=\frac{Z^2*P\,(1-P)\,*(DEFF)}{D^2}} = \frac{1.96^2*0.26(0.74)}{0.05^2} *1.5 = 443$$

Considerations for the design effect;

DEFF=1+ (*b*-1) *roh*, where ***b*** is the average cluster size in this case 50

Roh is the rate of homogeneity (intracluster correlation) =0.01

DEFF=1+ (50-1)0.01=1.5

Thus the design effect used was 1.5

10% increase to allow for contingencies like non response

Final sample size (N) = 488

Z is the value representing 95% confidence interval

D Margin of error (5%)

DEFF is the design effect=1.5

P is the estimated prevalence (based on study by Rhoda Azikoyo) and the value used is for stunting at 26.6. %. Study was done in Nambale, among children under five years and a sample size of 232)

ETHICAL CONSIDERATIONS

Study approval was sought from Kenyatta National Hospital/University of Nairobi/ Ethics and Research Committee, and the Busia County Director of Health and County Health Executive Committee.

Consent was sought from the parent(s) or guardian(s) to allow the mother/guardian-child pair to participate in the study. Participation was voluntarily and those who did not participate were not discriminated against in any way.

Information collected was kept securely and confidentiality was maintained. Identity of mother/guardian and the child was kept confidential. No harm was done to any child. Relevant information on the outcomes of the study shall be given to the County Health Executive Committee.

SAMPLING METHOD

The study incorporated multistage random sampling and EPI method at the village level.

All of the 6 divisions in Busia district were included in the study.

The number of children sampled in each division was determined using the under-5 population in each division as a percentage of the total number of under-5 population in the district multiplied by the total sample size. Using simple random sampling technique (lottery method) 2 villages were picked from each division.

At the village level, EPI method was used to sample the clusters. With the help of the local Community Health Volunteer, a geographical center of the village was established. From the center of the village, a direction was randomly chosen by spinning a pencil, on the ground and noting the direction it points when it stops. The investigator then walked in the direction indicated, to the edge of the village. At the edge of the village a pencil was spun again until it pointed into the body of the village. The investigator then picked the first household along this second line and all children aged 6–59 months in the household underwent nutrition survey and the guardians completed the questionnaire. The subsequent households were chosen by proximity until the desired sample size was achieved.

If a house hold had more than one child below 5 years, only one child was selected by random sampling method.

The study also incorporated use of Global Positioning System (GPS) to capture the locations of the study respondents at the house hold level as shown on figure 3.

The GPS unit was configured to match the standard time and geographical parameters suitable for mapping in Kenya.

Using ArcGIS 10.3, the GPS points were imported as a shape file. The points were then plotted and integrated into the base maps of administrative units, heath facilities, key roads, main rivers, Lake Victoria, and other counties in the immediate vicinity of Busia County. This process yielded a digital map showing the locations of the interviewed households within the spatial context of the greater region of this study.

Distribution of sample size

DIVISION	UNDER 5 POPULATION 2009 CENSUS	PERCENTAGE OF TOTAL UNDER 5 POPULATION IN BUSIA DISTRICT	NUMBER OF CHILDREN SAMPLED
NAMBALE	36185	23.7%	117
BUTULA	21748	13.0%	64
FUNYULA	16051	10.0%	49
BUDALANGI	12012	8.0%	39
MATAYOS	30132	18.6%	92
BUSIA TOWNSHIP	41460	26.7%	132
TOTAL	157,588	100%	493

DATA COLLECTION PROCEDURES

Recruitment of study assistants was done and they underwent training on the objectives and the procedures of the study. The study assistants consisted of 2 Community Health volunteers and 2 qualified and 2 nurse aides. Pre-testing of the study questionnaire was done in one of the selected households and corrections were made appropriately. The principal investigator together with the study assistants visited the households where the objective of the study was explained to the parents/guardian of the child. Consent form was issued to the parent/guardian to be filled after which anthropometric measurements were done. Parents/guardians were informed of the nutritional status of the child based on MUAC measurements.

All questionnaires filled were verified on daily basis by the principal investigator to ensure correct documentation of data. They were securely stored to await analysis. This process was repeated in all the households sampled.

DATA COLLECTION PROCESS AND TOOLS

Weighing was done using a sensitive digital bathroom scale to the nearest 100g (0.1kg). It was done three times and the average recorded as the weight of the participant. The scale was placed on a flat surface and adjusted to read 0.00kilograms. Weight was taken without shoes and with minimal light clothing.

The younger child unable stand on the weighing scale was weighed together with the mother or caregiver and without the child and the difference between the two measurements was documented as the child's weight.

Height was measured using a portable wooden stadiometer. Recumbent length was measured to nearest 0.1cm in children younger than 2 years or under 85cm if age was not known or those who were too ill to stand. The child was made to lie parallel to the long axis of the board and the crown of the head placed against the fixed board. Height of children (24-59 months of age) was measured in a standing-up position to the nearest 0.1 cm using vertical board with a detachable sliding headpiece.

Mid upper arm circumference was measured using a MUAC tape that was color coded with red/yellow/green. The measurement was done on the left upper arm with the arm hanging freely by the side. The point midway between the acromion process and the olecranon was identified and marked. The circumference was then taken to the nearest 0.1centimeter (millimeter). The measurement was taken two times and the average of the two readings recorded as the mid upper arm circumference.

Structured questionnaire prerecorded was used to collect background characteristics of parent/guardian and the children. Date of birth of children, in most cases was established by relying on the date given by the mother or guardian. For those with written evidence, date of birth was obtained from Mother and Child Health booklet from the households.

DATA MANAGEMENT

Data was entered into computer software, cleaned and all errors corrected using the original data collection tool. Data was analyzed using the EPI-INFO version 7 software package and SPSS version 21.0. Raw data was entered into the computer and variables were computed to nutritional status indices of weight for age, height for age and weight for height, according to WHO reference standard by taking –2SD as the cut-off point indicating malnutrition in terms of stunting, underweight and wasting. Anthropometric indices were calculated using EPI-INFO software.

Associations and correlations of the variables were computed using the Chi-square, OR and 95% CI. Both bivariate and multivariate logistic regression analysis were used to identify the determinants of child malnutrition.

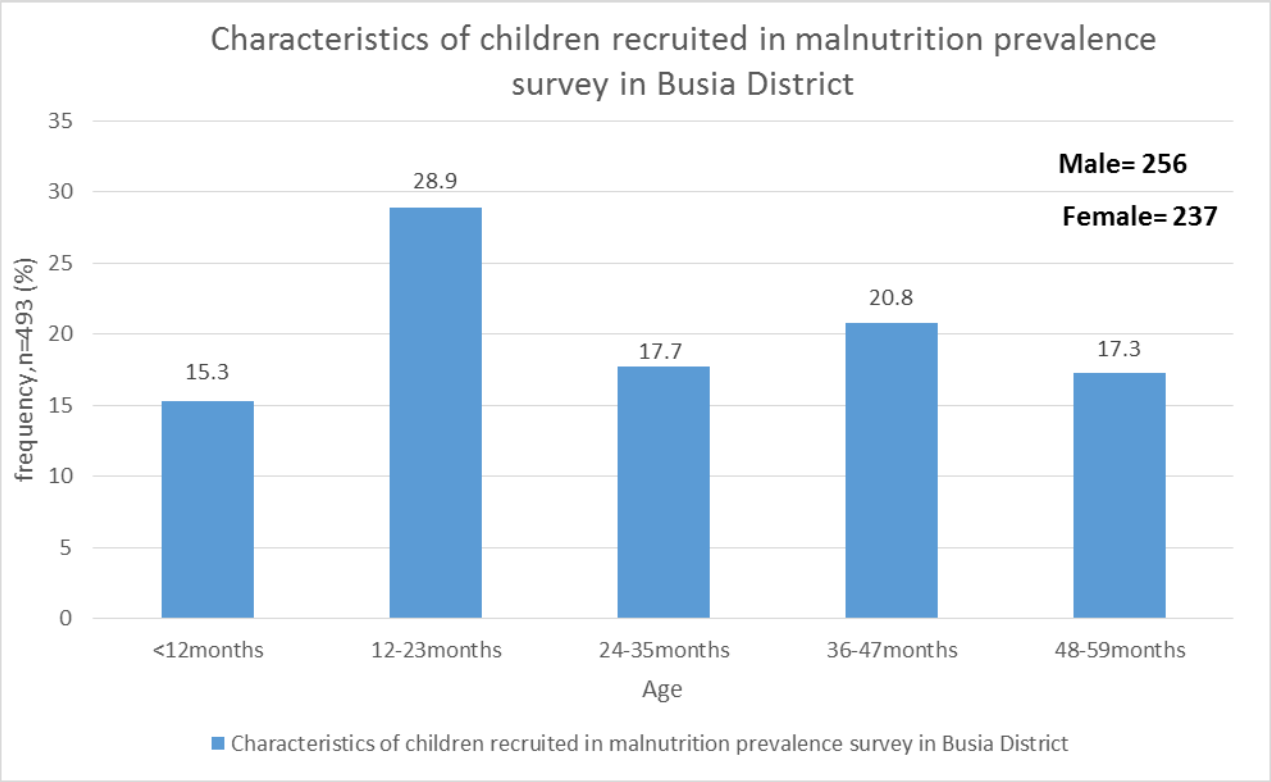
Data on MUAC measurements collected in this study was not analyzed as the other parameters were considered adequate for determining the nutritional status of children in this study.

RESULTS

CHARACTERISTICS OF CHILDREN 6-59 MONTHS IN BUSIA DISTRICT

A total of 493 children were recruited from 500 households in 6 divisions within Busia District. The mean age (± SD) of the children was 28.5 (± 15.4) months.

Figure 4: Characteristics of children recruited in malnutrition prevalence survey in Busia District



PREVALENCE OF MALNUTRITION

Table 1 presents the nutrition status of children 6-59 months included in the nutritional survey in Busia district. The overall prevalence of malnutrition based on the anthropometric indices was: 14.8% (95% CI, 11.8 to 18.3%) for WHZ < -2, 15.5% (95% CI, 12.3 to 18.9%) for WAZ < -2 and 13.3% (95% CI, 10.4-16.6%) for HAZ < -2.

Table 1: Nutritional status of children 6-59 months in Busia District

Nutrition indicator	Nutritional status	Frequency, n (%)
Weight for height(WH)	Not wasted(>-2SD)	420(85.2)
	Wasted (<-2SD)	73(14.8)
Weight for age(WA)	Not underweight (>-2SD)	413(84.5)
	Underweight (<-2SD)	76(15.5)
Height for age(HA)	Not stunted (>-2SD)	419(86.7)
	Stunted (<-2SD)	64 (13.3)

Malnutrition prevalence by Division

Malnutrition prevalence among children in the 6 divisions in Busia District is presented in Table 3. The prevalence of underweight in the six divisions ranged from 9.5 to 24.5%. Between 5.1 and 25.5% of children in the divisions in Busia District were stunted and the prevalence of wasting according to division was 10.6 to 23.4%.

Table 2: Prevalence of malnutrition among children 6 -59 months in Busia according to division

	Matayos	Funyula	Nambale	Budalangi	Busia Township	Butula	Total
Height-for-age Z							
Severe (< -3 SD)	1(1.1)	3(6.4)	6(5.2)	0(0.0)	5(3.8)	2(3.2)	17(3.5)
Moderate (<-2 SD)	6(6.7)	9(19.1)	7(6.1)	2(5.1)	13(10.0)	10(15.9)	47(9.7)
Normal (>-2 SD)	82(92.1)	35(74.5)	102(88.7)	37(94.9)	112(86.2)	51(81.0)	419(86.8)
Weight-for-age Z							
Severe (< -3 SD)	3(3.3)	6(12.2)	8(6.9)	3(7.7)	5(3.8)	8(12.5)	33(6.8)
Moderate (<-2 SD)	12(13.2)	6(12.2)	3(2.6)	5(12.8)	12(9.2)	5(7.8)	43(8.8)
Normal (>-2 SD)	76(83.5)	37(75.5)	105(90.5)	31(79.5)	113(86.9)	51(79.7)	413(84.5)
Weight-for-height Z							
Severe (< -3 SD)	6(6.5)	6(12.2)	8(6.8)	2(5.1)	5(3.8)	11(17.2)	38(7.7)
Moderate (<-2 SD)	11(12.0)	2(4.1)	6(5.1)	3(7.7)	9(6.8)	4(6.3)	35(7.1)
Normal (>-2 SD)	75(81.5)	41(83.7)	103(88.0)	34(87.2)	118(89.4)	49(76.6)	420(85.2)
Moderate/ severe stunting	7(7.9)	12(25.5)	13(11.3)	2(5.1)	18(13.8)	12(19.0)	64(13.3)
Moderate/ severe underweight	15(16.5)	12(24.5)	11(9.5)	8(20.5)	17(13.1)	13(20.3)	76(15.5)
Moderate/ severe wasting	17(18.5)	8(16.3)	14(12.0)	5(12.8)	14(10.6)	15(23.4)	73(14.8)

FACTORS ASSOCIATED WITH MALNUTRITION

Child characteristics

Prevalence of malnutrition based on WHZ <-2 (20.7%), WAZ <-2 (23%) and HAZ <-2 (18.4%) was higher among children aged 24-35 months (Table 4). Male children also had higher malnutrition rates compared to females: WHZ <-2 (17.6 versus 11.8%), WAZ <-2 (17.6 versus 13.1%) and HAZ <-2 (18.8 versus 6.8%).

Table 3: Child characteristics and malnutrition prevalence in Busia District

	Total		WHZ < -2	WAZ < -2	HAZ < -2
	N	%	n (%)	n (%)	n (%)
Age					
<1 year	75	15.3	6(8.0)	7(9.3)	9(12.0)
12-23 months	142	28.9	13(9.2)	24(16.9)	20(14.1)
24-35 months	87	17.7	18(20.7)	20(23.0)	16(18.4)
36-47 months	102	20.8	17(16.7)	11(10.8)	9(8.8)
48-59 months	85	17.3	18(21.2)	14(16.5)	10(11.8)
Sex					
Female	237	48.1	28(11.8)	31(13.1)	16(6.8)
Male	256	51.9	45(17.6)	45(17.6)	48(18.8)

Table 4: Association of malnutrition prevalence and child characteristics in Busia District

	WHZ < -2		WAZ < -2		HAZ < -2	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Age						
<1 year	1.0(ref)		1.0(ref)		1.0(ref)	
12-23 months	1.16(0.42-3.18)	0.775	1.95(0.80-4.76)	0.144	1.22(0.53-2.84)	0.638
24-35 months	3.00(1.12-8.01)	0.028	2.86(1.13-7.20)	0.026	1.65(0.68-3.99)	0.266
36-47 months	2.30(0.86-6.15)	0.097	1.17(0.43-3.18)	0.758	0.71(0.27-1.88)	0.486
48-59 months	3.09(1.16-8.26)	0.025	1.89(0.72-4.96)	0.198	0.98(0.37-2.55)	0.96
Sex						
Female	0.63(0.38-1.05)	0.073	0.70(0.43-1.15)	0.157	0.31(0.17-0.56)	<0.001
Male	1.0(ref)		1.0(ref)		1.0(ref)	

Housing factors

Most children resided in permanent houses 365 (74%), with multiple rooms 327 (66.3%). The houses that were mostly overcrowded 273 (56.9%), also depended on unprotected water sources 394 (79.9%), Table 5.

Table 5: Housing factors and prevalence of malnutrition in Busia District

	Total		WHZ < -2	WAZ < -2	HAZ < -2
Overcrowding within residence	**N**	**%**	**n (%)**	**n (%)**	**n (%)**
3 or more people per room	273	56.9	50(18.3)	51(18.7)	35(12.8)
<3 people per room	207	43.1	22(10.6)	24(11.6)	29(14.0)
Type of housing unit					
Permanent house	365	74	60(16.4)	62(17.0)	50(13.7)
Semi-permanent house	128	26	13(10.2)	14(10.9)	14(10.9)
Number of rooms in residence					
Multiple rooms	327	66.3	52(15.9)	49(15.0)	42(12.8)
Single room	166	33.7	21(12.7)	27(16.3)	22(13.3)
Main water source					
Protected water source	99	20.1	10(10.1)	10(10.1)	9(9.1)
Unprotected water source	394	79.9	63(16.0)	66(16.8)	55(14.0)
Toilet facilities					
Flash toilet	4	0.8	1(25.0)	1(25.0)	0(0.0)
None	4	0.8	2(50.0)	1(25.0)	2(50.0)
Pit latrine	485	98.4	70(14.4)	74(15.3)	62(12.8)

Table 6: Association between malnutrition prevalence and housing factors in Busia District

	WHZ < -2		WAZ < -2		HAZ < -2	
	OR (95% CI)	**P**	**OR (95% CI)**	**P**	**OR (95% CI)**	**P**
Overcrowding within residence						
3 or more people per room	1.89(1.10-3.23)	0.021	1.75(1.04-2.95)	0.036	0.90(0.53-1.52)	0.685
<3 people per room	1.0(ref)		1.0(ref)		1.0(ref)	
Type of housing unit						
Permanent house	1.0(ref)		1.0(ref)		1.0(ref)	
Semi-permanent house	0.57(0.30-1.09)	0.088	0.61(0.33-1.13)	0.114	0.80(0.42-1.50)	0.48
Number of rooms in residence						
Multiple rooms	1.31(0.76-2.25)	0.338	0.91(0.55-1.52)	0.72	0.96(0.55-1.67)	0.879
Single room	1.0(ref)		1.0(ref)		1.0(ref)	
Main water source						
Protected water source	1.0(ref)		1.0(ref)		1.0(ref)	
Unprotected water source	1.69(0.84-3.44)	0.144	1.79(0.88-3.62)	0.107	1.58(0.75-3.32)	0.229
Toilet facilities						
Flash toilet	1.98(0.20-19.27)	0.558	1.83(0.19-17.86)	0.602	1.0(ref)	
None	5.93(0.82-42.78)	0.078	1.83(0.19-17.86)	0.602	6.66(0.92-48.15)	0.06
Pit latrine	1.0(ref)		1.0(ref)		1.0(ref)	

Household factors

Household data

The most common source of food for participating household was home grown foods 302 (61.3%). Eighty seven percent of households had two or fewer children aged below 5 years and the birth order for 219 (44.4%) of participants was third or greater

Table 7: Household characteristics and prevalence of malnutrition in children in Busia District

	Total		WHZ < -2	WAZ < -2	HAZ < -2
Birth order of index child	**N**	**%**	**n (%)**	**n (%)**	**n (%)**
First	175	35.5	18(10.3)	19(10.9)	23(13.1)
Second	99	20.1	13(13.1)	16(16.2)	18(18.2)
Third and above	219	44.4	42(19.2)	41(18.7)	23(10.5)
Source of food in household					
Bought	191	38.7	28(14.7)	31(16.2)	23(12.0)
Home grown	302	61.3	45(14.9)	45(14.9)	41(13.6)
Number of under-fives within household					
<=2 under-fives within household	432	87.8	56(13.0)	61(14.1)	55(12.7)
>2 under-fives within household	60	12.2	17(28.3)	15(25.0)	9(15.0)

Table 8: Association between malnutrition prevalence and household characteristics in Busia District

	WHZ < -2		WAZ < -2		HAZ < -2	
	OR (95% CI)	**P**	**OR (95% CI)**	**P**	**OR (95% CI)**	**P**
Birth order of index child						
First	1.0(ref)		1.0(ref)		1.0(ref)	
Second	1.32(0.62-2.82)	0.476	1.61(0.79-3.30)	0.192	1.51(0.77-2.98)	0.228
Third and above	2.07(1.14-3.74)	0.016*	1.89(1.05-3.39)	0.033	0.77(0.42-1.43)	0.411
Source of food in household						
Bought	1.0(ref)		1.0(ref)		1.0(ref)	
Home grown	1.02(0.61-1.70)	0.941	0.90(0.55-1.48)	0.677	1.14(0.66-1.96)	0.65
Number of under-fives within household						
<=2 under-fives within household	1.0(ref)		1.0(ref)		1.0(ref)	
>2 under-fives within household	2.65(1.42-4.97)	0.002*	2.01(1.05-3.82)	0.034	1.18(0.55-2.53)	0.675

Characteristics of household head

Most 398 (81.7%) participating households were male headed. Nine percent of household heads were married and most commonly 281 (57.6%) had primary level education (Table 9).

The prevalence of HAZ < -2 was 21.3% compared to 11.3% in female and male headed households respectively (Table 10). Children in households headed by individual with no formal education had high malnutrition rates for all indices: WHZ < - 2 (27.6%), WAZ < - 2 (34.5%) and HAZ < - 2 (31%).

Table 9: Characteristics of household heads in Busia district and prevalence of childhood malnutrition

	Total		WHZ < -2	WAZ < -2	HAZ < -2
	N	%	n (%)	n (%)	n (%)
Sex of household head					
Female	89	18.3	12(13.5)	14(15.7)	19(21.3)
Male	398	81.7	61(15.3)	62(15.6)	45(11.3)
Marital status					
Married	446	90.5	67(15.0)	71(15.9)	61(13.7)
Single/ divorced/ separated	47	9.5	6(12.8)	5(10.6)	3(6.4)
Level of education					
Adult education	8	1.6	0(0.0)	0(0.0)	1(12.5)
None	29	5.9	8(27.6)	10(34.5)	9(31.0)
Primary	281	57.6	47(16.7)	48(17.1)	33(11.7)
Secondary	128	26.2	13(10.2)	14(10.9)	18(14.1)
Post-secondary	42	8.6	5(11.9)	4(9.5)	2(4.8)

Table 10: Association between prevalence of childhood malnutrition and characteristics of household heads

	WHZ < -2		WAZ < -2		HAZ < -2	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Sex of household head						
Female	0.86(0.44-1.68)	0.66	1.00(0.53-1.88)	0.999	2.18(1.20-3.96)	0.01
Male	1.0(ref)		1.0(ref)		1.0(ref)	
Marital status						
Married	1.0(ref)		1.0(ref)		1.0(ref)	
Single/ divorced/ separated	0.83(0.34-2.03)	0.679	0.64(0.24-1.67)	0.362	0.45(0.14-1.51)	0.198
Level of education						
Adult education	NA		NA		0.32(0.03-2.98)	0.315
None	1.0(ref)		1.0(ref)		1.0(ref)	
Primary	0.53(0.22-1.26)	0.15	0.40(0.17-0.91)	0.028	0.30(0.13-0.72)	0.007
Secondary	0.30(0.11-0.80)	0.017	0.23(0.09-0.60)	0.003	0.37(0.14-0.93)	0.035
Post-secondary	0.35(0.10-1.22)	0.101	0.21(0.06-0.74)	0.016	0.12(0.02-0.61)	0.011

Mother-child factors

Pre-lacteal feeds were introduced in 57 (11.6%) cases, 277 (56.2%) children breastfed exclusively for at least 6 months (Table 11). Most 291 (59%) children had three to four meals daily and it was reported that 348 (70.6%) children usually fed themselves.

Table 11: Child feeding practices and malnutrition in Busia district

	Total		WHZ < -2	WAZ < -2	HAZ < -2
Prelacteal feeding	**N**	**%**	**n (%)**	**n (%)**	**n (%)**
No	436	88.4	67(15.4)	70(16.1)	58(13.3)
Yes	57	11.6	6(10.5)	6(10.5)	6(10.5)
Breastfeeding initiation after delivery					
1hr-6hr	110	22.3	14(12.7)	16(14.5)	12(10.9)
30 min-1 hr.	153	31	24(15.7)	25(16.3)	23(15.0)
Less than 30 min	210	42.6	31(14.8)	30(14.3)	27(12.9)
More than 6 hrs.	20	4.1	4(20.0)	5(25.0)	2(10.0)
Number of daily feeds					
2-3 times	56	11.4	5(8.9)	7(12.5)	5(8.9)
3-4 times	291	59	52(17.9)	51(17.5)	35(12.0)
More than 4 times	146	29.6	16(11.0)	18(12.3)	24(16.4)
Who feeds the child?					
Parent	134	27.2	9(6.7)	20(14.9)	19(14.2)
Self	348	70.6	63(18.1)	55(15.8)	44(12.6)
Sibling	6	1.2	1(16.7)	0(0.0)	0(0.0)
Others	5	1	0(0.0)	1(20.0)	1(20.0)
Age at which solid foods were introduced					
6 months and above	277	56.2	32(11.6)	36(13.0)	32(11.6)
<6 months	216	43.8	41(19.0)	40(18.5)	32(14.8)

Table 12: Association between child feeding practices and malnutrition in Busia district

	WHZ < -2		WAZ < -2		HAZ < -2	
	OR (95% CI)	**P**	**OR (95% CI)**	**P**	**OR (95% CI)**	**P**
Pre-lacteal feeding						
No	1.54(0.64-3.74)	0.337	1.61(0.66-3.89)	0.293	1.34(0.55-3.26)	0.52
Yes	1.0(ref)		1.0(ref)		1.0(ref)	
Breastfeeding initiation after delivery						
1hr-6hr	0.84(0.43-1.66)	0.619	1.03(0.54-1.99)	0.925	0.86(0.41-1.77)	0.673
30 min-1 hr.	1.07(0.60-1.92)	0.808	1.16(0.65-2.06)	0.617	1.17(0.64-2.14)	0.602
Less than 30 min	1.0(ref)		1.0(ref)		1.0(ref)	
More than 6 hrs.	1.44(0.45-4.61)	0.535	1.98(0.67-5.84)	0.217	0.78(0.17-3.57)	0.749
Number of daily feeds						
2-3 times	1.0(ref)		1.0(ref)		1.0(ref)	
3-4 times	2.22(0.84-5.83)	0.106	1.51(0.65-3.52)	0.344	1.34(0.50-3.60)	0.557
More than 4 times	1.26(0.44-3.61)	0.673	0.99(0.39-2.52)	0.987	1.90(0.69-5.28)	0.216
Who feeds the child?						
Parent	1.0(ref)		1.0(ref)		1.0(ref)	
Self	3.07(1.48-6.37)	0.003*	1.07(0.61-1.87)	0.808	0.88(0.49-1.58)	0.677
Sibling	2.78(0.29-26.38)	0.374	NA		NA	
Others	NA		1.41(0.15-13.30)	0.763	1.49(0.16-14.03)	0.729
Age at which solid foods were introduced						
6 months and above	0.56(0.34-0.92)	0.022*	0.65(0.40-1.06)	0.084	0.75(0.44-1.26)	0.275
<6 months	1.0(ref)		1.0(ref)		1.0(ref)	

Recent illness, immunization and supplementation

Overall, 122 (24.7%) children had diarrhea in the last 7 days and 260 (52.7%) had ARTI during the same period (Table 13). Majority of children had ever been immunized 485 (99.4%), were immunized against measles 446 (90.5%) and had received vitamin A recently 371 (75.3%).

There were no major differences in the prevalence of malnutrition indices WHZ <-2, WAZ < -2 and HAZ < -2 between children with recent history of acute illnesses, vaccination and supplementation and those without.

Table 13: Recent illness, immunization and supplementation versus malnutrition among children in Busia district

	Total		WHZ < -2	WAZ < -2	HAZ < -2
Child had diarrhea in last 7 days	**N**	**%**	**n (%)**	**n (%)**	**n (%)**
No	371	75.3	56(15.1)	56(15.1)	45(12.1)
Yes	122	24.7	17(13.9)	20(16.4)	19(15.6)
Child had ARTI in last 7 days					
No	233	47.3	39(16.7)	41(17.6)	25(10.7)
Yes	260	52.7	34(13.1)	35(13.5)	39(15.0)
Ever been immunized					
No	3	0.6	1(33.3)	1(33.3)	0(0.0)
Yes	485	99.4	71(14.6)	75(15.5)	64(13.2)
Received measles vaccine					
No	47	9.5	7(14.9)	6(12.8)	7(14.9)
Yes	446	90.5	66(14.8)	70(15.7)	57(12.8)
Received vitamin A during the last 6 months					
No	122	24.7	19(15.6)	21(17.2)	20(16.4)
Yes	371	75.3	54(14.6)	55(14.8)	44(11.9)
Received iron supplementation during the last 6 months					
No	470	95.3	68(14.5)	72(15.3)	60(12.8)
Yes	23	4.7	5(21.7)	4(17.4)	4(17.4)
Child not allowed to eat certain foods					
No	478	97	72(15.1)	75(15.7)	64(13.4)
Yes	15	3	1(6.7)	1(6.7)	0(0.0)

Table 14: Association between recent illness, immunization and supplementation versus malnutrition among children in Busia district

	WHZ < -2		WAZ < -2		HAZ < -2	
	OR (95% CI)	**P**	**OR (95% CI)**	**P**	**OR (95% CI)**	**P**
Child had diarrhea in last 7 days						
No	1.10(0.61-1.97)	0.754	0.92(0.53-1.60)	0.764	0.75(0.42-1.34)	0.337
Yes	1.0(ref)		1.0(ref)		1.0(ref)	
Child had ARTI in last 7 days						
No	1.34(0.81-2.20)	0.254	1.35(0.83-2.20)	0.233	0.67(0.39-1.15)	0.143
Yes	1.0(ref)		1.0(ref)		1.0(ref)	
Ever been immunized						
No	2.92(0.26-32.58)	0.385	2.71(0.24-30.23)	0.419	1.0(ref)	
Yes	1.0(ref)		1.0(ref)		1.0(ref)	
Received measles vaccine						
No	1.01(0.43-2.34)	0.986	0.80(0.33-1.96)	0.624	1.20(0.51-2.80)	0.679
Yes	1.0(ref)		1.0(ref)		1.0(ref)	
Received vitamin A during the last 6 months						
No	1.08(0.61-1.91)	0.784	1.18(0.68-2.05)	0.557	1.43(0.81-2.54)	0.221
Yes	1.0(ref)		1.0(ref)		1.0(ref)	
Received iron supplementation during the last 6 months						
No	0.61(0.22-1.69)	0.342	0.87(0.29-2.63)	0.802	0.67(0.22-2.06)	0.488
Yes	1.0(ref)		1.0(ref)		1.0(ref)	
Child not allowed to eat certain foods						
No	2.48(0.32-19.17)	0.383	2.63(0.34-20.31)	0.353	NA	NA
Yes	1.0(ref)		1.0(ref)		NA	

Multivariable logistic regression

Multivariable logistic regression model was used to examine the null hypothesis of no association between child characteristics (age, sex, birth order and number of under-fives in household, age of solid food introduction and child feeding) and prevalence of underweight in Busia district.

The dependent variable was malnutrition coded as follows: 0 = normal weight, 1 = underweight. The variables were selected based on the levels of statistical significance in the bivariate analysis.

The following model equation was used in logistic regression:

Ln (Y_i / [1- Y_i]) = $\boldsymbol{B_0}$ + $\boldsymbol{B_1}$aget$_i$ + $\boldsymbol{B_2}$sex$_i$ + $\boldsymbol{B_3}$birth order$_i$ + $\boldsymbol{B_4}$under fives$_i$+ $\boldsymbol{B_5}$age solid foods$_i$+ $\boldsymbol{B_6}$child feeding$_i$

Table 15: Multivariate logistic regression of predictors of underweight in children 6-59 months in Busia district

	OR (95% CI)	**Standard error**	**Z**	**P value**
Age of child				
<1 year	1.00 (Ref)			
12-23 months	0.67(0.2-2.2)	0.41	-0.67	0.504
24-35 months	1.18(0.33-4.25)	0.77	0.25	0.8
36-47 months	0.95(0.25-3.57)	0.64	-0.08	0.939
48-59 months	1.05(0.28-3.98)	0.71	0.07	0.943
Sex				
Male	1.00 (Ref)			
Female	0.59(0.35-1.01)	0.16	-1.92	0.054
Number of under-fives within household				
<=2 under-fives within household	1.00 (Ref)			
>2 under-fives within household	2.17(1.12-4.2)	0.73	2.3	0.022
Age at which solid foods were introduced				
<6 months	1.00 (Ref)			
6 months and above	0.72(0.42-1.23)	0.2	-1.2	0.232
Birth order				
First	1.00 (Ref)			
Second	1.32(0.59-2.97)	0.55	0.68	0.496
Third or higher	1.9(1.02-3.57)	0.61	2.01	0.045
Who feeds the child?				
Parent	1.00 (Ref)			
Sibling	1.68(0.15-18.76)	2.07	0.42	0.673
Self	2.18(0.79-6)	1.13	1.51	0.132

DISCUSSION

In Kenya and the rest of Sub -Saharan African countries malnutrition is still a major health problem. MDG report 2013,showed that still one in eight people globally did not consume adequate food on regular basis to get their minimum dietary requirements and majority were in developing countries.[36] Kenya has met the 2015 Millennium Development Goal (MDG) target of reducing the prevalence of underweight children under -age 5 to 11 percent (Ministry of Devolution and Planning, 2013).

The objective of the study was to determine prevalence and the factors associated with malnutrition among children aged 6-59 months in Busia District. The study was carried out in December 2015 in 6 divisions of Busia district now part of Busia County.

The commonest form of malnutrition was underwent 15.5%, while those stunted were 13.3% and wasted were 14.8%The prevalence of stunting, underweight and wasting among children age 6 to 59 months were about 13.3%, 15.5% and 14.8%, respectively. Prevalence of underweight was slightly higher than national as well as regional figures of 11% and 9% respectively as per KDHS 2014 report. This could be attributed to the dry spells usually experienced in the region from December through to February.

Funyula division had the highest number of stunted children at 25.5% followed by Butula division at 19% and Busia Township at 13.8% .The main economic activities in Funyula and Butula is fishing with minimal food crop farming while in Busia Township it is trading with the neighboring Uganda.

Wasting was highest in Butula Division at 23.4% followed by Matayos and Funyula divisions at 18.5% and 16.3% respectively. Prevalence of underweight was highest in Funyula at 24.5% followed by Budalangi division (20.5%) and Butula division (20.3%).

Nambale division results showed that 11% of children were stunted, 12% wasted and 9.5% underweight. A comparable study done in Nambale division by Rhoda Azikoyo et al in 2012, to assess nutrition of children under 5 years in cassava consuming communities had shown a prevalence of stunting, wasting and underweight at 26.6%, 10.1% and 13.9% respectively. This shows remarkable decline in prevalence of stunting by 50% in this area.

Prevalence of malnutrition based on WHZ <-2 (20.7%), WAZ <-2 (23%) and HAZ <-2 (18.4%) was higher among children aged 24-35 months.

Male children also had higher malnutrition rates compared to females: WHZ <-2 (17.6 versus 11.8%), WAZ <-2 (17.6 versus 13.1%) and HAZ <-2 (18.8 versus 6.8%).

Females had lower odds of HAZ < -2 compared to male children (OR = 0.31, 95% CI 0.17-0.56), P < 0.001. Sex was not significantly associated with either WAZ < -2 (p = 0.073) or WHZ < -2 (p = 0.157). Age did not show statistically significant associations with malnutrition. This could be attributed to the fact that boys are more vulnerable to health inequalities than their female counterparts in the same age groups and increased attention being paid to female children, as well as reduced care and attention for older and weaned children.[37]

Prevalence of malnutrition was consistently higher in households that used unprotected water sources: WHZ <-2 (16 versus 10.1%), WAZ <-2 (16.8 versus 10.1%) and HAZ <-2 (14 versus 9.1%). This could be attributed to the fact that access to clean water will prevent the spread of water-borne diseases that can negatively affect the health and nutrition of young children. Access to unsafe water supply has been found as a risk factor for chronic malnutrition.[38]

Wasting (18.3%) and underweight (18.7%) was higher in overcrowded households compared to households with <3 people per room, WHZ <-2 (10.6%) and WAZ < -2 (11.6%). The remaining housing characteristics did not show consistent patterns with prevalence of malnutrition indices.

Children residing in overcrowded households had higher odds of malnutrition compared to those in households with less than 3 people per room: WHZ <-2 (OR 1.89, 95% CI 1.1-3.23, p = 0.021) and WAZ < -2 (OR 1.75, 1.04-2.95, p = 0.036). There was no significant association between malnutrition and type of housing, water source and toilet facilities.

The most common source of food for participating household was home grown foods 302 (61.3%). Eighty seven percent of households had two or fewer children aged below 5 years and the birth order for 219 (44.4%) of participants was third or greater (Table 8).

Malnutrition prevalence was higher among children in households with more than two children under five compared to those with two or fewer children in the age group: WHZ <-2 (28.3 versus 13%), WAZ <-2 (25 versus 14.1%) and HAZ <-2 (15 versus 12.7%).

There were no remarkable difference in malnutrition prevalence according to birth order of the index child or source of food within the household (Table 8). The odds of WHZ < -2 was two-fold higher in children residing in household with more than two under-fives (OR 2.65, 1.42-4.97, p = 0.002), compared to those with two or less under-fives. Similarly, the odds of WAZ <-2 was in households with at least 3 under-fives was twice that of household with two or less under-fives (OR 2.01, 1.05-3.82, p = 0.034), Table 9.

This is consistent with the results of a study done in Iran by Elham Kavosi et al to assess prevalence and determinants of under-nutrition in under 6 year children. Food intake and accessibility of healthcare decrease with higher family size especially in low income families. Mothers belonging to households with many children did not have time to care and feed each one of them.[37]

Higher birth order was also significantly associated with prevalence of malnutrition with the risk of malnutrition being 1.9 times greater in children of third or higher birth order compared to first borne children. This consistent with a study in India that showed that the risk of under-nutrition in higher birth orders (more than 3) was more than in first birth order.[39]

The odds of wasting, underweight and stunting were consistently lower in children in households headed by individuals with various levels of formal education (primary, secondary or post primary) compared to those with household heads reporting no formal education. Likewise, previous study done in Saudi Arabia showed that the higher the level of education of the head of household, the lower the prevalence of malnutrition in their children.[40] Children residing within female headed households had higher odds of HAZ < -2 (OR 2.18, 1.2-3.96, p = 0.01), compared to those in male headed households.

Prelacteal feeds were introduced in 57 (11.6%) cases, 277 (56.2%) children breastfed for at least 6 months (Table 12). Most 291 (59%) children had three to four meals daily and it was reported that 348 (70.6%) children usually fed themselves.

The prevalence of malnutrition indices were higher in children who were started on complementary feeds early before 6 months of life compared to those started after six months, wasting (19 versus 11.6%), underweight (18.5 versus 13%) and stunting(14.8 versus 11.6%).

The odds of WHZ <-2 were three times higher among children who fed themselves compared to those fed by parents (OR 3.07, 1.48-6.37, p = 0.003). Initiation of complementary feeds at or after 6 months of life was associated with lower odds of WHZ < -2 (OR 0.56, 0.3-0.92, p =

0.022). There was no statistically significant association between the anthropometric indices of malnutrition and reported history of Recent illness, immunization and supplementation .
The use of GPS in the mapping exercise ensured completeness and scalability in that it provided a complete picture by adding location components to the descriptive statistics collected from the field. It also ensured that data collected can be amenable to Geographical Information System(GIS) thus easy to integrate with other geographically referenced data for more advanced analysis whenever need arises.

CONCLUSION

The finding of this study indicates that malnutrition is still an important major public health problem among children 6-59 months of age in Busia district. High prevalence rate of malnutrition (wasting, stunting and underweight) among the under five children were observed, with variations among the divisions, indicating that the nutrition situation in study area needs to be addressed. The prevalence of malnutrition was significantly associated with number of under-fives in the households (p=0.02) and the child's birth order (p=0.045) . The risk of underweight was two times higher in a child from a household which had more than 2 under-fives compared to a child from a household with less than two under-fives (OR = 2.17, 95% CI 1.12-4.2, p = 0.02).

Higher birth order was also significantly associated with prevalence of underweight with the risk of underweight being 1.9 times greater in children of third or higher birth order compared to first borne children (OR = 1.9, 95% CI 1.02-3.57, p = 0.045).

STUDY STRENGTHS

1. This study was able to assess multiple outcomes and determinant factors at the same time thus short time was needed.
2. The study also allowed prompt feedback to be given to the mother/guardian about the nutritional status of the child and where there was need the child was referred to the nearest health facility for care.

STUDY LIMITATIONS

1. The study was cross-sectional in design, it neither represented seasonal variation of nutritional outcomes particularly to the wasting status nor established causal relationship.
2. Qualitative aspects of data were not included in this study to explore the associated factors and to strengthen the findings of the quantitative study through qualitative data.
3. The study was questionnaire-based, questions that required a good memory were vulnerable to recall bias.

RECOMMENDATION

1. Assessment and treatment of acute malnutrition through continuous nutrition and early warning information systems followed by response
2. Health Extension Workers (HEWs) and Community Health Volunteers should strengthen giving participatory nutrition education to create awareness and to develop behavior change communication for better feeding and caring practices among the community.

DISSEMINATION PLAN

Important findings were made available to guardian/parent of the study participant immediately after the assessment. A copy of the final report will be submitted to Busia County Health Executive Committee as feedback.

The study findings will also be presented to the University of Nairobi, Department of Pediatrics and Child Health staff and students.

I also hope to publish these results so as to disseminate the knowledge gained and hope to contribute towards reducing malnutrition in Kenya.

REFERENCES

1. De Onis M. Blossier. WHO Global Database on Child Growth and Malnutrition Doc /WHO/NUT/97.4)
2. R E Black, L H Allen, Z A Bhutta, et al (2008) 'Maternal and child undernutrition: global and regional exposures and health consequences', The Lancet, 2008, Jan 19, 371 (9608), 243–60.
3. Amy L. Rice, Lisa Sacco, Adnan Hyder, & Robert E. Black, Malnutrition as an underlying cause of childhood deaths associated with infectious diseases in developing countries, Bulletin of the World Health Organization, 2000, 78: 1207–1221.
4. Alive and thrive. Nutrition and brain development in early life Washington dc 2012
5. R Kar, Shobini L Rao and B A Chandramouli ,Cognitive development in children with chronic protein energy malnutrition Bhoomika ,Behavioral and Brain Functions 2008, 4:31
6. WHO Global Database on Child Growth and Malnutrition World Health Organization/Department of Nutrition for Health and Development CH - 1211 Geneva 27
7. Black, R.E., et al., 'Maternal and Child Undernutrition and Overweight in Low-income and Middle-income Countries', Lancet, vol. 382, no. 9890, 3 August 2013, pp. 427–451.
8. M. de Onis , C. Monteiro , J. Akré and G. Clugston, The worldwide magnitude of protein-energy malnutrition: an overview from the WHO Global Database on Child Growth Bulletin of the World Health Organization, 71 (6):703-712 (1993) World Health Organization 1993
9. Levels and Trends in Child Malnutrition: UNICEF/WHO/The World Bank joint child malnutrition estimates,2013
10. Kenya Counties Facts Sheets. Kenya Demographics and Health Survey(OF28) ,2014
11. Transforming our World: The 2030 Agenda for Sustainable Development ,United Nations, 2015
12. Government of Kenya (GoK). Ministry of Gender, Children and Social Development, 2012. Social Protection Policy.
13. Rhoda Azikoyo Nungo, Michael Wandayi Okoth, Samuel Kuria Mbugua Nutrition Status of Children Under-Five Years in Cassava Consuming Communities in Nambale, Busia of Western Kenya, Food and Nutrition Sciences, 2012, 3, 796-801

14. Black, Robert E., et al.Prevalence of Malnutrition and Associated Factors among Children Age 6-59 Months at Lalibela Town Administration, North WolloZone, Anrs, Northern Ethiopia Birara Melese Yalew Federal Ministry of Health Addis Ababa, Ethiopia.
15. Solomon Demissie1,Amare Worku ,Magnitude and factors associated with malnutrition in children 6-59 months of age in pastoral community of Dollo Ado district, Somali region, Ethiopia
16. Elham Kavosi, Zahra Hassanzadeh Rostami, and Mohammadreza Heidari Prevalence and determinants of under-nutrition among children under six: a cross-sectional survey in Fars province, Iran ,July 2014,Int J Health Policy Manag 2014;3:71-76.doi;10.15171/ijhpm.2014.63
17. UNICEF, Improving Child Nutrition, New York, United Nations Children's Fund (UNICEF) 2013
18. Reference: Measuring and interpreting Malnutrition and Mortality (manual); WFP and CDC; 2005
19. . Developing and Validating Simple Indicators of Dietary Quality and Energy Intake of Infants and Young Children in Developing Countries: Summary of findings from analysis of 10 data sets. Working Group on Infant and Young Child Feeding Indicators. Food and Nutrition Technical Assistance (FANTA) Project, Academy for Educational Development (AED), Washington, D.C., FANTA. 2006
20. Towards a food secure future', Africa human development report 2012, United Nations Development Program , 2012
21. Food and Agricultural Organization. The State of the food security in the world, 2014 report.
22. Kenya Food Security Steering Group (KFSSG) ,Kenya Food Security Outlook Update, February , 2015
23. John Hoddinott, John Malluccio, Jere Behran, Rafael Flores, Reynaldo Martorell, Effect of a nutrition intervention during early childhood on economic productivity in Guatemalan adults, The Lancet, 371,no.9631(2008):p411-416.
24. Cesar G. Victoria et al., Maternal and Child Under nutrition 2: Consequences for Adult Health and Human Capital, the Lancet 371, no. 9610 (2008): 340-71.

25. Owor M, Tumwine JK, Kikafunda JK, Socio-economic risk factors for severe protein energy malnutrition among children in Mulago Hospital, Kampala, East African medical journal vol. 77 no. 9 September 2000:471-5
26. Pelletier DL, Frongillo EA Jr, Habicht JP. Epidemiologic evidence for a potentiating effect of malnutrition on child mortality. 1993 Aug;83(8):1130-3
27. Based on malnutrition and infection – a review- Nutrition policy discussion paper No5. ACC/SCN June 93
28. Towards a food secure future', Africa human development report 2012, United Nations Development Program, 2012.
29. Cogill Bruce. Anthropometric indicators measurements guide. Food and nutrition technical assistance project academy for educational development Washington D.C 2003.
30. Physical status: the use and interpretation of anthropometry. Report of a WHO Expert committee. Geneva, World Health Organization, 1995 (WHO Technical Report Series, No.854)
31. Busia District Environment Action plan,5555 2009-2013
32. Kenya County Fact Sheets 2011,
33. The Kenya Human Development Report (2009)
34. Government of Kenya, Central Bureau of Statistics. Kenya Demographic Health Survey 2009
35. Republic of Kenya (RoK), "Busia District Development Plan 2002- 2008", Nairobi, Government Printer, 2001
36. UN Department of Economic and Social Affairs. The Millennium Development Goals Report 2013
37. Henry W, Anne NA, Stefan P, James KT and Thorkild T.,Boys are more stunted than girls in Sub-Saharan Africa: meta-analysis of 16 demographic and health surveys; BMC Pediatrics 2007, 7:17
38. Hunter PR, MacDonald AM, Carter RC. Water Supply and Health. PLoS Med.2010;7:e1000361. doi: 10.1371/journal.pmed.1000361.
39. Svedberg P. Why malnutrition in shining India persists ,NFHS23rev3 text doc./2008-11-25

40. Mohammad I. El-Mouzan, Abdullah A.Al-Salloum, Abdullah S.,Mansour M.,Ahmad A., Effects of education of the head of the household on the prevalence of malnutrition in children. Saudi Med J.2010 Mar;31(3):304-7
41. Harishankar, Dwivedi S. Nutritional status of children under 6 years of age. Indian J Prev Soc Med.2004;35:156-62

APPENDICES

ANNEX 1: QUESTIONNAIRE

PREVALENCE OF CHILHOOD MALNUTRITION AND ASSOCIATED FACTORS AMONG CHILDREN AGE 6-59 MONTHS IN BUSIA DISTRICT.

Questionnaire No …….. **.....**

Date of interview ……..……

Name of interviewer…….....

Division**.....**

Village**.....**

Personal Data for child 6-59 Months (Respondent is a parent or guardian)

Date of birth (dd/mm/yyyy) ……or Age: ☐ years ☐ months

Sex: ☐ Male ☐ Female

Weight ……..Kilograms.

Height ……..…Centimeters

Mid upper circumference …….Centimeters

DATA ON HOUSING

1) How many rooms are in the house? (Including kitchen if not separate)

☐

2) What is the roofing of the house?

a) Iron sheets
b) Grass-thatched
c) Tiles
d) Others (Specify)……

3) What is the type of walls for the house?

a) Mud
b) Bricks
c) Timber
d) Other (Specify) ……

4) What is the type of floor in the house?

a) Earth

b) Cemented

c) Other(Specify)..... …

5) a)Do you own the land you live on?.....Yes/No

d) If yes what is the size of the land? .....Acres

6) What is the main type of fuel used for cooking?

a) Gas

b) Paraffin

c) Charcoal

d) Firewood

e) Other (Specify) ……

7) What is the main source of water?

a) Community tap

b) Stream

c) Borehole

d) Other (Specify) ……

8) What type of toilet do you use at home?

a) Pit latrine

b) Flash toilet

c) None

HOUSEHOLD DATA

9) What is the main source of food in the household?

a) Bought

b) Home grown

c) Donated

d) Other (Specify)

10) How many people live in the household? ☐

11) How many under 5 years' children are in the household? ☐

12) What is the child's birth order? .....

DATA ON HEAD OF HOUSEHOLD

Age ……..……..

Sex ☐ Male Female ☐

13) Marital status

a) Single
b) Married
c) Divorced/Separated
d) Widowed

14) What is his/her Educational level?

a) None b) Primary
c) Secondary d) Post-secondary
d) Adult education e) don't know

15) Employment status

a) Casual b) Self-employed
c) Unemployed d) don't know
e) Employed

DATA ON MOTHER- CHILD PRACTICES

16) What was the age of mother at delivery of first born? ☐

17) What was the age at delivery of lastborn? ☐

18) Was the child given any feeds before initiating breastfeeding...? Yes/No

If yes what was the child given...

a) Water only
b) Salty water solution
c) Glucose drink
d) Non-human milk
e) Honey
f) Others specify.....

19) After how long was breastfeeding initiated after birth?

a) Less than 30 min
b) 30 min - 1 hr

c) 1hr - 6hrs

d) More than 6 hrs

20) At what age was the child introduced to complementary feeds? ☐

21) What was the age at cessation of breastfeeding ☐

22) How many times is the child fed per day?

a) 2-3 times

b) 3-4 times

c) More than 4 times

23) Who feeds the child?

a) Parent b) Sibling

c) Self d) others (specify)

24) Has the child had diarrhea in the last 7 days?.....Yes/No

25) Has the child had acute respiratory tract infection in last 7 days?.....Yes/No

26) Has the child ever been immunized...? Yes/No

If yes when was the last time?

a) Less than 3 months b) 3-6 months c) more than 6 months ago

27) Has the child received measles vaccine?.....Yes/No

28) Has the child been given vitamin A in the last 6 months?.....Yes/No

29) Has the child been given iron supplements in the last 3months...? Yes/No

30) Are there foods that the child is not allowed to eat...? Yes/No

If yes specify.....

ANNEX 2: CONSENT EXPLANATION FORM

My name is Dr. Nakhabi Jela Phoebe, a post graduate student in Master of Pediatrics University of Nairobi. I am conducting a research study on prevalence of malnutrition and associated factors among children age 6-59 months in Busia district. I would like to request you and your child to participate in my research study. The purpose for this consent form is to give you information that you may need to help you decide whether to participate in the study.

OBJECTIVE OF THE STUDY

To conduct a nutritional assessment on children aged 6-59months and find out factors that are associated with malnutrition.

PROCEDURE

If you agree your child to join this study you will be asked questions relating to your social wellbeing, environment, feeding practices, and child caring practices that may contribute your child's nutrition state. Upon completion of the questionnaire, measurements of his/her weight, height and mid upper arm circumference will be taken.

RISKS

No experimental investigations or products will be employed in this study therefore there are no foreseeable risks to their health or well-being by participating in this study.

BENEFITS

The results of the assessment will be given to you individually. Nutritional advise will be given to you and your child appropriately and free of charge and if need be for admission we will refer you to Busia District Hospital

VOLUNTARISM

Participation in this study is purely voluntary and you can choose to opt out of the study at any stage without any penalty.

COMPENSATION

No compensation will be offered for participation in the study.

CONFIDENTIALITY

All information collected will be kept securely and used only for data analysis and not for other purposes not indicated in the study.

If you agree that your child joins this study you will be required to sign a consent form

CONTACT INFORMATION

If you have any questions about the study, your participation in the study or your ethical rights as a research participant you can contact the following people;

PRINCIPAL INVESTIGATOR

Dr. Jela Nakhabi Phoebe, MB.ChB
University of Nairobi
Mobile No:+254 711 862237
E-mail:dr.jelaphoebe@gmail.com

SUPERVISOR

Dr. Ahmed Laving, MB.ChB, MMed. Gastroenterologist
Lecturer, Department of Pediatrics and Child Health,
University of Nairobi
E-mail:arlaving@yahoo.com

Dr. Daniel Njai, MB. ChB, MMed.
Lecturer, Department of Pediatrics and Child Health,
University of Nairobi.
E-mail: drdanielnjai@yahoo.com

Kenyatta National Hospital/University of Nairobi/ Ethics and Research Committee (KNH/UON/ERC)
Phone No: (254-020)726300-9
E-mail:uonknh_erc@uon.bi.ac.ke

ANNEX 3: CONSENT FORM

I…….. The parent(s)/ guardian(s) to the child, have read the above explanation and after being well informed by Dr. Nakhabi Jela Phoebe and understood do agree that the child participate in the study on **PREVALENCE OF CHILHOOD MALNUTRITION AND ASSOCIATED FACTORS AMONG CHILDREN AGE 6-59 MONTHS IN BUSIA DISTRICT.**

I am also aware that I can choose to withdraw them from the study at any point without any penalty.

SIGNED……

WITNESS…….

DATE…….

ANNEX 4. SWAHILI CONSENT

Jina langu ni Daktari Nakhabi Jela Phoebe, mimi ni mwanafunzi wa chuo kikuu cha Nairobi, anaye somea shahada ya juu ya uuguzi wa watoto.

Nafanya utafiti kuhusu visa vya utapiamulo kwa watoto walio na umri wa kuanzia miezi sita hadi miezi hamsini na tisa.

Pia nitaulizia kuhusu sababu ambazo zinaezachangia kusababishwa kwa utapiamlo kwa mfano, aina ya vyakula,mazingira ya nyumbani,hali ya kupata riziki na pia magonjwa ya kuharisha.

JINSI YA UTAFITI

Ukikubali mtoto wako ahusike katika utafiti huu,wewe kama mzazi utaulizwa maswali kisha mtoto atafanyiwa vipimo vya uzito ,urefu na pia atangaliwa kama kuna tatizo la kiafya lolote.

HATARI

Utafiti huu hauweki wewe ama mtoto wako kwa hali ya hatari yoyote. Hakuna vipimo vyovyote vitafanywa vinavyohusu kudungwa wala kukatwa kwako ama mtoto wako.

USIRI

Kuna uhakikisho kwamba habari yoyote itakayopatikana kutoka kwa huu utafiti itawekwa kwa usiri na kutumuka tu kwa utafiti.Jina la mtoto wako ama lako halitaandikwa kwenye makaratasi yanayotumika

MANUFAA

Manufaa utakayopata kwenye utafiti huu ni kuwa utaweza kufahamu hali ya lishe ya mwanao na pia utafunzwa jinsi ya kusaidia kurekebisha iwapo utafiti utaonyesha utapiamulo

KUJITOLEA

Hakuna malipo yoyote itapeanwa kwenye utafiti huu na ikiwa utakubali kuhusika kwenye utafiti huu itakuwa kwa hiari.Unayo haki ya kukataa kushiriki kwenye utafiti huu wakati wowote bila tashwishi yoyote**.**

MAWASILIANO

Ukiwa na maswali yoyote unaeza uliza wakati huu au uwasiliane kutumia anwani zifuatazo:

MTAFITI MKUU

Dr. Jela Nakhabi Phoebe, MB.ChB
Mwanafunzi Chuo kikuu cha Nairobi
Simu ya rununu:+254 711 862237
Barua pepe:dr.jelaphoebe@gmail.com

WASIMAMIZI

Dr. Ahmed Laving, MB.ChB, MMed. Gastroenterologist
Mkufunzi, Sehemu ya Mafunzo ya Watoto
Chuo kikuu cha Nairobi
Barua pepe:arlaving@yahoo.com

Dr. Daniel Njai, MB. ChB, MMed. Mkufunzi, Sehemu ya Mafunzo ya Watoto
Chuo kikuu cha Nairobi
Barua pepe:drdanielnjai@yahoo.com

Kenyatta National Hospital/University of Nairobi/ Ethics and Research Committee (KNH/UON/ERC)
Barua Pepe:uonknh_erc@uon.bi.ac.ke

ANNEX 5 CONSENT IN LOCAL DIALECT - BASAMIA

Mmeta nese Omulesi Nakhabi Jela Phoebe,ndi musomero elia akulu mmalwaliro ka-abaana khatula mukoleji ya Nairobi.Khubikha bino ndikhweka nende okonya makhuwa ko bulamu bwa abaana nende kosi kebiakhulia mumibiri chiabwe.

Esifune sia esomero lino

Okhukonya, nende okhubona khumanye makhuwa akachaana nende ebiakhulia mumibiri chia abaana bie miesi 6 khwola 59.

Nga -kachaana

Nofukirira omwana wao abe mulala khunibo bala abelekhonyiswa khumeeko kano ,amateebo kosi akachaana khulukhasi/khulusaacha,bukhongo bwoomwana akulu wa makhuwa kosokosi akedala liao kaladakhikhana.

Mubumaririsi,oburei,obusito nende obukhomefu bwe mikhono chiomwana wao bulabukulwa.Obusanjirani bwao mumeeko kano noblekhule ne onyala watulamo bikha biosi biosi nodakha bila obudinyu bwosi bwosi.

Amadinyu

Bubulao obudinyu nomba obuchuni obutulana nende ameeko kano.Makhuwa kosi khumwana wao kalekholekha khumubiri tali mukati wo mubiri da.

Obulai

Embosi yosi ilanyokhana khumwana wao khunakhuberesa ewe omwibusi nende omwana wao bikhaya. Nikhunanyola mbwe omwana wao adakha obukhonyi nende obulesi khunakhutuma mulwaliro khongo lia Busia

Obwesikwa

Kala kosi kalanyolekhana kumwana sikakhoya kamanyikhane ne khandi kanabikhwa bulayi okhewkhoniswa khusomero lino liong'ane.

Nofukirira omwana wao okhubaokhusomero lino taakho olwala lwao ano

FUKIRIRE

Ese.....Omwibusi/Omulesiwo omwana uno somere khandi mbulire kosi kadakhikhana khusomero lino nga Omulesi Nakhabi Jela Phoebe abolire fukirira omwana wange asaangirane mukhukhwikhone serwa khumeeko kano aka biakhulia nende koi akachaana nende obulamu bwa abana be miesi 6-59 mu Busia.

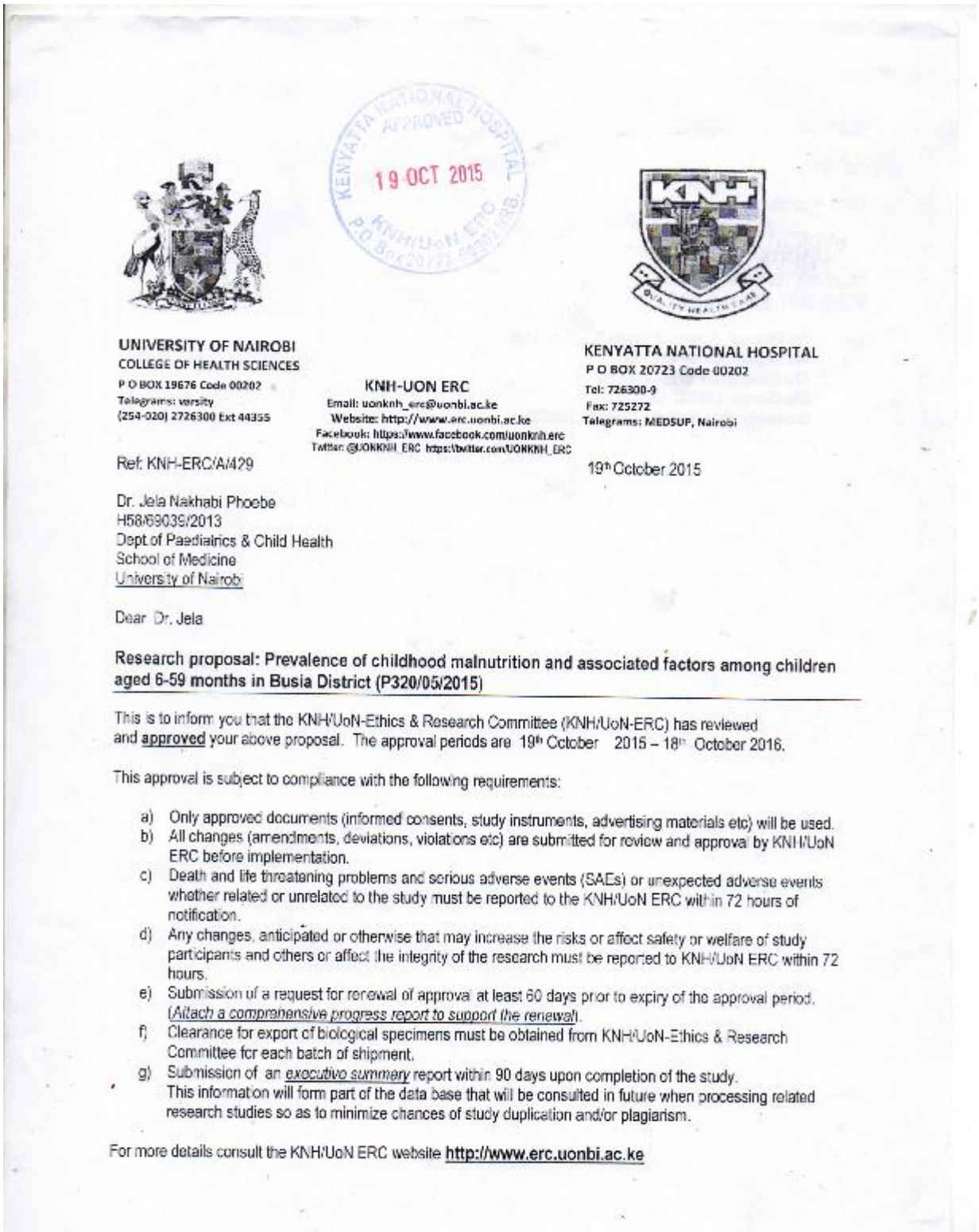
Emanyire khandi mbwe enyala ndatulamo nindakha bikhaya.

Saini ya mwibusi.....

Omuloli.....

Ludalo.....

ANNEX 6: KNH ETHICAL APPROVAL LETTER



KENYATTA NATIONAL HOSPITAL APPROVED 19 OCT 2015 KNH/UoN ERC P.O. BOX 20723-00202 NAIROBI

UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
(254-020) 2726300 Ext 44355

KNH-UON ERC
Email: uonknh_erc@uonbi.ac.ke
Website: http://www.erc.uonbi.ac.ke
Facebook: https://www.facebook.com/uonknh.erc
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/429

19th October 2015

Dr. Jela Nakhabi Phoebe
H58/69039/2013
Dept of Paediatrics & Child Health
School of Medicine
University of Nairobi

Dear Dr. Jela

Research proposal: Prevalence of childhood malnutrition and associated factors among children aged 6-59 months in Busia District (P320/05/2015)

This is to inform you that the KNH/UoN-Ethics & Research Committee (KNH/UoN-ERC) has reviewed and **approved** your above proposal. The approval periods are 19th October 2015 – 18th October 2016.

This approval is subject to compliance with the following requirements:

a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
b) All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH/UoN ERC before implementation.
c) Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH/UoN ERC within 72 hours of notification.
d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH/UoN ERC within 72 hours.
e) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*).
f) Clearance for export of biological specimens must be obtained from KNH/UoN-Ethics & Research Committee for each batch of shipment.
g) Submission of an *executive summary* report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/or plagiarism.

For more details consult the KNH/UoN ERC website **http://www.erc.uonbi.ac.ke**

Yours sincerely,

PROF. M.L. CHINDIA
SECRETARY, KNH-UoN ERC

c.c. The Principal, College of Health Sciences, UoN
The Deputy Director CS, KNH
The Chairperson, KNH/UoN-ERC
The Director, UNITID, UoN
Supervisor: Prof.Walter O. Mwanda, UNITID