SCHOOL OF PUBLIC HEALTH

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ASSESSING THE NUTRITIONAL STATUS OF CHILDREN UNDER-FIVE YEARS IN A FISHING COMMUNITY IN EKUMFI DISTRICT OF THE CENTRAL REGION GHANA.

BY

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DECLARATION

I hereby declare that with the exception of references cited to other people's work which has been duly acknowledged, this work is the result of my own research work done under supervision and has neither in part or whole been presented elsewhere for another degree.

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Date …….

DEDICATION

I dedicate this work to my lovely mother Mrs Mary Nuako Bandoh

ACKNOWLEDGEMENT

I thank God for his grace that has brought me this far in my academics.

I wish to express my sincere gratitude to my academic supervisor, Dr Kenu of School of Public Health for his guidance, contribution and mentorship.

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May God richly bless you all, I would not have come this far without you.

ABSTRACT

Malnutrition is a major problem in the world especially in developing countries. It is responsible for over a million direct and indirect causes of death worldwide especially in under-fives. In spite of the abundance of protein in fishing communities, they are not spared of this problem. One successful way of tackling this problem is assessment of nutritional status of populations and coming up with appropriate interventions. The study sought to assess the proportion of children under-five who were malnourished and to identify some of the major factors associated with malnutrition there.

A community based cross-sectional study was conducted in April 2015 to assess the nutritional status of children aged six to fifty-nine (6-59) months in Ekumfi Narkwa and identify factors leading to malnutrition in the community. A total of two hundred and fifty (250) children and their caregivers were involved. A pre-tested, structured, interviewer administered questionnaire consisting of mothers' childcare practices, child and socio-demographic factors, dietary, clinical assessment and anthropometric measurement was used to gather data. Clinical assessment was done by physical examination of the child. Data was entered with Microsoft Excel 2010. WHO Anthro software version 3.2.2 was used in determining the z-scores and STATA software version 12 was used to perform univariate, bivariate and multivariate logistic regression analysis.

The rate of malnutrition was 27.6% (under-nutrition 26.4%, over-nutrition 1.2%). The rate of stunting, wasting and underweight were seventeen point six percent (17.6%), four point four percent (4.4%) and twelve percent (12%) respectively. Neither consumption of fish nor any other factor from the study was found to be significantly associated with the nutritional status however stunting was associated with the age group of the caregiver. Less than one-third (23.6%) of the children were fed less than

four food groups a day. More than half the children (66.8%) showed at least one clinical sign of nutrient deficiency.

These findings suggest that education on infant and young child care and feeding practices need to be re-structured to suit the population. Also more efforts such as periodic assessments need to be put in help reduce the prevalence of malnutrition.

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LIST OF ABBREVIATIONS

BA	-	BMI –for- age
BAZ	-	BMI –for- age Z-score
BMI	-	Body Mass Index
CDC	-	Centre for Disease Control
CHPS	-	Community-based Health Planning and Service
FAO	-	Food and Agriculture Organization of the United Nations
GDHS	-	Ghana Demographic and Health Survey
GHS	-	Ghana Health Service
GSS	-	Ghana Statistical Service
HA	-	Height – for – Age
HAZ	-	Height – for – Age Z - Score
MGRS	-	WHO Multicentre Growth Reference Study
TBA		Traditional Birth Attendant
UNICEF	-	United Nations Children's Fund
WA	-	Weight – for – Age
WAZ	-	Weight – for – Age Z – Score
WFP	-	World Food Program
WHO	-	World Health Organization

DEFINITIONS OF TERMS

Dwelling unit	A specific area or space occupied by a particular household and therefore need not necessarily be the same as the house.
Household	A person or a group of persons, who lived together in the same house or compound and shared the same house-keeping arrangements.
House	Structurally separate and independent place of abode such that a person or group of persons can isolate themselves from the hazards of climate such as storms and the sun
Stunted	Height–for–age below minus two standard deviation of the median
Underweight	Weight–for–age below minus two standard deviation of the median
Under-five	A child between the ages of 0 to 59 months
Wasted	Weight–for–height below minus two standard deviation of the median
Z-score	Standard deviation units from the median reference population

CHAPTER ONE

INTRODUCTION

1.1Background

Malnutrition is the greatest threat to global health and survival and leads to increased morbidity and even death. It is therefore an issue of public health concern. Children are the most vulnerable to malnutrition because they are stilling developing (de Onis et al., 2004). Over one third of the children under-five are malnourished worldwide. If children are not able to meet their nutrient needs in these early years of their lives, it has lifelong consequences on them. This is because it turns to affect their physical, psychological and mental development (European Commission, 2008; United Nations Children's Fund-World Health Organization- The World Bank., 2012). This can lead to low human capacity and reduced economic productivity in the future.

Most African countries including Ghana suffer the consequences of malnutrition because of their high malnutrition rates. The Nutrition and Consumer Protection Division of Food and Agriculture Organization of the United Nations(FAO) (2009), classifies Ghana as a country with medium severity of malnutrition. Child malnutrition and health has been a major challenge and thus has become an issue of key importance to the nation (Ministry of Health, 2007).

One important step in solving this problem of malnutrition is by identification of places with high rates and the factors associated with it (Nikoi, 2011). Nutrition surveys are examples of the right tools to be used for this purpose.

Nutrition surveys are carried out to determine the overall nutritional status of a population, identify those at higher risk and also characterize the extent and nature of malnutrition within the same population (Wasantwisut et al., 2007).

In spite of the abundance of fish in fishing communities, people living in fishing communities are generally thought to be at a high risk of malnutrition(Baker-French, 2013). They are characterized by poverty and food insecurity due to the serious problems they face such as migration of populations, rapid population growth and lack of alternate sources of income (Food and Agriculture Organization of the United Nations (FAO) Fisheries and Aquaculture, 2014).

Ghana shares its boundary on the south with the Gulf of Guinea and its coast stretches for a distance of about 560 kilometres (Ghana Ministry of Information, 2006). All the communities along this long stretch of coast are fishing communities with fishing as their main economic activity. These small scale fisheries actually serve as a major source of animal protein for millions of people in developing countries such as Ghana. According to (FAO Fisheries and Aquaculture, 2014 fish accounts for about 50% of our total animal protein intake. Thus the health status of our fishing communities should be of concern to the nation.

In Ghana, little is known about the state of our fishing communities with respct to their health and nutritional status. Assessing their nutritional status is a step in the right direction towards solving the malnutrition problem in our country.

More of these studies need to be done in various places to help identify its causes and find solutions to reduce the prevalence of malnutrition in Ghana so that our children can develop to their maximum potential and project the image of our beloved country further.

1.2 Statement of Problem

Malnutrition is a worldwide problem. Globally, nearly 870 million people are under nourished (FAO, 2012). Child malnutrition was associated with 54% of

child deaths worldwide (Blössner and de Onis, 2005). In Africa, malnutrition affects over 200 million children below five years old, thus they fail to reach their potential cognitive development (Grantham-McGregor et al., 2007).

Ghana is not spared this problem. Children under-five years form about 15% (3.9 million) of the country's population.(GSS, 2010) and the Demographic Health Survey 2008 indicates that 28% of the children under-five are stunted, which a measure of chronic malnutrition. Central region, recorded a far higher rate of 34% for under-five stunting. An early study in the Mfantsiman district, (from which the new Ekumfi district was formed,) of the same region revealed that their rate of malnutrition was 20.2% (GSS, 2003). This means, the rate of malnutrition in the region has worsened over time.

The nutritional status of specific communities in this district is not known. However, literature of other places reveals that nutrition is relatively low in fishing communities in spite of the abundance of protein (FAO Fisheries and Aquaculture, 2014)

This study seeks to assess the nutritional status of under-fives in Ekumfi Narkwa, and the factors associated with malnutrition in this area.

1.3 Conceptual Framework: Nutritional Status of a Child

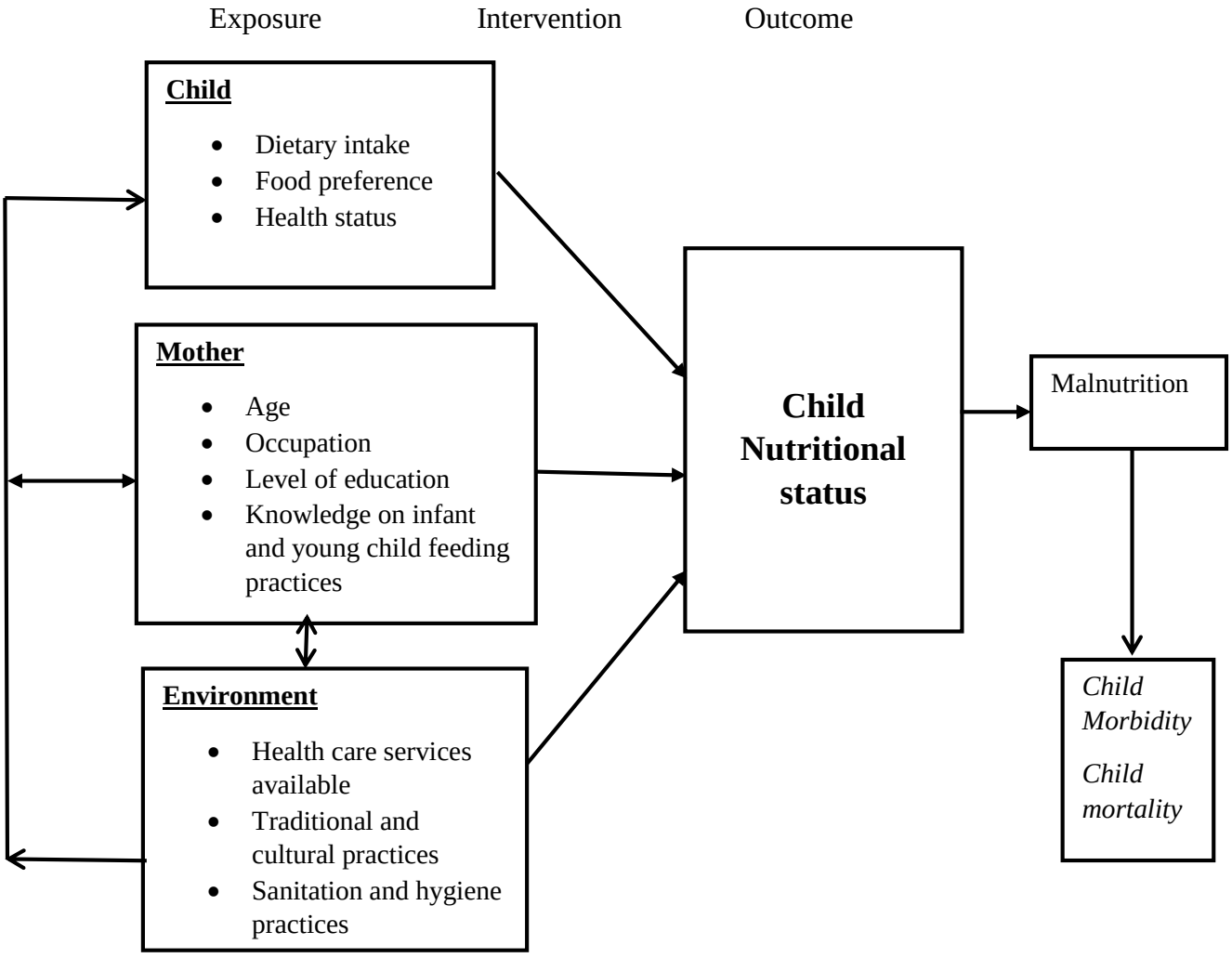

Figure 1: Conceptual Framework: Nutritional Status of a Child

Conceptual framework explained

Malnutrition can be described as the entire range of problems that occur when nutrient intake from our diet is insufficient or excessive for our bodies (FAO, 2010). It can be caused by a lot of factors which are interconnected. For the purpose of this study, only a few of the factors have been selected to be assessed. These include the following.

Mother:

The mother plays a very important role in the determination of the nutritional status of her child. Nti & Lartey, 2006 reveals that there is a significant relationship between the two. In most cases, the mother is the primary care giver of the child in the early years of its life and thus has a lot of influence on what the child feeds on. The mother can affect the nutritional status of her child with her own nutritional status. This could be because she spends most of her time with the child and feeds the child what she eats.

Also the mother's knowledge on infant and young child feeding practises affects the child's nutritional status. In the same way, the mother's occupation can have an effect on the nutritional status of the growing child.

Child:

The child can directly determine what their nutritional status would be. This could be from their dietary intake whether they are able to take in much food or not, their food preferences and their own eating pattern they may have adopted.

Environment:

Aside these major factors, the environment of the child may indirectly affect its nutritional status. Access to primary health care may positively affect the child if the mother pays frequent visits to the facility and/ or practise what she is taught at the facility.

Cultural norms and traditions of the community may indirectly affect the child's nutritional status. In the same way the nature of the community whether rural, urban or peri-urban may also determine the nutritional status of the child. The rate of malnutrition it generally higher in rural areas than in urban areas (GSS et al., 2009).

The sanitation and healthcare practices of the community could also have an impact on the nutritional status of the child.

Interventions and outcome:

The actions of the mother and the environment directly and indirectly affect the child's nutritional status. Knowledge on causes and prevention of malnutrition, good infant and young child practices in the community and support environmental beliefs and practices improve the child's nutritional status and prevent malnutrition which leads to morbidity and eventually death. Should malnutrition occur in spite of all these interventions, treatment for malnutrition available at the health facility in the community need to be applied in tackling the problem. This would prevent further morbidity and death due to malnutrition.

1.4 Justification

Malnutrition in infants is a major problem in developing countries including Ghana. Fortunately, malnutrition is highly preventable and something can be done to save millions of children who die every year as a results of malnutrition (Daelmans et al., 2009). This problem needs to be solved. One way of doing this is by identifying places with high rates of malnutrition and the underlying factors in those areas so that the right interventions are put in place. This can be done by assessment of the nutritional status of infants the community and coming up with the right interventions for them.

Assessing the nutritional status of children, is a way of determining their health status since knowledge of the health status of under-fives in the community is a sensitive indicator of the overall health of the community (Amosu et al.,

2011;World Food Programme (WFP) & Center for Disease Control and Prevention (CDC), 2005).

Besides, this assessment would provide information on causes of malnutrition for more effective interventions to be rolled out to help solve the problem of malnutrition in Ghana as a whole. This is because malnutrition is internationally recognized as an important public health indicator for monitoring nutritional status and health in populations (de Onis et al., 2004).

In developing countries, where under-nutrition is a problem, there is the need to assess the nutritional status of fishing communities since they contribute to food security and improving nutrition of the nation (Kawarazuka, 2010). In addition, (Nikoi, 2011) reveals that assessing nutritional status of fishing communities would help in the identification of specific localities and their specific nutritional needs, so that resources can be sent to appropriate target areas.

1.5 Objectives

1.5.1 General Objective

To access the Nutritional Status of Children Under-five years in Ekumfi Narkwa, a Fishing Community in Ekumfi District of the Central Region, Ghana.

1.5.2 Specific Objectives

a. To assess the proportion of children under five years who are malnutrition in Ekumfi Narkwa, a Fishing Community in Ekumfi District of the Central Region, Ghana.
b. To determine factors facilitating malnutrition in this fishing community

1.6 Research Questions:

1. What is the Nutritional Status of Children under-five in Ekumfi Narkwa in the Ekumfi District of the Central Region, Ghana?
2. What proportions of the children are malnourished?
3. What are the factors leading to their current nutritional status?

CHAPTER TWO

LITERATURE REVIEW

2.1 Malnutrition

WHO defines malnutrition as deficiencies, excesses or imbalances in intake of energy, protein and other nutrients. This is the effect of being unable to meet ones nutrient needs continually over a period of time. Child malnutrition has been and is still a major problem in the world. Various studies have been conducted and are still being conducted, all in an attempt to solve the problem of malnutrition. In spite of all these efforts, each year, 4.6 million children under-five die due to malnutrition (World Health Organisation "WHO", 2009).

2.2 Malnutrition in fishing communities

Under-fives are known to have a higher risk of malnutrition especially in fishing communities. These communities are characterized by the presence of fish and its high consumption because of its abundance. However, a study in Malawi revealed that though prevalence of malnutrition was lower in fishing households than in non-fishing household, malnutrition was not associated with fish consumption but rather with other factors such as high income and breastfeeding practices (Aiga et al., 2009).

2.3 Trends in child malnutrition

According to (UNICEF, 2014) there has been a 37% drop in stunting worldwide since 1990. The GDHS 2008 also reported there has been a steady decrease in the rate of malnutrition in Ghana over the years. However, an evaluation of child malnutrition trends over the years done by UNICEF-WHO- The World Bank.(2012), points out that the progress made is insufficient and millions of children still have low chances of survival if the current trends continue. de Onis et al., (2004) had early observed an

uneven progress in the trend, with Africa showing very little improvement compared to Eastern and South-Eastern Asia. Therefore, new ways of tackling the malnutrition in Africa need to be looked into to help eradicate the problem and save millions of innocent lives. Akorede & Abiola (2013) in their recommendation on solving the problem on malnutrition suggested that periodically, nutritional assessments should be conducted to help track the progress being made to solve the malnutrition problem. Thus there is the need to assess nutritional status of communities.

2.4.0 Nutritional status

This refers to the one's state of health as depicted by the quality of nutrient intake and the body's ability to utilize them for metabolic needs (Amosu et al., 2011). The nutritional status gives an indication of the health of an individual in terms of what they consume or better still one's current state of health after the body has made use of the food they take. The evidence of the effect of our dietary intake is visible on the human body and thus can tell us a lot about the state of health of an individual.

2.4.1 Nutritional status of under-fives

In children under-five, nutritional status is a reflection of the child's overall health (GSS, 2011). It is also an accepted indicator for nutritional wellbeing and health of their community (WFP & CDC, 2005). It is not surprising most studies seek to assess the nutritional status of children under-five.

2.5.0 Assessment of nutritional status

Assessment of ones nutritional status tries to give an interpretation of what the body lacks, has in right amounts or has in excess. It helps in identification of people with nutritional deficiencies and the type of deficiencies they have.

Nutrition status can be determined by either one of the following method or a combination of them. According to (Maqbool et al., 2008), every nutritional assessment requires one or more of these for better interpretations since no single method provides an adequate assessment of nutritional status. They include anthropometry, biochemical analysis, clinical assessment and dietary assessment. The gold standard for assessing of nutritional status of a population is by combing all four methods ; anthropometry, biochemical, clinical and dietary methods (Wasantwisut et al., 2007). The purpose of these indicators is to measure long term nutritional imbalance and malnutrition.

2.5.1 Dietary assessment

This involves a measure of dietary intake and one's feeding ability. It can be used to measure both nutrient and food intake. Dietary assessment involves different methods. It includes individual dietary assessments, food frequency questionnaires, household survey methods and simple food list. It is an essential component of nutritional assessment because it provides information about the amount, and quality of food consumed and also eating patterns and behaviours of the family (Maqbool et al.,2008). In nutritional assessments of children, it gives an idea of the child's intake over a specified time period. It is most at time used as a reflection of the child's diet.

2.5.2 Biochemical assessment

Biochemical assessment is used in assessment of the nutrients in the body. It involves collection of laboratory samples to assess nutritional status. Samples such as blood and urine are taken form the individual. These tests are done to assess the level of biological markers in the body. These makers are used to determine levels of nutrients the body contains ((Maqbool et al., 2008).

2.5.3 Clinical assessment

Signs of malnutrition may be seen on the body of the individual. These signs can be seen by close observation. Maqbool et al.(2008) elaborates on clinical assessment; it involves the close examination of ones' physical body such as skin, hair and teeth. This is done to find evidence of specific nutritional deficiencies. Clinical assessment serves as a valuable aid in detecting nutritional deficiency since it requires little expertise.

2.5.4. Anthropometry

Duggan, (2010) describes anthropometry as a useful tool for monitoring growth and nutritional assessment which has been used for a long time as a diagnostic tool for grading malnutrition. He further describes it as a deceptively simple tool for nutritional assessment of individuals because of its objectivity and relatively low technology required in its usage. Anthropometric measurements are most widely used indicators for nutritional status in a community. It can be used to determine prevalence of malnutrition in a survey population (WFP & CDC, 2005). It is also used to assess growth and development especially in young children.

Anthropometry involves taking body measurements such as weight, height, mid-upper arm circumference and comparing them to the WHO growth standards. These body measures are used to formulate indicators that give some information on the nutritional status of the child. There are three main indicators used in assessing nutritional status of children by anthropometry they are height-for age, weight-for-height and weight – for-age.

2.5.1. Anthropometric Indices

Height -for-age

It measures linear growth. Faltering in linear growth is detected as low height for age and is referred to as stunting. It reflects chronic malnutrition (malutriton over a long period of time) which results from prolonged inadequate nutrient intake (GSS, 2011). Stunting is the greatest problem of the three indicators and can also result in underweight. Thirty-one (31%) of children in low and middle income countries are stunted (Prentice, Greshwin, Schaible, Keusch, & Gordon, 2008). Even in Ghana, stunting has been the greatest problem, twenty-eight (28%) of the children under-five are stunned (GSS et al., 2009).

Weight -for -height

This measures the child's weight versus their height. A child with a low weight for height is referred to as wasted. This is a measure of acute malnutrition (malnutrition of a short period of time) that is recent nutrition deficiency (Prentice et al., 2008). This indicator shows significant changes associated with the availability of food or disease prevalence (GSS, 2011).

Weight -for -age

This assess the weight of the child for his age and is a measure of long and short term malnutrition (Prentice et al., 2008). A child with a low weight-for-age is referred to as underweight (GSS, 2011).

2.6 Factors leading to malnutrition

Malnutrition is caused by multiple and interrelated factors. According to (Iram & Butt, 2006), food issues are just one aspect of the multiple factors that lead to malnutrition.

Thus, malnutrition causes may include food factors and non-food factors. Different studies have come up with various factors leading to malnutrition.

2.6.1 Maternal factors

Nyaruhucha et al (2006), in a study assessing the nutritional status of children under-five in Tanzania revealed that mother's age, educational level, marital status were significantly linked with the child's nutritional status. Akorede & Abiola (2013) and Iram & Butt (2006) in similar studies done in Nigeria and Pakistan respectively also confirm that maternal factors such as age and level of education are important determinants of the child's nutritional status. Younger mothers are more likely to have undernourished children due to their inexperience and inability to take good care for the child (Akorede & Abiola, 2013; Nyaruhucha et al., 2006).

Contrary to this, Nikoi (2011) found that in Ghana, paternal education and maternal occupation had no significant relation with child nutritional status.

2.6.2 Environmental Factors

Duggan (2010) reveals that the environment has a greater impact on early child growth than genetics. Thus the environment in which the child grows cannot be overlooked when determining factors which may lead to malnutrition in children. Nikoi (2011), also found out that household water supply, and percentage of district residents in rural or urban area location have a positive correlation with the nutritional status of the child. In agreement with this, Iram and Butt (2006) confirmed by their findings that nutritional status depends on sanitary conditions in which the child lives. They explain that sanitary conditions influence the prevalence of diseases and infections. In his work on sanitation environment and its implications on child health, (Buttenheim, 2008) emphasized that improved sanitation positively affects the health of the child. Since Malnutrition and

infections interact closely, poor sanitation would invariably lead to malnutrition and even child mortality.

2.6.3 Child factors

The age of a child is an important factor in nutrition especially after six months. This is the stage where the child is introduced to complementary food and is later weaned off breast milk. Inability of a child to adjust to intake of solid foods could prevent them from meet their nutrient needs during this stage and this can lead to malnutrition (Macharia et al., 2005). They also add that previous exposure to infection in children may lead to reduced dietary intake, reduced health and eventually malnutrition. According to (Prentice et al., 2008), infections lower the child's resistance to diseases and act hand-in-hand with malnutrition. Thus, the child's current health state can affect their nutritional status.

CHAPTER THREE

METHODS

3.1 Type of Study

The study was a cross-sectional study involving children between the ages of 6-59 months and their caregivers.

3.2 Study Location/ Area

Ekumfi Narkwa is found in the Ekumfi district which was formed in 2012. It was carved out of the Mfantsiman district. The district is located along the coastline of the Central region.

Ekumfi Narkwa, is the second most densely populated town in the Ekumfi district thus it could serve as a good representation for the district. It is one of the nine fishing communities in the district and has a population of 4169 with 506 children under-five (GSS), 2014), It is bounded on the north by Nanabin on the south by Ekumpoano, on the west by Ebuakwa and on the east by the Gulf of Guinea.

The community is an urban community and connected to the national electricity grid and has a tarred road which links it to the main Accra - Cape coast road. The community has a Community based Health Planning and Services (CHPS) compound with health workers resident in the facility. In addition, it has two chemical sellers, a private clinic and a number of traditional and spiritual healers. It also has two public basic schools and a private basic school.

The major economic activity in the community is fishing and selling of the fish in either the raw or smoked state. Every year, during the lean fishing season, most of the fishermen migrate to the western region to continue their fishing activities. Their wives

and children go along with them to facilitate the handling and selling of the fish. Other economic activities in the community include salt production, trading, rearing of livestock (mainly pigs), crop farming, including pineapple, maize and other vegetables.

This newly formed district is a first class investment and tourism destination (Okyere 2014), thus one whose welfare should be of great concern since it has potential for development into a viable tourist destination.

3.4 Study Population

The study involved caregivers with their infants and young children between the ages of 6-59 months who have started complementary feeding in Ekumfi Narkwa.

3.3 Sampling

3.3.1 Sample Size

Sample size the sample size was determined using the formula:

$$N = \frac{z^2 * pq}{e^2}$$

p= % malnourished

q= (1-p) % healthy

e= estimator (acceptable error) 5%

z= value standard variant: 1.96 (as per table of area under normal curve for the given confidence level of 95%).

(Charan & Biswas, 2013)

$$\frac{1.96^2 * 0.202 * 0.798}{0.05^2}$$

$$=248$$

To make up for non-response and missing data, ten percent (10%) of the sample size was added on: $(10/100)*248 = 24.8 \approx 25$

$$248+25 = \mathbf{273.}$$

However, only a total of 254 caregiver and child pairs were recruited and data complete for only two hundred and fifty (250) caregiver and child pairs. Thus analysis was done for two hundred and fifty (250) of them.

3.4.2 Sampling Method

The community is divided into four suburbs with clear demarcations namely Asemasa-Esikado, Ahenbrom, Kokodo and Adukrom respectively. These existing demarcations were used as the segments in the sampling. A minimum of forty-five subjects were selected form each suburb.

The community did not have a proper housing list therefore, the modified random walk was used to select the households from housing units. This was done in accordance to Manu, (2011), which reveals that the modified random walk can be used in the absence of a proper housing list.

3.4.2.1Modified Random walk

In the modified random walk, key land marks in the community such as private and public schools, churches, the mosque, the CHPS compound, the information centre and the community taxi rank were listed. One of the landmarks was randomly selected and the first house closet to the landmark was chosen as the first house from which subjects were selected. For Asemaasa-Esikado, the Methodist church was selected, Ahembrom, the information centre, Kokodo, the child welfare clinic site and for Adukrom, the Methodist Primary school.

Dwelling place unit were used for identification of households. (GSS, 2010) refers to them as a specific area occupied by a particular household and therefore need not necessarily be the same as a house. Children under-five years were identified by asking the residents. In a house with several dwelling units, all children aged 6-59 months from

the different households were eligible to be part of the study. The study was explained to the caregivers of these children and they were taken through the consent procedure if they agreed to take part in the study. In households, mothers had two children under-five years; one of the children was randomly select to be part of the study.

3.5 Variables

3.5.1 Dependent Variable

Nutritional status of children between the ages of 6-59 months in the community (height-for-age, weight-for-height, weight-for-age)

3.5.2 Independent Variable

Maternal factors (age, level of education, occupation, health seeking practices)

Child factors (age, sex, age-specific immunization status, dietary diversity of meal)

Environmental factors (hand washing practices, household sanitation)

3.6 Data Collection Techniques/ Methods & Tools

The mothers and their under-fives selected from the households were interviewed on household characteristics, the child's health status, hygiene and sanitation practices and dietary diversity using a structured questionnaire. The weight and height of the children were measured after the interview and also a physical examination of the children was done to identify any clinical signs of nutrient deficiency.

3.6.1 Anthropometric Measurements

Anthropometric measures (weight and height) were taken twice and recorded on the questionnaires. All children were cladded in only underwear or light clothing during measurements. The measurements were taken using WHO standard procedure. Each measurement was taken by two field skilled workers.

Weight measurement: For children below 24 months, mothers were made to stand on the scale bare footed after all heavy objects she was holding or adorned with had been collected. The scale was then tarred and the child handed to the mother on the scale and the weight of the child taken. Children above 24 months stood by themselves on the scale and their feet positioned slightly apart. They were asked to stand still and the reading was taken and recorded on the questionnaire.

Length: Recumbent length was taken for children below 24 months. It was measured with the infantometer. The child was gently placed on the infantometer with his/her head against the head board. The child's head was held in place by cupping the ears. It was ensured that the vertical line formed from the ear canal to the lower border of the eye socket the child was perpendicular to the horizontal board. This is referred to as the Frankfort vertical plane. The other fieldworker ensured that the child's trunk was straight and flat on the board. The foot board was gradually pushed to the feet of the child with the left hand whiles the right was used to hold the legs together in place. The length was recorded on the questionnaire.

Height was taken for children the rest of the children (above 24 months). It was taken with a stadiometer. The child was asked to stand on the footboard with their back against the back board. It was to make sure that the back of their head, shoulder blade, back, buttocks calf and their heel touched the back board of the stadiometer. The head was positioned so that the horizontal line connecting the upper ear opening and lower edge socket of the eye ball run parallel to the base board. This formed the Frankfort horizontal plane. The tummy was pushed in gently to help the child to stand straight and the head board pressed firmly on the top of the head. The reading was then taken and recorded.

3.6.2 Clinical Assessment

A physical examination of the children's hair, eyes, lips, teeth, gum, and skin were critically observed for any signs of malnutrition. The following are the signs that were look for and the interpretations. The observations were recorded on the questionnaire.

Table 1: Signs Looked out For during Nutritional Deficiency Clincal Assessment

Body Parts Examined	Signs looked out for	Nutrient Deficient
Eye	Not bright and clear, shiny, sores at corner of eye lids	Vitamin A
Lips	Not smooth, swollen or chapped	Micronutrients and iron
Teeth	Not bright, cavities and pain	Vitamin A and D
Gum	Not healthy, red, not bleeding or swollen	Vitamin C
Face	Skin colour not uniform, unhealthy appearance, swollen	Micronutrients and protein
Feet	Oedema	Calories
Hair	Not shiny nor firm, easily plucked	Protein
Skin	Signs of rashes, swellings, spots	Micronutrient

Source: Modified from Maqbool et al.,(2008)

3.6.3 Dietary Assessment

A dietary diversity questionnaire was used to collect information on the types of food given to the child over the past seven days and how often it is eaten. The caregiver was asked whether the child had eaten foods from eight (8) main food groups in the past seven days. The frequencies of consumptions of each food group was reorded respectively.

3.6.1 Community Entry process

Consent and cooperation was sought from the health authority with a letter from the District Health Directorate. This was followed by seeking permission from the traditional and opinion leaders prior to enrolment of study participants. The community was then duly informed about the study before the selection of subjects was done.

3.7 Data Quality Control

Research assistants with the requisite knowledge in data collection for nutrition surveys were recruited and trained for the study. Data collected was checked daily to ensure that all information had been properly collected and the questionnaires properly filled. Questionnaires that were excluded for inconsistences or incompleteness were kept for discussion in the final report. Double data entry was done to ensure that the right information is entered from questionnaires.

3.7.1 Training

A two day training session for the research assistants was organised. The aim of the training was to equip them with the pre-requisite skills need to perform their task. The training was organised by the researcher. The content of the training included a discussion of the purpose of the study, ethical issues and questionnaire administration. Research assistants were also trained on the collection of anthropometric measurements using the WHO Multicentre Growth Reference Study (MGRS) training video.

3.8 Data Processing and Analysis

3.8.1 Data Processing

Data was entered in Microsoft Excel Office 2010 and exported to WHO Anthro version 3.2.2 and STATA Version 12 Software for further analyses.

3.8.2 Data Analysis

Data collected on demographic characteristics and their general practices were presented in tables as frequencies and percentages. From the anthropometric data obtained, the Height-for-age, (HA), Weight-for-age (WA) and Weight-for-Height (WH) of the subjects was compared to the WHO child growth standards (World Health Organisation, 2006). The respective deviations from the reference standard (z-scores)

were then calculated for each subject. This was done using WHO ANTHRO Plus and WHO ANTHRO software.

$$\text{Z-score} = \frac{\text{(child's measurement)} - \text{(median values of the reference population)}}{\text{Standard deviation of the reference population}}$$

source: (Elder & Kiess, 2004)

The anthropometric data was presented in age and by sex. According to (Elder & Kiess, 2004), that is the best way since growth failure varies from age to age and within sexes.

Age was categorised in months: 6–11, 12–17, 18–23, 24–35, 36–47, and 48–59

The prevalence of malnutrition was assessed by the three commonly used indicators of nutritional status; stunting, wasting and underweight (GSS, 2011). The prevalence of malnutrition was determined as those who fall below -2 Z-scores.

Prevalence of stunting: The proportion of children under-five whose height –for- age was below -2 standard deviation of the WHO reference population (WHO, 2006) were referred to as moderately stunted and those below -3 were referred to as severely stunted.

Prevalence of wasting: The proportion of children under-five whose weight for height was below -2 standard deviation of the WHO reference population (WHO, 2006)were referred to as moderately wasted and those below -3 were referred to as severely wasted.

Prevalence of underweight : The proportion of children under-five whose weight –for –age was below -2 standard deviation of the WHO reference population (WHO, 2006)were referred to as moderately underweight and those below -3 were referred to as severely underweight.

After categorising the nutritional status of the children according to HAZ, WAZ and WHZ, the overall nutritional status of the children was determined using the following

classification: a child with a z-score of less the -2SD for any of anthropometric indices was classified as undernourished. A child with all three indices above -2SD was considered normal. This categorisation was used in the further analysis. Chi-square tests were used to find out any significant link with the nutritional indices and the study variables.

Logistic regression is the most preferred statistical technique for analysing association between nutritional outcomes (Nikoi, 2011) since it has a lot of advantages over the other methods such as being dichotomous making it easier to compare the nutritional outcome variables used in the analysis. Thus regression analysis was used in further assessment of the statistical association between under-five children's overall nutritional status and each of the independent variables (maternal factors, environmental factors and child factors). Crude and adjusted odds ratios, and p-values were obtained and statistical significance determined at 95% confidence intervals (CI).

Three different models were run for the logistic regression for overall nutritional status and each of the child and maternal, child and environmental factors respectively. Since most of the factors were not found to be significant in the bivariate chi-squared analysis and simple logistics regression, factors found to be significant by earlier studies were selected for the multivariate logistic models.

A sub-analysis was also done to find factors significantly linked with each of the anthropometric indices (stunting, underweight and wasting) identified. A regression model was run with the anthropometric indices and selected the exposure variables from literature.

The clinical signs observed were described with percentages. Nutritional status of children under-fives in the community was also described holistically based on the anthropometric, clinical and dietary data outcome.

3.10 Pre-test or Pilot

The data collection tools and techniques were pre-tested on mothers with children under-five in the Bantuma, a fishing community in the Komenda Edina Eguafo Abriem (KEEA) district in the central region. This community was chosen because it has similar characteristics as the study area.

3.11 Ethical consideration

Ethical clearance was sought from the Ghana Health Service Ethical Review Board (Appendix C). Permission was sort from Health Directorates at the regional and district levels. The staff of the health facility in the community was adequately informed about the study by a letter from the district directorate. Permission was then sort from the community leaders. The study was explained to the mothers and caregivers and both verbal and written consents were obtained. Privacy was ensured during the interview; respondents were assured of confidentiality. Subject codes were used to hide respondents' identity. Personnel involved in data collection were cautioned during training to ensure confidentiality throughout the study. Data collected was stored in locked cabinets and only accessed by the principal investigator under extremely necessary conditions.

The informed consent administered to the respondents explained the confidentiality, voluntary participation, withdrawal and risk/benefits of the study to them (Appendix A).

CHAPTER FOUR

RESULTS

4.0 Demographic characteristics

4.1 Background Characteristics of Respondents

A total of 250 children between the ages of 6- 59 months with their caregivers which comprised of mothers and grandmothers living in Ekumfi Narkwa during the period of data collection were sampled and their data analysed.

Majority of the caregivers, 96.4% (241/250), were mothers whilst the rest were grandmothers. The average age of the caregivers interviewed was 28.68 ± 9.5 years. The youngest mother was 15 years and the oldest, 45 years. Most of the caregivers were between the ages of 20-25 years (37.6%, 94/250). The modal level of education was junior high school. The main occupation was trading of non-fish products, 55.2% (138/250). Of the two hundred and fifty respondents, 38.40% of them were indigenes who periodically migrate to western region to engage in fishing activities.

Almost all the respondents were Akans 98.8%, (247/250).The average household size was six. Nearly half, 47% (118/250) of the household heads were the fathers of the under-fives involved in the study. Only15% (38/250) of the mothers were household heads.

Table 2: Socio-Demographic Characteristics of Respondents in Ekumfi Narkwa

Variable	Frequency (%)N=250
Age of caregiver (years)	
Below 20	17(6.8)
20-25	94(37.6)
26-30	48(19.2)
31-35	47(18.8)
36 and above	44(17.6)
Level of education of caregiver	
No formal education	76(30.4)
Primary	67(26.8)
Junior high	97(38.8)
Senior high	8(3.2)
Tertiary	2(0.8)
Primary occupation	
Unemployed	29(11.6)
Fishmonger	35(14.0)
Farmer	15(6.0)
Trader(other than fish products)	138(55.2)
Artisan	28(11.2)
Other occupations	5(2.0)
Head of household	
Mother	37(14.8)
Father	117(46.8)
Grandparent	92(36.8)
Non-relative	4(1.6)
Migration status	
Permanent resident	154(61.6)
Migrant	96(38.4)

Half of the children surveyed were males, 50.4% (126/250). The median age group was 24-35 months (187/250). The mean age of the children was 27 months with the highest number recruited being within the ages of 12-23 months. Only 18% of the children had started schooling.

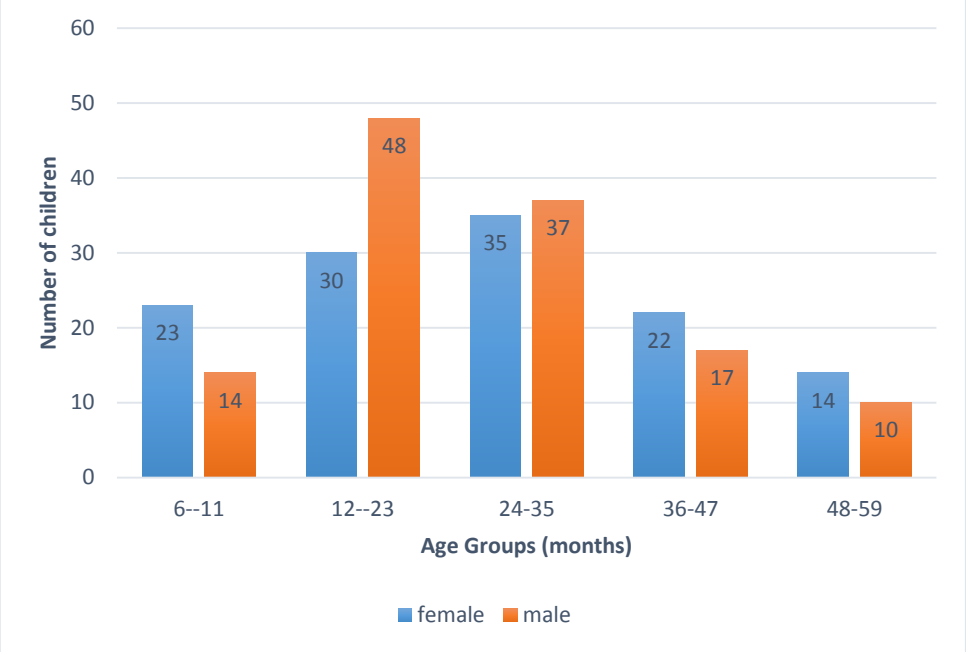

Figure 2 : Distribution of Under-fives in Ekumfi Narkwa by Age and Sex

4.2 Maternal and Environmental Characteristics of Respondents

4.2.1 Child Health Seeking Practices

Table 2 summaries the child health care practices of the caregivers enrolled in the study. Almost half of the children were born in a health facility (45%, 110/250).The main centre for treatment of a sick child was the health facility (70.4%, 176/250). One hundred and sixty of the two hundred and fifty (64%) of the children had been appropriately vaccinated for their age however, 1 child had never been vaccinated. More than half of the children (61.2%, 153/250) were introduced to complementary foods at six months.

Table 3: Some Child Health Practices of Respondents in Ekumfi Narkwa

Health Practice	Frequency (%) N=250
Place child was born	
Health facility	110 (44)
TBA	95 (38)
Home(No TBA)	33 (12.3)
Church/Garden	12 (4.8)
Child immunization status*	
Appropriate	162 (64)
Partial	87 (34.8)
Never	1 (0.4)
Where child Is taken when Ill	
Health facility	176 (70.4)
Self-care	72 (28.8)
Church / Prayer camp	1 (0.4)
Herbalist	1 (0.4)
Caregiver source of advice on child care	
Health workers	110 (44)
Self	66 (26.4)
Family members	71 (28.4)
Community members	3 (1.2)
Age at which complementary food was introduced (months)	
Below 3	21 (8.4)
3-5	39 (15.6)
6	153 (61.2)
After 6	37 (14.8)

*(immunization status checked form child health record cards)

4.2.2 Hygiene and sanitation

Majority of the respondents use pipe borne water, 96% (240/250) whiles the 4 (1.6%) respondents use rain water for drinking and cooking the child's food. Of the respondents interviewed 36% (90/250) used washing basin to fetch water to be used in the home. Majority of the caregivers practiced hand washing before cooking and feeding the child some of the time (118/250) but not always. Just one-third of the caregivers reported that they wash their hands with soap before cooking or feeding the child every time.

From observation of respondent's surroundings, 85% (213/250) had a well swept compound whiles 81% (203/250) had a well swept cooking area. About half of the respondents (52%, 130/250) had cooking areas that were not restricted from animals. They cooked in open space where animals strayed into easily. However, 93.6% (234/250) had their food covered whilst 86.8% (217/250) also had their water covered.

Table 4: General Hygiene Practices of the Respondents in Ekumfi Narkwa

Practice	Frequency (%) N=250
Water source for drinking	
Pipe	241 (96.4)
Borehole/ well	2 (0.8)
Rain	4 (1.6)
Sachet water	3 (1.2)
Vessels for fetching water	
Vessels for that purpose	136 (54.4)
Bathing buckets	22 (8.8)
Washing basin	92 (36.8)
Washing of hands before cooking	
Never	42 (16.8)
Always	92 (36.8)
Sometimes	116 (46.4)
Washing of hands before child feeding	
Never	45 (18.0)
Always	87 (34.8)
Sometimes	118 (47.2)
Frequency of child bathing	
Once a day	5 (2.0)
More than once a day	235 (94.0)
Every other day	10 (1.0)
Cooking area restricted	
No	130(52)
Yes	120(48)
Visible signs of excreta	
No	137(54.8)
Yes	113(45.2)

4.2.3 Dietary Diversity

The average number of food groups consumed in a day was 4 food groups. About 80% (198/250) of the children were reported to have consumed other fruits and vegetables such as banana, tomato and orange daily but only 10.8% (27/250) had taken vitamin A rich foods such dark green leafy vegetables and pawpaw daily. Children 58.8% (147/250) consumed sweets and confectionaries on a daily basis.

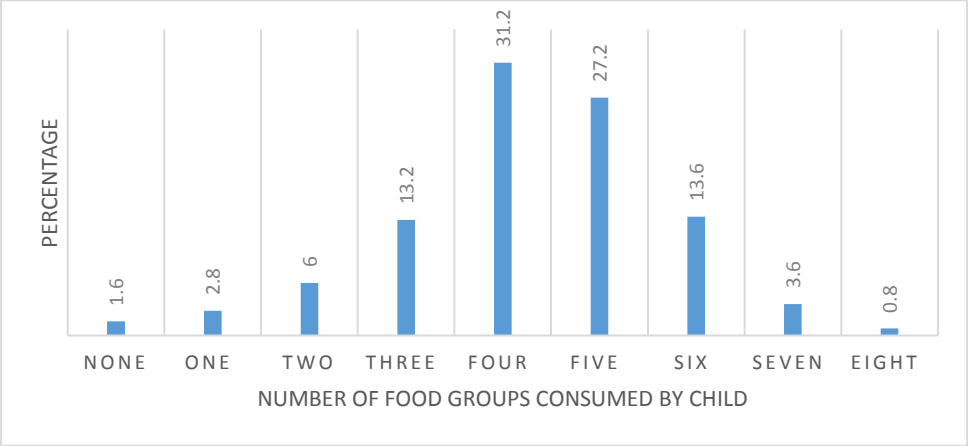

Figure 3: Distribution of the Number of Food Groups Consumed By Under-Fives Daily in Ekumfi Narkwa

More than half of the children, 56.8% (142/250) had not consumed any meat product over the past seven days, their reasons being, it was not common or it was too expensive to get. Only 3.6% (9/250) had consumed meat each day in the past seven days. The main daily source of animal protein was sea foods (fish and others sea products) 78% (195/250). Even though 76.4% (187/250) of the children were fed from four or more food groups a day, 41.7% (78/187) of them were fed form exactly four food groups and only 2 children were fed all the eight required food groups per day. The children were fed three or less food groups daily were 23.6% (59/250).

Table 5: Food Groups and Frequency of Consumption by Under-fives in Ekumfi Narkwa in the Past Week

Food Group	Consumption Over The Past Seven Days (%)	
	Less than four times	**More than four times**
Foods from cereals, roots tubers and plantain	24 (9.6)	226 (90.4)
Vitamin A rich foods	163 (65.2)	87 (34.8)
Other fruits or vegetables	81 (32.5)	169 (67.5)
Meat	204 (81.5)	46 (18.5)
Fresh or dried fish or shellfish	34 (13.7)	216 (86.3)
Eggs	174 (69.6)	76 (30.4)
Foods from beans, peas, or nuts	137 (54.7)	113 (45.4)
Milk products	162 (64.6)	88 (35.4)
Foods made with oil, fat	69 (27.5)	181 (72.5)
Sweets, pastries, drinks,	59 (23.5)	191 (76.5)

The most consumed food group in the past seven day was foods from cereals, root, tubers and plantain, followed by the fish group. The least consumed food group was meat products.

4.3 Main Findings

4.3.1 Nutritional Status of Under-fives

A total of 66 children (26.4%) were either, stunted, underweight or wasted whiles 73.6% (184/250) had a good nutritional status per the nutrition indices used by this study. Only 3 of the children (1.2%) were found to be overweight (WHZ z-score above +2 SD).

Table 6: Prevalence of Under-nutrition in Among Under-fives in Ekumfi Narkwa

Category	Anthropometric Indices			Overall nutritional status
	Height-for-age (%)	Weight-for-age (%)	Weight-for-height (%)	
Low (below -2 SD)	44 (17.6)	30 (12.0)	11 (4.4)	66 (26.4)
Normal (Above -2 SD)	206 (82.4)	220 (88.0)	239 (95.6)	184 (73.6)
Total	250 (100)	250 (100)	250 (100)	250(100)

Almost 18% (44/250) of the children were stunted, 12% underweight and 4% wasted. The mean z-score (standard deviation) for the population from the reference group for each of the anthropometric indices were -1.1, -0.9 and -0.4 for height-for-age, weight-for-age and weight-for-age respectively. Three of the children (1.2%) had high BMI-for-age.

4.3.2 Under-Nutrition by Age and Sex of the Child

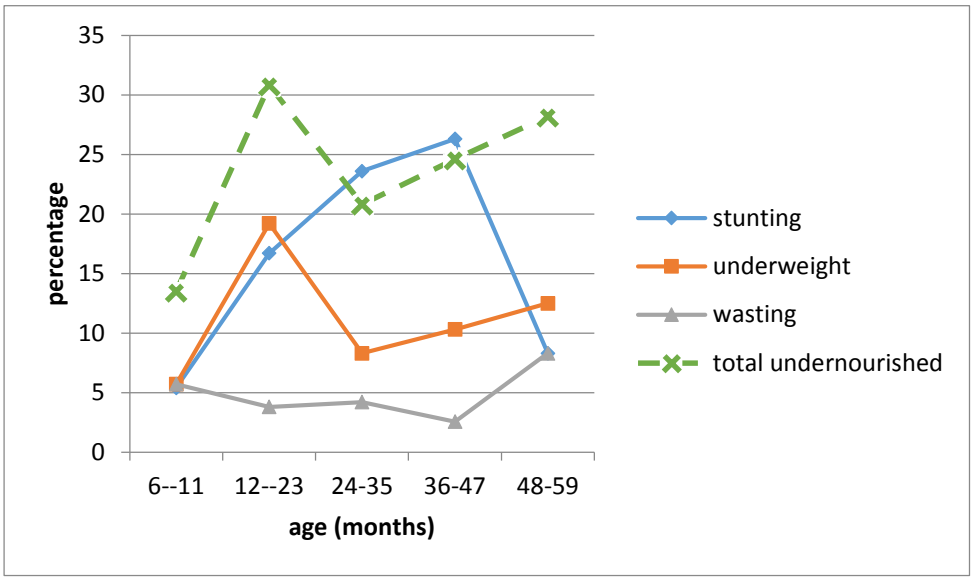

Figure 4: Nutritional status of under-fives by age group in Ekumfi Narkwa

Total undernourished children were seen to found to follow the same pattern as underweight. The highest percentage was seen in children between the ages of 12-23 months, the period weaning begins. Wasting was the nutritional index with the lowest rates.

Stunting is the most common form of under-nutrition in under-fives in Ekumfi Narkwa. It gradually rises as the child grows form 6-11 months and peaks at 36-47 months. There is a sharp loss in children's weight as the grow through the first and second years of life, however, underweight drops after the second year and gradually increases as the children continue to grow.

Table 7: Categorisation of Under-nutrition among Under-fives by Age Group and Sex Distribution in Ekumfi Narkwa

	HAZ N=250 Frequency (%)			WAZ N=250 Frequency (%)			WHZ N=250 Frequency (%)			Overall nutritional status N=250 Frequency (%)	
	Below -3 SD	**Below -2 SD**	**Normal**	**Below -3 SD**	**Below -2 SD**	**Normal**	**Below - 3 SD**	**Below - 2 SD**	**Normal**	**Undernourished**	Normal
Age of child (months)											
6-11	1 (2.7)	1 (2.7)	35 (94.6)	0 (0)	2 (5.7)	35 (94.3)	0 (0)	2 (5.7)	35 (94.3)	5 (13.5)	32 (86.5)
12-23	1 (1.3)	12(15.4)	65 (83.3)	1(1.3)	14 (17.9)	63 (80.8)	1 (1.3)	2 (2.5)	75 (96.2)	24 (30.8)	54 (69.2)
24-35	3 (4.2)	14 (19.4)	55 (76.4)	2 (2.8)	4 (5.5)	66 (91.7)	0 (0)	3 (4.2)	69 (95.8)	20 (27.8)	52 (72.2)
36-47	4(10.3)	6 (15.3)	29 (74.4)	0 (0)	4 (10.3)	35 (89.7)	0 (0)	1 (2.56)	38 (97.4)	12 (30.8)	27 (69.2)
48-59	0 (0)	2 (8.3)	22 (91.7)	0 (0)	3 (12.5)	21 (87.5)	0 (0)	2 (8.3)	22 (91.7)	5 (20.8)	19 (79.2)
Sex											
Male	4 (3.1)	20 (15.9)	102 (81.0)	1 (0.8)	16 (12.7)	109 (86.5)	0 (0)	3 (1.6)	123 (98.4)	31 (24.6)	95 (75.4)
Female	5 (4)	15 (12.1)	104 (83.9)	2 (1.6)	11 (8.9)	111 (89.5)	1 (0.8)	7 (5.6)	116 (93.5)	35 (28.2)	89 (71.8)
Total	**9 (3.6)**	**35 (14)**	**205 (82.3)**	**3 (1.2)**	**27 (10.8)**	**220 (88)**	**1 (0.4)**	**10 (4)**	**239 (95.6)**	**66 (26.4)**	**184(73.6)**

(HAZ - height-for-age z-score, WAZ - weight-for-age z-score, WHZ- weight-for-height z-score)

From Table 7**,** Children between the age group 24-35 months had the highest rate of stunting, 26.3% (17/72) whiles those within the range of 6-11 months had the lowest percentage of stunting (5%). For underweight, children within the ages of 12-23 months had the highest percentage, 19.2% (15/78) and the children between 6-11 months again had the lowest percentage of underweight (5.7%) that is only 2 out of the 37 children were underweight. Just 1 of the 39 children between the ages of 36-47 months was wasted. However, 2 of the 24 the children (8.3%) between 48-60 months were wasted. Fourteen per cent (35/250) of the children were moderately stunted (35/250) whiles 3.6% (9/250) were severely stunted. Only 1 child of the total study population was severely wasted whiles 4% (10/250) children were moderately wasted. A higher percentage of boys were stunted compared to their female counterparts (boys- 19.2% (24/125), girls- 16.1% (20/125)). However, more females were wasted than the males.

4.3.3 Clinical Assessment

Upon close physical examination of children for signs of malnutrition, it was observed that 66.85 (167/250) had at least one clinical sign of nutrient deficiency. The most common form of nutritional deficiency was micronutrient. No child had a gum defect but 8 of the children (3.3%) had teeth defects.

Table 8: Nutritional Deficiency Clinical Assessment of Children in Ekumfi Narkwa and its Interpretation

Body Parts Examined for deficiency	Suspected Nutrient Deficient	Frequency (%) N=250
Eye	Vitamin A	38(15.3)
Lips	Micronutrients and iron	2(0.8)
Teeth	Vitamin A and D	8(3.3)
Gum	Vitamin C	0
Face	Micronutrients and protein	17(6.85)
Feet	Calories	5(2)
Hair	Protein	32(12.9)
Skin	Micronutrient	41(16.5)

4.4 Factors Associated With Malnutrition

Table 9a: Bivariate Analysis of Nutritional Status Exposure Variables of Children under- five in Ekumfi Narkwa: Maternal Factors

Maternal Factors	Nutritional status of child		Chi-square	p-value
	Undernourished	Normal		
Age of caregiver(y)			6.30	0.188+
Below 20	4	13		
20-25	27	67		
26-30	18	30		
31-35	8	39		
36 and above	9	35		
Primary occupation			2.11	0.188+
Unemployed	6	23		
Fishmonger	11	24		
Farmer	4	11		
Trader	34	104		
Artisan	9	19		
Other	2	3		
Level of education			2.32	0.806+
No formal education	23	53		
Primary	16	51		
Middle / Junior high	26	71		
Secondary	1	7		
Tertiary	0	2		
Household head			7.24	0.067+
Mother	12	25		
Father	25	92		
Grandparent	26	66		
No relative	3	1		

***Significant at p <0.05 + fisher exact p-value (some cell frequencies<5)**

Table 9b: Bivariate Analysis of Nutritional Status Exposure Variables of Children under-five in Ekumfi Narkwa: Child Factors

Child Factors	Nutritional status of child		Chi-square	p-value
	Undernourished	Normal		
Age group (m)			4.76	0.312
6-11	5	32		
12-23	24	54		
24-35	20	52		
36-47	12	27		
48-59	5	19		
Sex			0.42	0.516
Female	35	89		
Male	31	95		
Place of birth			2.83	0.419
Health facility	32	78		
TBA	21	74		
Home (no TBA)	8	25		
Church	5	7		
Vaccination status for age			1.15	0.596+
Appropriate vaccination	40	122		
Partial vaccination	26	61		
Never vaccinated	0	1		
Food group eaten a day			0.67	0.413
Less than four groups	18	41		
Four or more food groups	48	143		
Consumption of fish in past seven days				
Never	6	20	1.70	0.745+
1-2	1	9		
3-5	5	15		
6-7	54	141		

***Significant at p <0.05 + fisher exact p-value (some cell frequency<5)** ** (immunization status checked form child health record booklets)

Table 9c: Bivariate Analysis of Nutritional Status Exposure Variables of Children under-five in Ekumfi Narkwa: Environmental Factors

Environmental Factors	Nutritional status of child		Chi-square	p-value
	Undernourished	Normal		
Hand washing before cooking			0.05	0.977
Never	11	31		
Always	25	67		
Sometimes	30	86		
Hand washing before eating			0.63	0.731
Never	14	31		
Always	22	65		
Sometimes	30	88		
Suburb			15.80	0.001*
Esikado- Asemasa	11	42		
Ahenbrom	28	60		
Kokodo	20	27		
Adukrom	7	55		
Well swept cooking area			0.05	0.828
Yes	53	150		
No	13	34		
Restricted cooking area			3.68	0.055
Yes	41	89		
No	25	95		

*Significant at p <0.05

The differences between the undernourished and normal children with respect to their maternal characteristics were not seen to be significant. Similarly, no differences were seen in the consumption of fish in the past seven days or any other child characteristics and the child's nutritional status too (Table 9c). The suburb the child lived in was the only environmental factor which was associated to the nutritional status. However, this association was not significant when the logistic model was run. (AOR= 1.15, 95%CI=0.88-1.51).

From the simple and multiple logistic regressions none of the independent variables examined was found to be significantly associated with the overall nutritional status of under-fives (table 10).

Table 10: Associations between Exposure Variables and Overall Nutritional Status of the Child

Variable	Crude OR	95% CI	Adjusted OR	95% CI
Maternal factors				
Caregiver's age group (years)	1.15	0.9-1.46	1.19	0.94-1.50
Primary occupation	0.94	0.75-1.18	0.90	0.71-1.14
Level of education	1.17	0.86-1.58	1.20	0.88-1.65
Head of household	0.87	0.58-1.29	0.89	0.59-1.33
Child factors				
Child age group (months)	0.93	0.73-1.17	0.92	0.72-1.17
Sex			No observation	
Child's place of birth	1.00	0.72-1.39	1.03	0.73-1.44
Vaccination status	0.81	0.46-1.43	0.79	0.44-1.40
Environmental factors				
Washing of hands before cooking	0.92	0.69-1.49	0.799	0.41-1.54
Washing of hands before eating	1.12	0.77-1.63	1.18	0.61-2.27
Suburb	1.15	0.89-1.50	1.15	0.88-1.51
Restricted cooking area	1.75	0.98-3.11	1.85	0.61-2.27
Well swept cooking area	1.08	0.53-2.20	0.78	0.75-5.15

*Significant at p ≤0.05

4.4.2 Sub-Analysis of Factors Associated to Malnutrition

A sub- analysis of the anthropometric indices and some factors associated to malnutrition revealed the following: A significant relationship was observed between the caregivers' age group and child stunting ($p<0.05$). Older mothers are 54% less likely to have underweight children compared to younger mothers (AOR=1.46; 95%CI 1.03-2.07).

Table 11: Associations between Selected Exposure Variables and Stunting, Wasting and Underweight

Factors	Stunting		Underweight		Wasting	
	Crude OR (95% CI)	**Adjusted OR (95%CI)**	**Crude OR (95% CI)**	**Adjusted OR (95% CI)**	**Crude OR (95% CI)**	**Adjusted OR (95% CI)**
Caregiver age group	1.00 (0.77-1.31)	1.01 (0.77-1.31)	**1.45*** (1.03-2.04)	**1.46*** (1.04-2.07)	1.17 (0.69-1.20)	1.17 (0.69-1.99)
Household head	0.60 (0.55-1.40)	0.89 (0.56-1.41)	0.968 (0.57-1.65)	1.01 (0.58-1.74)	1.10 (0.45-2.65)	1.09 (0.44-2.68)
Child's sex	No observation		No observation		No observation	
Suburb	0.46 (0.83-1.52)	1.11 (0.82-1.51)	1.23 (0.85-1.76)	1.25 (0.22-9.51)	0.89 (0.50-1.60)	0.90 (0.50-1.62)

*Significant at p <0.05

CHAPTER FIVE

DISCUSSION

In this study, the indicators used in the assessment of malnutrition were stunting, underweight and wasting. A total of 250 children were assessed. The findings of the study show that 27.6% were malnourished (26.4% under-nourished and 1.2% over-nourished). The prevalence of stunting, underweight and wasting in Ekumfi Narkwa are 17.6%, 12% and 4.4% respectively. These rates are lower than the recent GDHS 2012 report which reveals that in Central region the rates of stunting, underweight and wasting among under-fives were 30.6%, 16.2% wasting 8.3% respectively (GSS et al., 2014).

According to the WHO classification, the prevalence of stunting and wasting in Ekumfi Narkwa is classified as low. However, the prevalence of underweight in the community is medium (WHO, 2015). Weight-for-age can be used as an overall indication of a population's nutritional health according to (GSS) et al., 2014. This means that 12 out of 100 people in the community are not nutritionally healthy. Weight-for-height also gives the current nutritional status of the child therefore; we can say from the results of the study that only 4.4% of the children currently have poor nutritional status.

The United Nations Division for Sustainable Development(2007) and Macharia et al.(2005) describe stunting as the reflection of the cumulative effects of under-nutrition and infections. It serves as an indication of poor environmental conditions and long term chronic restriction of a child's growth potential. Therefore, 14% (35/250) of the children showed moderate effects of under-nutrition and infection whiles 3.6% (9/250) showed severe effects.

The mean z-scores for HAZ, WAZ and WHZ were -1.1, -0.9 and -0.4 respectively. This represents the nutritional status of the children in the community without using the cut-off

points. These negative z-score values imply that on the average, children in the population are less nourished than the WHO reference group. However, these values observed were similar to the mean z-score of the Central region as reported by the GDHS 2012; HAZ -1.1, WAZ -0.8 and WHZ -0.2 respectively.

It was observed that the prevalence of stunting was lower in the first year of life. The prevalence increased through 12-35 months. This is in consonance with earlier work done by Badake et al., (2014) and Jayatissa et al., (2012). Badake et al, 2014 attributes this pattern to poor weaning and complementary feeding practices leading to inadequate protein and energy intake in the child. This can be caused by the caregiver's lack of knowledge about proper infant and young feeding practices.

The prevalence of stunting was higher in males than females. This is a confirmation to the report of the GDHS 2008 that males are more likely to be stunted than females (GSS et al., 2009). However, from the study, this difference was not statistically significant.

There was a significant association between the rate of stunting in children and caregiver's age. From the multivariate analysis, older mothers were 54% less likely to have a stunted child than a young mother ($p<0.05$, 95% CI=1.03-1.46). Reports by Fall et al. (2015) in a similar study done in some selected low and middle income countries revealed that the age of the mother was associated with stunting. Children with young mothers were more disadvantaged in childhood nutrition than those with older mother.

Though the lowest prevalence of underweight was seen in those who were 6-11 months, there was no pattern in the prevalence of underweight with increasing age. This is similar to an earlier finding by Jayatissa et al.(2012) in a similar study in Sri Lanka.

Children between the ages of 12-23 months had the highest prevalence of underweight. This could be due to the fact that during this stage, breastfeeding has stopped and foods given may be inadequate for the child or previous infection may have resulted in reduction in food intake of the child. This is likely since the average duration of breastfeeding in the community was 19.8 months. Ajao et al.(2010) associates these reasons to households which might have food insecurity. However, from this study, no significant relationship was found between duration of breastfeeding and underweight.

Contrary to the findings of Akorede & Abiola, (2013), Asfaw et al. (2015) and Hailemariam, 2014) that some maternal, child and environmental factors were significantly associated with underweight, no significant association was seen between any of these factors and underweight in the present study. Similar, no significant association were seen between child wasting and any of the exposure variables, though Asfaw et al., (2015) and Mengistu et al. (2013) found them to be significantly associated. This could be because majority of the respondents had similar characteristics and practices.

Dietary diversity is a potential and useful indicator for growth. This is because it tells whether the child's diet has the important elements needed for growth and whether it is contained in the child's diet. (Potts & Sealey-Potts, 2014). It serves as a proxy for measurement of the nutritional quality of an individual's diet. Earlier studies have shown that consuming a diet with a wide range of food items increases intake of energy and micronutrients in developing countries (Bilinsky & Swindale, 2006). Over 70% (175/250) of the children consumed four food groups a day, implying that the children met the adequate dietary diversity minimum of four groups a day. This can be translated to mean that seven out of every ten children is likely to meet their daily micronutrient requirement in the community.

The main source of protein their diets was fish. Whiles 78% (195/250) of the children consume fish each day only 3.7% (9/250) consumed meat daily. The consumption of fish is a good practices because fish is more nutritious than staple foods providing protein, essential fatty acids and micronutrients which help in the growth and development of the child (Kawarazuka, 2010). The high consumption of fish could be attributed to the fact that the people have access to fish and have to pay little or nothing for it. Also, the presence of fish is known to increase the intake of non-staples and improve the care for children and women's health. This is confirmed by (Gomna & Rana, 2007) in their study on fish consumption in Nigeria. Also, the main livestock in the community which were pigs were reared and sold as a source of income and not as food. However, similar to the findings of (Aiga et al., 2009), the consumption of fish was not found to be associated with the nutritional status of the children.

Almost 8 out of 10 children consume sweets at least four times in a week. This practice of high sweet consumption affects the health and nutrition of the child. Studies have shown that too much sweet consumption in young children may lead to dental caries (Duijster et al, 2013; Naidoo, 2013). It may also lead to increased risk of non-communicable diseases such as diabetes in later stages of the child's life (Naidoo, 2013). Duijster et al.,(2013), also found that dental caries were associated with underweight. However, no significant association was found between underweight and sweet consumption.

Clinical assessment can be used in the determination of nutrient deficiencies or signs of malnutrition in an individual. Most of these physical signs imply micronutrient deficiency. Nearly 70% (167/250) of the children had at least one clinical sign of nutrient deficiency. This is an indication that the diet diversity of the children either needs to be improved and /or the quantities of the different foods the children take needs to be increased.

The eyes of 15.3% of the children were neither clear nor shiny and others had pale eye membranes. This is an indication of lack of vitamin A. This can be attributed to the low consumption of vitamin A rich foods in the children's diet. About 65% (163/250) of the children had consumed vitamin A rich food less than four times in the past week. Approximately 13 %(33/250) of them had sparse, de-pigmented and easily pluckable hair, a sign of protein deficiency. This implies that though mothers reported that a high percentage of the children consumed fish and other protein sources such as egg, meat and even legumes, not all the children may be taking it in adequate quantities of proteins their body requires or there may be mal-absorption of protein. However, none of these physical signs was significantly associated to any of the nutritional status of the child.

Majority of the population utilize the CHPS zone and the services they offer. Thus 70% (175/250) of the children are taken there for treatment when they were ill. Also, 44% (110/250) of the children in the study were born in a health facility. The high patronage of the health facility present might be a reason why the differences between nutritional indices of the children and child health seeking practices of their caregivers were not significant. These findings are however to contrary to the findings of two earlier studies conducted by Iram & Butt (2006) and Macharia et al., (2005) which found a significant relationship between these factors and child malnutrition.

In spite of the high patronage of the health facility, appropriate immunization-for-age rate was barely 65% (163/ 250). This is much lower than the GDHS 2012 rate of 70%for the Central region. Most mothers tend to stop attending Child Welfare Clinics (CWC) after their children turned one year old, thinking that the child is too old to be taken for the clinic sessions, thus the low rate.

Inadequate sanitation is identified by (Buttenheim, 2008) as one of the leading causes of child mortality and diarrheal diseases especially in developing countries Only 35% (88/250) of the respondent said they always wash their hands with soap before cooking and feeding the child. Hand washing with soap can reduce the transfer of parasitic infections such as soil helminthes from contaminating the food we eat. It can also lead to a reduction in the cases of diarrhoea. More than half of the respondents, 52% (130/250) of the respondents cooked in places which were not restricted from straying animals thus, they could easily stray in and litter the place with their excreta. As a confirmation to this, 54.8% (137/250) of the households had visible signs of these animal droppings littering them. This is a sign of poor sanitation and could lead to the children picking up infections as they play on the compound and also contamination of foods and utensils used in food preparation.

However, no significant relationship was found between any of the anthropometric indices determined and hygiene or sanitation practices of the household. This is a confirmation of Kibu (2007)'s findings in a similar study in Kenya, though a systematic review by(Rah et al., (2015) suggests that hygiene practices may greatly increase the likelihood of stunting.

There were no general traditional practices in the community which prevented children from being fed some kinds of foods, however, some people had personal reasons and reservations about some foods which they felt should not be fed to children.

Linking the results of the study to conceptual framework, no child and environmental factors was seen to be significantly associated to the child's nutritional status as expected; however, a maternal (caregiver age group) were seen to be associated with child nutritional status. Knowledge on malnutrition, some good hygiene practices, available healthcare services in the community could have helped in improving the nutritional status of the children under-five years in the community, thus for the medium rates of malnutrition seen.

This study had some limitations which include some of the following. The study was a cross-sectional study so it was difficult to examine any potential temporal relationships or causal associations. Also, hygiene practices were determined based on self-reported data from the caregivers. Furthermore, the information on dietary diversity was collected for seven days prior to the day of interview. This long period may have led to recall bias thus, providing less accurate information on the child's diet due to an imperfect recall by respondents. More research needs to be done to explore how seasonal changes affect the nutritional status of fishing communities and the factors associated with it.

The rate of malnutrition in under-fives in the community, were lower than expected. This is an indication that to some extent, the community has some good child, maternal and environmental practices which improve young child care, growth and development. However, there are still more interventions which need to be put in place to encourage and improve the nutritional status of the children and the community as a whole.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusions

This study revealed that under-nutrition is the main nutritional problem among under-fives in Ekumfi Narkwa. None of the factors examined was found to be associated with overall nutritional status of the child but stunting is significantly associated with the caregiver's age group. Stunting and underweight are prevalent during the second and third years of life. This indicates failure in growth and development of the children in the community. The information obtained on the nutritional status of the children and their current child care practices can help to come up with right measures to improve their nutritional status and their overall health in general.

6.2 Recommendations

The results of the study suggest the following recommendations to improve nutritional status and overall health of the children. The district and regional health directorates should consider coming up with effective monitoring structures for nutritional and health status of children under-five especially those above 24 months. This would assist government in planning of the right interventions for the places that require the most attention. Doing this would lead to tracking the progress being made to reduce the problem of malnutrition and help in building a more efficient workforce for the economic growth of the country in the near future.

I commend the local CHPS zone for the education on infant and young child practices which they give mothers during child welfare clinics, however, these educations need to tailored towards utilization the local resources in the feeding of their children under-fives and focus on teaching the caregivers to practise what they are taught.

The importance of proteins (fish products in this community to that matter) in the growth and development of children should be constantly emphasized in the community by health workers at any available forum. This should be done to encourage caregivers to make use of the abundance of fish products in the diet of their children. Thus helping to improve the nutritional status and health of the children and the community as a whole.

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APPENDICES

Appendix A: Consent Form

INFORMED CONSENT

Title: Nutritional Status of Children under-five in a fishing community in Ekumfi District of the Central Region, Ghana.

Principal Investigator: Delia Akosua Benewaa Bandoh

Introduction

School of Public Health, University of Ghana, is conducting a research in this community to assess the nutritional status of children under-five years in this community. I would like you and your child to participate in this study. Kindly read the consent before deciding to whether or not to be part of the study.

Description of Procedure

You are being invited to participate because you have a child between the ages of 6 to 59 months.

If you agree to participate, you would willingly sign or thumbprint the consent form. The study staff you ask you questions about your child and your household. The weight, height and mid upper arm circumference (MUAC) of your child would be taken and the physical body examined for signs of malnutrition.

Risks and Benefit

There is no risk in participating in this survey. There would be a slight discomfort when the field staff visit you at home and engage you in the short interview followed by child anthropometric measurements. However, well trained field assistants will carry the procedure out in order to minimize time spent or any other discomfort.

There is no direct benefit. However, information obtained will be used to provide some recommendations to reduce the incidence of malnutrition in your community and in Ghana as a whole.

Participant Rights

Your participation in the study is voluntary and you may choose to skip any of the questions you feel uncomfortable with or end your participation at any time. If you choose not to participate, it would not affect you or your child in any way.

Confidentiality

Participants would be given unique codes for identification. These codes word be written on the questionnaires and used during data entry. Records identifying participants will be kept confidential to the extent permitted by laws and regulations and would not be made publicly available.

Subject's permission

The informed consent has been read to me and I understand all the conditions of this project. All my questions have been answered. I agree to take part in the study

Name of Mother…….

Name of child……..

Signature/thumbprint……

Signature of witness …….

Date ……..

Researcher's signature……. Date……

Contacts for additional information

If you have any further questions regarding clarification of the study, you can contact Delia Akosua Benewaa Bandoh on 024-235-6585/ 020-952-3261. Or ERC, administrator Hannah Frimpong on 0243235225 or 0507041223

Appendix B: Questionnaire

UNIVERSITY OF GHANA
SCHOOL OF PUBLIC HEALTH

QUESTIONNAIRE FOR NUTRITIONAL STATUS OF CHILDREN UNDER-FIVE	
I am a student reading master of Public Health from the above school conducting a research into the nutritional status of children under-five in this community. This questionnaire is to gather information on your demographics, household characteristics and the anthropometric measurements of your child. Any information collected would be treated as confidential and would not take much of your time.	
Child's name:	Child's date of birth: (dd/mm/yy) __ __/ __ __/ __ __
Mother's name:	Mother's age: __ __ DK 9
Child's sex:	M 1 F 2
Has (name) started school	Y 1 N 0
Have you been living in this community for the past three months	Y 1 N 0 skip to A1
Where were you	……

No	Questions	Coding Categories	Skip to	Codes
A. Household Characteristics				
A1	Who is the head of the household?	Mother……...1 Father ……..2 Grandparent ……3 Other (specify) ……....4		HHH
A2	Primary occupation of head of household	Unemployed…..…….….0 Fisherman…….……..…1 Fishmonger……..……...2 Farmer……..……...3 Trader……..……4 Artisan…….……5 Other (specify)……...6		POHHH
A3	How many people currently live in the household	---- -----		PCLHH
A4	What ethnic group does the household belong to	Akan……..…1 Ewe……....……2 Ga / Dangme……..….3 Other(specify) ……..….4		EGHH
A5	Age of caregiver (As at last birthday)	----- -----		ACCA
A6	Level of education of caregiver	No formal education ….0 Primary……..1 Middle/JHS……2 SHS/commercial……3		LEDU

		Tertiary……..4 Other(specify)……..5		
A7	Primary occupation of caregiver	Unemployed……..0 Fishmonger……...1 Farmer……...2 Trader……..3 Artisan……4 Other (specify)……5		POCG
A8	How much money comes into the household in a month (in cedis)	Less than 50..……1 50 – 100……2 101 – 300…….3 Above 400……4		MCHH
A9 b	How many life births have you had How many are alive now?	__ __ __ __		LB NLN
B. Child Health-Seeking Practices (Request for subject U-5s weighing card)				
B10	Where was (name) born?	Health Facility ……...1 TBA……2 Home (no TBA)…….3 Church/garden……4 Other (specify)……...5		WB
B11	Has your child's immunisation being completed (for their age)	Appropriately vaccinated1 Partially vaccinated……2 Never vaccinated……3		CICA
B12	When your child is ill where is s/he taken to (most of the time)	Health Facility ……...1 Self-care……..2 Prayer camp……3 Herbalist……4 Other (specify)……5		CIWT
B13	Are you able to feed your child when s/he is ill	Y……1 N ……0		FCI

C. Current Health Status of Child					Codes
Did (name) get any of these conditions in the past week (7 days)					
	Condition	Status	From previous week	Treatment	
C14	Diarrhoea				DS
C15	Fever				FS
C16	Persistent fever for more than 12 hours				PFS
C17	Cough				CS
C18	Runny nose / catarrh/ cold				RNS
Codes Status: Yes =1 No = 0 Previous week: Yes =1 No = 0 Treatment : Health Facility = 1 Self- care = 2 No treatment = 3 Other(specify) = 4					

D. Feeding practices				
D19	Was (name) breastfed	Yes……..1 No……...0		WBF
D20	At what age did you introduce other foods and water	Below 3 months……..1 3-5months……...2 6 months ……..……..3 After 6 months……4		AIFW
D21	At what age did (name) stop breastfeeding	--- --- months N/A……9	Skip to D22	ASBF
D22	Why did you stop breastfeeding	Was told to ……1 Infant stopped …….....2 Pregnancy……..3 Other (specify)……4		WSB
D23	Whose advice do you take on what to feed your child	Health workers ……..1 Self ……....2 Mother / In-law ……..3 Community members ....4 Other(specify) ……...5		AWFC
D25	How many times in a day is (name) fed?	Less than 3 times……1 3 times a day……...2 More than 3 times a day.3		TID
D26	Are there any beliefs about feeding children in the community	…….. …….. ……		BFCC
D27	Are there any foods the child should not eat	Yes ……1 No ……..0	Skip D28&29	FCSNE
D28	Please list	…… …… ……		LF
D29	What are you reasons	…… …… ……		RFNE

E. Dietary Diversity						
How often do you give your child the following foods in the past 7 days?						codes
Food item	Daily (6-7)	1 – 2	3-5	Never	DK	
A. Foods made form cereals, roots tubers and plantain foods?						A
B. Vitamin A rich (dark Green Leafy Vegetables (Kontomire, Aleefu, Cassava Leaves)? Ripe Mangoes, Pawpaw?						B
C. Any Other Fruits Or Vegetables (Banana, pear, Tomatoes, Orange?						C
Food item	Daily (6-7)	1 – 2	3-5	Never	DK	codes

D. Any Meat Such As Beef, Pork, Lamb, Goat, Chicken Or Duck?						D
E. Fresh Or Dried Fish Or Shellfish (Prawns, Lobsters...)?						E
F. Eggs?						F
G. Any Foods Made From Beans, Peas, Lentils Or Nuts?						G
H. Milk Cheese, Yogurt Or Other Milk Products?						H
I. Any Oil, Fats Or Butter, Or Foods Made With Any Of This?						I
J. Any Sugary Foods or drinks As Chocolate, toffee, Pastries, Biscuits, drinks, ice cream?						J

F. Household Sanitation and Hygiene Practices				
F30	What source of water do you drink and use for cooking child's food	Pipe……1 Well……...2 Rainwater……..3 Borehole……4 Other(specify)……...5		WDCF
F31	What vessels are used for fetching water for cooking and drinking?	Vessels for that purpose...1 Bathing buckets ……...2 Washing basin…….....3 Other (specify) ……4		VFWCD
F32	How often do you your hands with soap before cooking?	Never ……...0 Always……..1 Sometimes ……....2 Other ……3		WHSC
F33	How often are hands washed with soap before feeding child?	Never ……...0 Always……..1 Sometimes ……....2 Other ……3		HWSFC
F34	How often is (name) bathed	Once a day…….....1 More than once a day …..2 Every other day…....…...3 Other (specify) ……4		HOB
Household sanitation checklist (observe and answer)				
F35	Physical appearance of caregiver (clean clothes, looking tidy)	Yes ……...……1 No ……..……..0		PACG
F36	Compound well swept	Yes ……...……1 No ……..……..0		CWS
F37	Cooking area well swept and clean	Yes ……...……1 No ……..……..0		CAWS
F38	water container well covered	Yes ……...……1 No ……..……..0		WCWC
F39	Cooked food covered	Yes ……...……1		CFC

		No ……..……..0		
F40	Visible signs of animal excreta	Yes ……..……1 No ……..……..0		VSAE
F41	Are animals restricted from cooking area	Yes ……..……1 No ……..……..0		ARCA

G. Anthropometry	1	2	
Child's weight (kilograms)	__ __.__ __	__ __.__ __	
Child's length/ height (cm)	__ __ __.__	__ __ __.__	Length not measured…….9

H. Clinical Assessment			
Body part observed	Normal signs	Seen Y N	Observation(s)
Eye	Bright, clear, shiny, no sores at corner of eye lids	1 0	
Lips	Smooth, not swollen or chapped	1 0	
Teeth	Bright, no cavities nor pain	1 0	
Gum	Healthy, red, not bleeding or swollen	1 0	
Face	Skin colour uniform, healthy appearance, not swollen	1 0	
Feet	No oedema	1 0	
Hair	Shiny, firm, not easily plucked	1 0	
Skin	No signs of rashes, swellings, spots	1 0	

Appendix C: Ethical Clearance Documents

GHANA HEALTH SERVICE ETHICAL REVIEW COMMITTEE

In case of reply the number and date of this Letter should be quoted.

My Ref. :GHS-ERC: 3
Your Ref. No.

Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra
Tel: +233-302-681109
Fax + 233-302-685424
Email: *Hannah. Frimpong@ghsmail.org*

23rd March, 2015

Delia Akosua Benewaa Bandoh
School of Public Health
University of Ghana
Legon, Accra

ETHICAL APPROVAL - ID NO: GHS-ERC: 47/02/15

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol titled:

"Assessing Nutritional Status of Children under Five in a Fishing Community in the Ekumfi District in the Central Region, Ghana"

This approval requires that you inform the Ethical Review Committee (ERC) when the study begins and provide Mid-term reports of the study to the Ethical Review Committee (ERC) for continuous review. The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Please note that any modification without ERC approval is rendered invalid.

You are also required to report all serious adverse events related to this study to the ERC within seven days verbally and fourteen days in writing.

You are requested to submit a final report on the study to assure the ERC that the project was implemented as per approved protocol. You are also to inform the ERC and your sponsor before any publication of the research findings.

1

Please note that this approval is given for a period of 12 months, beginning March 23rd 2015 to March 22nd 2016.

However, you are required to request for renewal of your study if it lasts for more than 12 months.

Please always quote the protocol identification number in all future correspondence in relation to this approved protocol

SIGNED.....

DR. CYNTHIA BANNERMAN
(GHS-ERC CHAIRPERSON)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra

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GHANA HEALTH SERVICE

IN CASE OF THE REPLY THE NUMBER AND THE DATE OF THIS LETTER SHOULD BE QUOTED.

GHANA HEALTH SERVICE
Your Health - Our Concern

REGIONAL HEALTH DIRECTORATE
P.O.BOX 63
CAPE COAST
CENTRAL REGION
GHANA

MY REF. NO CR/G-15/173
YOUR REF. NO. .....

31st March , 2015

TEL: 03321 32281/2
FAX. 03321

THE DISTRICT DIRECTOR OF HEALTH SERVICE
EKUMFI DISTRICT HEALTH DIRECTORATE
ESSUAKYIR

Dear colleague,

RE: INTRODUCTION OF MS DELIA AKOSUA BANDOH FOR AN ACADEMIC RESAERCH IN EKUMFI DISTRICT

Ms. Delia Akosua Bandoh is an MPH student in epidemiology at the University of Ghana School of Public Health.

Towards Ms. Bandoh's dissertation, she is going to work on the following topic: "Assessment of Nutrition status of under five in Ekumfi Narkwa District".

Please give Ms Bandoh the necessary support toward this research.

Thank you

Attention DO, Mabrik & Paakwa
Kindly assist Ms Bandoh with her research. She will need assistance with Community entry, home visits. Data collection (field work) will be from April to June 2015
7/4/15

DR KWAKU KARIKARI
DEPUTY DIRECTOR (PUBLIC HEALTH)
FOR : REGIONAL DIRECTOR OF HEALTH SERVICE
CENTRAL REGION