SOCIO-ECONOMIC FACTORS CAUSING PROTEIN ENERGY MALNUTRITION (PEM) IN UNDER FIVE-YEARS- OLD CHILDREN AT KENYATTA NATIONAL HOSPITAL, NAIROBI, KENYA.

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REG: NO: H56/70505/2007

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF REQUIREMENT OF DEGREE OF MASTER OF PEDIATRICS NURSING, UNIVERSITY OF NAIROBI

2009
DECLARATION

I hereby declare that this thesis is my original work and to the best of my knowledge, has not been presented for award of degree in any university or any other award

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ACKNOWLEDGEMENT

I am greatly indebted to my supervisors: - Dr. Blasia Osogo Omunga, and Mrs. Eunice Ajode Odhiambo for their invaluable input to this work. Additionally, I am grateful to the University of Nairobi (Board of post graduate studies) and school of nursing for offering me the opportunity to pursue the course. Thanks also go to my parents and siblings for the support they have given me throughout the process.

The contribution of my colleagues, Philip, Sarah and Juma cannot go unmentioned. I am also indeed grateful to all my research assistants for their commitment in data collection and Kenyatta National Hospital administrators for allowing data collection within the hospital.

Finally, I wish to acknowledge the study subjects for their cooperation.

“May God bless all of you”
DEDICATION

I dedicate this work to my parents Mr. and Mrs. Oluchina, my sisters and brothers, and finally to the late professor Musandu for being an inspiration in my life.
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<th>Full Form</th>
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<tr>
<td>FAO</td>
<td>Food and Agriculture Organization.</td>
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<tr>
<td>NCHS</td>
<td>National centre for health and statistics of the United States of America.</td>
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<tr>
<td>BMI</td>
<td>Body mass index</td>
</tr>
<tr>
<td>KDHS</td>
<td>Kenya Demographic Health Survey.</td>
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<tr>
<td>UNESCO</td>
<td>United Nation Educational, Scientific, and Cultural Organization.</td>
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<td>UNICEF</td>
<td>United Nation Children’s Fund.</td>
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<tr>
<td>UN</td>
<td>United Nation.</td>
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<tr>
<td>WHO</td>
<td>World Health Organization.</td>
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<tr>
<td>KNH</td>
<td>Kenyatta National Hospital.</td>
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<tr>
<td>MTRH</td>
<td>Moi Teaching and Referral Hospital.</td>
</tr>
<tr>
<td>MCH</td>
<td>Maternal and Child Health.</td>
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<tr>
<td>HIV</td>
<td>Human immune-virus.</td>
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<tr>
<td>AIDS</td>
<td>Acquired immune deficiency syndrome.</td>
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<tr>
<td>PEM</td>
<td>Protein Energy Malnutrition.</td>
</tr>
<tr>
<td>Kshs</td>
<td>Kenyan shillings.</td>
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<tr>
<td>Kgs</td>
<td>Kilogram.</td>
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<tr>
<td>SD</td>
<td>Standard deviation.</td>
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<tr>
<td>SPSS</td>
<td>Statistical package for social sciences.</td>
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### OPERATIONAL TERMS DEFINITIONS

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<th>Term</th>
<th>Definition</th>
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<tr>
<td>House-hold</td>
<td>All people who live together and operate as a unit, including such members as unrelated servants and relatives, who share food from the same pot and share resources of livelihood. They must have lived in the house-hold for at least 3 months prior to the study.</td>
</tr>
<tr>
<td>House-hold size</td>
<td>The total number of people living in the house-hold for at least 3 months prior to the study.</td>
</tr>
<tr>
<td>Height-for-age</td>
<td>This is a nutritional index which is a measure of chronic or long term nutritional problem. It is the measure for stunting.</td>
</tr>
<tr>
<td>Weight-for-age</td>
<td>This is a nutritional index which is a measure for under weight or over weight.</td>
</tr>
<tr>
<td>Weight-for-height</td>
<td>This is a nutritional index which is a measure of acute malnutrition or wasting.</td>
</tr>
<tr>
<td>Z-score</td>
<td>This is one of the systems that will be used to compare a child or a group of children to the reference population. This system will express anthropometric value as a number of standard deviations or z-score cut off point of &lt; (less than) -2 standard deviation (SD) and will be used to classify low weight-for-age, low height-for-age, and low weight-for-height. Stunting &lt; -2 z-score height-for-age; severe stunting &lt; -3 z-score height-for-age; wasting &lt; -2 z-score weight-for-height; severe wasting &lt; -3 z-score weight-for-height.</td>
</tr>
<tr>
<td>Dietary intake</td>
<td>The expression of quantity of meal that will be consumed by an individual or house-hold in terms of energy, proteins and micro-nutrients.</td>
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</table>
ABSTRACT

The study aimed to establish the socio-economic factors associated with PEM in under five-years-old children at Kenyatta national hospital. A total of 118 children aged below 60 months were targeted for the study in the three departments of KNH namely: - paediatrics medical wards, paediatrics outpatient and maternal and child health clinics.

A descriptive cross sectional study was conducted. All the children aged below 60 months in the above departments were eligible for the study population from which a representative sample was selected. Purposive, systematic and random sampling was used. Interview was used for data collection and the tools which were utilised were questionnaires and anthropometric equipments.

The data collected was entered into computer packages for analysis and presentation. The SPSS statistical program was used for analysis of the factors while the anthropometric statistical program was used to convert raw anthropometric data into anthropometric indices and then was compared with the National centre Health statistics (NCHS) reference figures. Chi-square test was used for bivariate and logistic regression for multivariate analysis

The results of the study showed that 59.3% of the study children were underweight, 53.3% were stunted and 33.9% were wasted. The socioeconomic factors found to be associated with childhood PEM in the study were complementary feeding (p=0.003) and times of feeding during illness (0.009).

The results of this study would provide baseline data for further studies that would be carried out in the area. The information would be used for planning purposes and also for decision making in order to help implement appropriate strategies aimed at improvement of the overall health and nutrition status of the population. The study recommends awareness creation on health and nutrition as well as sanitation and hygiene.
CHAPTER ONE: INTRODUCTION

1.1 Background information

Protein energy malnutrition (PEM) is the most common form of malnutrition resulting from impairment of health from deficiency of proteins and energy. The clinical conditions that occur are underweight, marasmus, kwashiorkor and marasmic-kwashiorkor. Growth failure (or failure to thrive) is a further result of PEM that cannot be easily placed under any of these four conditions, but it is always its earliest sign. Both underweight and kwashiorkor cases weigh 60 to 80% of the normal weight and marasmus and marasmic-kwashiorkor cases weigh below 60% of normal weight. There is presence of oedema in both kwashiorkor and marasmic-kwashiorkor cases. (Stanfield, Balldin. and Versluys, 2001).

More recent nutrition surveys use ‘wasting’ and ‘stunting’ in defining PEM. Wasting is a feature of acute PEM, whereas stunting is a result of long standing under nutrition. In any underweight child one or another of these may be noticeable. A child who is 60% of the normal weight for his age could be very thin and wasted but of normal height for his age. On the other hand, he could be of normal build but very small and stunted for his age. An underweight child can be mainly stunted, wasted, or both stunted and wasted. The cut off point for wasting is below 80% of the normal weight for age and for stunting is below 90% of the normal height for age (Stanfield, Balldin, and Versluys, 2001).

The percentage of stunted, wasted, and underweight children did not change substantially in Kenya between 1993 and 2003 (KDHS, 2003). The percentage of children below 5 years of age who were wasted was 7.8% in 1993, 6.1% in 1998, and 4.8% in 2003. The percentage of those who were stunted was 33.6%, 33% and 30.6% in 1993, 1998, and 2003 respectfully (UNICEF, 2000). These figures are way beyond the levels expected in a well fed population, whereby it is expected that only 2 – 3% of the children would be malnourished from PEM (UNICEF, 2000).
The prevalence of PEM in the developing countries is 40% while in the developed countries it ranges from 2 to 10% (Abidoye, and Sikabofori, 2000). In many parts of Africa, the prevalence of PEM in children under five years old is on average 40% estimated on the percentage of stunted children in any community (Stanfield, Balldin, and Versluys, 2001).

It is well documented that PEM has serious short and long term implications. Malnourished children from PEM are likely to be impaired leading to education failure and they are likely to have low capacity of physical activity later in the adulthood. Finally, health consequences of PEM in terms of impaired immune function and vulnerability to development of chronic degenerative diseases in adulthood are well known (Raheela 2002). This can reduce the opportunities to secure a livelihood (Benn 2002).

Several socio-economic factors have been studied and shown to cause PEM. In low income countries, the socio economic factors include single parent-hood, being born out of wed-lock, and low income being earned by parents, living in mud walled houses, young age of the care takers, lack of breast feeding, failure to complete immunization, no land ownership and no ownership of livestock, living with a step mother, and not staying with both the parents (Ayaya, et al 2004). The factors that have been found to be important in predisposing to PEM in the high income countries include chronic illnesses and congenital disorders which are medical factors (Waihenya, Kogi, and Muita, 1996).
1.2 Problem statement

A study of children admitted in KNH, the largest public hospital in Kenya, found prevalence of PEM among children less than 5 years to be 75% at admission. During hospital stay, 58% of them had further deterioration in nutrition status when assessed using Nutritional Risk Index (NRI), and 34% had deteriorated when percentage weight loss was used to assess the nutritional status (Nyandiko, 2000).

In the hospital setting, especially the paediatrics medical wards, bed capacities increases to the extent that other patients with acute and chronic illnesses lack where to be admitted and most of them die at home due to lack of access to medical services, yet it is the national hospital that should receive referral patients from other hospitals with complicated conditions country wide (Nyandiko, 2000). It is estimated that in KNH paediatrics medical wards the total bed capacity with under five-years-old children with PEM is 55% and this frequently increases during drought seasons. About 35% of under five years old children with other acute and chronic diseases lack bed and are treated as out-patients (Nyandiko, 2000).

Medical personnel’s in KNH are overwhelmed with a lot of work of caring for the under five-years-old children with PEM and their quality of services reduces (Nyandiko, 2000). According to the quality assurance committee it has been noted that the quality of care in the paediatrics medical wards has gone down since 1999 and this pose a lot of concerns to the medical personnel’s. It has forced the hospital to employ many medical personnel to cater for the increased admission so as they are not overwhelmed with a lot of activities causing the quality of their services to be lowered.

The children admitted with PEM in KNH in most instances come from poor families approximately 85% and payment of the hospital bill is a problem (KDHS, 2003). This causes the hospital not to be adequately equipped with medical facilities since they can not be maintained and bought after being used due to lack of finance.
The most serious problem is an increased risk of death resulting from PEM in the under five-years-old children admitted in KHN. Approximately 50% of the 1000 thousand deaths that occur each year in children under five-years-old in KNH are directly or indirectly attributed to PEM according to the 2006 statistics. Opportunistic diseases developed due to compromised immune status as a result of lack of enough nutrients to necessitate immune factors synthesis or renewal. Respiratory tract infections and gastrointestinal infections are the commonest and they further lower the immune status.

PEM in the under five-years-old children results in poverty and marital conflicts (Benn, 2002). The high financial burden from the hospital and medical treatments makes house-holds consume their resources and as a result marital conflicts occur due to insufficient resources to support the family. Hospital admission also brings marital conflicts as family roles are disrupted when mothers have to stay with their children who are under five-years-old in the wards. This increases the chances of psychological stress.

PEM manifesting in children who are stunted, wasted and underweight is especially common in the hospital with devastating consequences for the growth and development of the children under five-years-old. It has been reported that the children who survive after admission in the hospital from PEM have low academic achievement in school and during adulthood their work productivity is reduced and absenteeism from work place increased due to inferiority complex and increased hospital admission, which reduces a person’s life time earning potential and the ability to contribute to the national economy (Nyandiko, 2000).

It is well established fact that PEM is usually an outcome of multiple and complex socio-economic factors which are often interrelated. Some of the critical factors associated with PEM include: - improper child feeding practices, improper child caring practices, the house-hold size, poor quality of housing, low house-hold income, and child being born out of wedlock.
Despite the fact that high rates of cases of PEM have been reported in children under 5 years old at KNH, no study has been done to find out the socio-economic factors causing PEM in this age group.

1.3 Research questions.

1. What are the demographic characteristics of parents causing PEM of the under five-years-old children?
2. What is the relationship between child’s demographics characteristics and PEM of the under five-years-old children?
3. What is the relationship between social factors and PEM of the under five-years-old children?
4. What is the association between economic factors and PEM of the under five-years-old children?
5. What is the protein energy malnutrition status of children aged below 60 months?

1.4 Broad objective

To determine socio-economic factors predisposing under five-years-old children to moderate and severe PEM at KNH, Nairobi.

1.5 Specific objectives

1. To determine whether demographic characteristics of parents cause PEM of the under five-years-old children.
2. To determine the relationship between child’s demographics characteristics and PEM of the under five-years-old children.
3. To determine the relationship between social factors and PEM of the under five-years-old children.
4. To determine the association between economic factors and PEM of the under five-years-old children.
5. To assess protein energy malnutrition status of children aged below 60 months.
1.6 Hypothesis
There is no relationship between socio-economic factors and PEM in the under five-years-old children.

1.7 Key variables
These were socio-economic factors causing PEM in the under-5 years-old children at KNH.

1.8 Definitions of key variable

1.8.1 Independent variables (inputs)
- Demographic factors
- Economic factors
- Social factors

1.8.2 Dependent variables (outputs)
- Maternal knowledge, attitude and practice.
- Alternative care takers knowledge, attitude and practice.
Figure 1: Conceptual framework

The conceptual framework modified from the model of malnutrition UNICEF1998

Independent Variables

- Demographics factors
- Social factors
- Economics factors

Dependent Variables

- Maternal knowledge, attitude and practice.
- Alternative care takers knowledge, attitude and practice

Outcome

Occurrence of Protein energy malnutrition.
**Figure 2: 1.10: Operational framework.**

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Dependent variables</th>
<th>Outcome</th>
</tr>
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<tbody>
<tr>
<td><strong>Demographics factors</strong></td>
<td>Maternal knowledge, attitude and practice on:</td>
<td>Occurrence of Protein energy malnutrition.</td>
</tr>
<tr>
<td>a. Maternal factors</td>
<td>1. Preventive care</td>
<td>• Underweight</td>
</tr>
<tr>
<td>- Age</td>
<td>• Immunization</td>
<td>• Stunting</td>
</tr>
<tr>
<td>- Marital status</td>
<td>• Hygiene</td>
<td>• Wasting</td>
</tr>
<tr>
<td>- Education level</td>
<td>2. Promotive care</td>
<td><strong>Social factors</strong></td>
</tr>
<tr>
<td>- Occupation</td>
<td>• Nutrition</td>
<td>- Family cohesiveness</td>
</tr>
<tr>
<td>- Age</td>
<td><strong>Economics factors</strong></td>
<td>- Social amenities</td>
</tr>
<tr>
<td>- Education level</td>
<td>- House-hold income</td>
<td>- Religious practices</td>
</tr>
<tr>
<td>- Occupation</td>
<td>- Resource ownership</td>
<td>- Community feeding practices</td>
</tr>
<tr>
<td>c. Child factors</td>
<td>- Food security</td>
<td>- Health seeking behaviour</td>
</tr>
<tr>
<td>- Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Birth order and interval</td>
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</tr>
</tbody>
</table>

**Social factors**

- Family cohesiveness
- House-hold size
- Social amenities
- Religious practices
- Community feeding practices
- Health seeking behaviour

**Economics factors**

- House-hold income
- Resource ownership
- Food security
1.11 Justification

Information on socio-economic factors predisposing under five-years-old children to PEM in KNH is scarce, yet many researchers have documented that under five-years-old children prevalence of PEM is higher in the hospital that is 75% (Nyandiko, 2000).

In the hospital setting, especially the paediatric medical wards, children under five-years-old with PEM have occupied the beds to the extent that other patients with acute and chronic illnesses lack where to be admitted and most of them die at home due to lack of access to medical services, yet it is the national hospital that should receive referral patients from other hospitals with complicated conditions country wide (Nyandiko, 2000).

Medical personnel’s in KNH are overwhelmed with a lot of work of caring for the under five-years-old children with PEM and their quality of services reduced. (Nyandiko, 2000). This has forced the hospital to employ many medical personnel to cater for the increased admission so as they are not overwhelmed with a lot of activities which was not on the hospital budget.

PEM has devastating consequences for the growth and development of the children. It reduces the child immunity and this makes them susceptible to a number of infections for example pneumonia, tuberculosis and diarrhoea which increases the mortality rate of children. More children without PEM in our societies are also affected by these opportunistic infections bringing more burdens to their families. Children who survive have low academic achievement in school and during adulthood their work productivity is reduced and absenteeism from work place increased. (Nyandiko, 2000).

It results in poverty and marital conflicts in house-holds (Benn, 2002). It increases unfaithfulness in marriages and denial of parental love to other siblings when mothers and fathers have to stay at the hospital with admitted children. The mothers and fathers who stay in the wards with their admitted children are between the ages of 18 -30 years, which is the productive age group in the societies. This has made the economy of the country to decrease as the number of productive individuals is less.
1.12 **Purpose of the study**
The study aimed to determine the socio-economic factors causing protein energy malnutrition (PEM) in the under five-years-old children at KNH. The under five-years-old children were unique in that they were highly vulnerable group and the main indicators of the nutritional status of the communities. One of the measures to lessen PEM in the under five-years-old children was to identify the socio-economic factors causing them.

1.13 **Expected benefits**
The findings of the study would act as a base line data for other studies and for planning of health and nutritional interventions targeting young children. The results would be useful in assisting policy makers, NGO’s, and other stake holders in planning and implementing of relevant activities for alleviation of PEM. The information would also be useful to health planners, field nutritionists, health workers, and other stake holders in devising appropriate interventions to improve PEM level.

The results would be of great public importance especially when putting up intervention measures in the communities, to tackle the problem of under five-years-old PEM. The results would be also useful in formulating relevant strategies in dealing with the problem of PEM.

1.14 **Study assumptions**
1. Respondents (child’s mothers) would provide the correct information for the questions asked during interview session.
2. The children sampled for the study together with their mothers would be available throughout the interview session.
3. Misinterpretation of the questions would be minimal.
4. Errors during assessment of the anthropometric measurements would be minimal.
5. Errors during analysis and presentation of the results would be minimal.
CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Overall the absolute number of PEM children worldwide has grown. Five hundred children are chronically undernourished worldwide (FAO and WHO 2002). It is estimated that about 182 million or 33% of the children under 5 years of age in the developing countries are stunted while 27% are underweight (UNICEF, 2000). The death of 6 million or 55% of children under five-years of age in developing countries is directly or indirectly related to PEM (UNICEF, 2001).

Great efforts have been made towards improvement of under five-years-old children’s nutritional status. Despite all efforts put, PEM continue to be a major public health problem of considerable magnitude in most developing countries of the world (Tai, 2007).

In Kenya, the nutritional status of children under 5 years of age has not significantly changed over the past decade. An estimate of the prevalence of PEM indicates that about 30.6% of the Kenyan children are stunted, 19.1% are underweight while 4.8% are wasted (KDHS, 2003). The proportion of the Kenyan children under five-years of age who are stunted is about 15 times the level of stunting in a healthy well nourished population of under five-years-old children while the proportion of underweight and wasted children under five-years of age stands at 9% more and 2 times more respectfully (KDHS, 2003).

The government of Kenya in its development plan has outlined the fact that PEM is a major problem that leads to a lot of child’s mortality. Estimates indicate that 23,000 under five-years-old children deaths in Kenya in the year 2000 were associated with moderate and severe PEM (KDHS, 2003). The government in its plan has indicated the need to develop strategies that will address the problem.
2.2 Maternal demographic characteristics

A. MATERNAL AGE AND MARITAL STATUS

The age at which the child bearing starts has important health implication for the child and the mother (KDHS, 2003). A study conducted in Uganda, showed no significant association between maternal age and the nutritional status of the study children. In the same study however, stunting and wasting was found to be higher among younger mothers than the older mothers (Efata, 2000). In another study done in India, the level of stunting was found to be higher among children of younger mothers compared to those of the older mothers. This was attributed to the fact that the older mothers have more and better experience in child care than their younger counterparts (Mittal et al, 2007).

It has also been noted that young mothers do not like to breast feed because they fear they will loss shape of their body due to breast feeding since most of them are not yet married. Also because most of them are working they spent most of their time outside the homes leaving the child in the care of alternative care takers thus increasing the chances of development of PEM (UNICEF, 2000).

A different study done in Ethiopia, showed that maternal age was only significantly associated with stunting, an indication of young mothers inability to provide adequate care to the children (Reifen et al 2003). Another study done in Nairobi showed no significant relationship between the nutritional status of children and the age of the mothers (Tai, 2007).

The mechanism by which marital status affect child nutritional status remains uncertain. However, children of single mothers are at a greater risk of PEM as compared to their counterparts whose fathers and mothers are spouses (Efata, 2000).

Single mothers have to work outside home most of the time to look for income, thus leaving the young infant in the care of alternative care takers. The money they earn is less and thus cannot be able to sustain the child nutritional requirements increasing chances of development of PEM.
In a study carried out in Kenya no association was found out between the marital status of the mother and nutritional status of children (Tai, 2007). In yet another study done in Brooke Bond tea estate of Limuru, there was a higher proportion of stunted children among house-holds of single and divorced mothers than house-holds where mothers were married and divorced (Alhaji and Allen 2002).

B. MATERNAL EDUCATION

Children of more educated mothers have in general, more chance of both survival and healthy growth. A mother level of education and access to health information, determine the mother’s importance of breast feeding, weaning time and method, preparation of food, hygiene and health seeking behaviours. Maternal education increases the maternal income and the level of care given to the children.

In a study conducted in Ethiopia, maternal education was found to be associated with variables that reflect more intensive care for the children. The same study however found that more education to be associated with less adequate feeding practices that is, terminating of breast feeding and a large number of bottle feeding per day (Reifen, et al 2003).

The mothers who are continuing with education or who are working because of their education qualifications have to leave breastfeeding at an early age to go back to school or to work area respectfully. They leave the children in the care of alternative care takers predisposing them to PEM.

In Kenya, the mother level of education was found to have an inverse relationship with the nutritional status of the children. Children of mothers with secondary education were found to have the lowest level of stunting and underweight at 19% and 11% respectfully while 36% and 33% children whose mothers have no education at all were stunted and underweight respectfully. Women with no education at all were also found to have
children with the highest level of wasting compared to children whose mothers had primary education (KDHS, 2003).

Literature review therefore shows conflicting evidence as to the relationship between maternal education and the nutritional status of children.

C. MATERNAL OCCUPATION

Most investigators have found that overall, women spent more time than men in all work activities. In addition to child care, women must fetch water, gather fire wood, do farm work and the household chores. Some studies have shown a positive association between the mothers' work and the nutritional status of the children, while others have shown no association at all. Women are involved in economic activities which could jeopardize children's welfare by displacing child care. Mothers have to look for income to meet their family needs and as a result, they do not allocate adequate time for child care (Efata, 2000).

Despite the fact that women are involved in a lot of economic activities, they are rarely involved in the control of resources and in decision making. The study done in rural Maragua district of Kenya showed that although women were the main workers in the farms, they were rarely involved in decision making regarding allocation of money from sale of farm produce. The study also showed that women especially those in the rural areas, face problems of gender inequality, illiteracy, and discrimination (Maina, 2006).

Working women play a vital role in ensuring household food and nutrition security. Encouraging women to work promote agricultural growth, greater income for the women and better food and nutrition for all.

Study carried out in Kibera slums in Nairobi, found no relationship between maternal employment and the children nutritional status (Tai, 2007). In a study done in lower Nyakach, Kisumu district, it was found out that there was a highly significance relationship between wasting and maternal occupation. Children of business women were
more wasted than those of farmers (Opiyo, 2005). This was attributed to the quality of the alternative child care and the amount of time the two groups of women spent out of the house-hold during the day. The business women spent more time outside the house-hold as compared to women doing farming. In MTRH study, there was a significant relationship between maternal occupation and nutrition status of the children. This was associated with the high income earning capacity (Ayaya, et al 2004)

A study conducted in rural Iran showed that, the nutritional status of children of mothers working outside the home was found to be poorer than that of children of non-working women. This finding was partly attributed to the quality of the alternative child care, since the older siblings who were left to take care of the young children were probably minimally competent in feeding and other related child care tasks (http://www.unu.edu/unipress/food8F14/e/8F14/Eoa.htm.)

2.3 Paternal demographics characteristics

A. PATERNAL EDUCATION

Children of more educated fathers have in general, more chance of both survival and healthy growth. A father level of education and access to health information, determine the father’s importance of breast feeding, weaning time and method, preparation of food, hygiene and health seeking behaviours. Paternal education increases the paternal income and the level of care given to the children.

In a study conducted in Ethiopia, paternal education was found to be associated with variables that reflect more intensive care for the children (Reifin, et al 2003). The reason for this is good employment and payment and as a result better quality and quantity of food for the family.

In Kenya, the father level of education was found to have a positive relationship with the nutritional status of the children. Children of fathers with secondary education were found to have the lowest level of stunting and underweight at 10% and 12% respectfully
while 25% and 32% children whose fathers have no education at all were stunted and underweight respectfully. Fathers with no education at all were also found to have children with the highest level of wasting compared to children whose fathers had primary education (KDHS, 2003).

Literature review therefore shows positive relationship between paternal education and the nutritional status of children.

B. PATERNAL OCCUPATION

Some studies have shown a positive association between the fathers’ work and the nutritional status of the children, while others have shown no association at all. Men are involved in economic activities which could jeopardize children’s welfare by displacing child care. Fathers have to look for income to meet their family needs and as a result, they do not allocate adequate time for child care (Efata, 2000).

Working men play a vital role in ensuring house-hold food and nutrition security. Encouraging men to work promote agricultural growth, greater income for the family and better food and nutrition for all.

Study carried out in Kibera slums in Nairobi, found positive relationship between paternal employment and the children nutritional status (Tai, 2007). In a study done in lower Nyakach, Kisumu district, it was found out that there was a highly significance relationship between nutritional status of children and paternal occupation (Opiyo, 2005). This was attributed to the income earned since the household could be able to purchase quality and quantity food. In MTRH study, there was a significant relationship between paternal occupation and nutrition status of the children for the same above reason (Ayaya, et al 2004).

Literature review therefore shows conflicting relationship between paternal occupation and nutritional status of children.
2.4 Child demographic characteristics

A. CHILD’S AGE AND SEX

Male children have low immunity status compared to their age mate female children. This is because of low maternal immunoglobulin G and cell mediated immunity. Also the younger children immunity is still immature and these increase their chances of contracting infections (UNICEF, 2000).

Studies conducted earlier in Kenya have revealed high prevalence of stunting among older children than among younger children. For example, in Maragua district, malnutrition was found to be more advanced in older children than younger children while in a study done in Lower Nyakach, Kisumu, older children were found to be significantly more underweight and stunted than younger children (Maina, 2006 and Opiyo, 2005).

Study done in Lower Nyakach, Kisumu also revealed that more male than female children were prone to malnutrition (Opiyo, 2005).

B. BIRTH ORDER AND INTERVAL

The birth order and interval affect nutrition status of children. Children who are 1st borns tend to receive much care from their parents and therefore are at a reduced risk of suffering from protein energy malnutrition. This is because of the small household size and therefore all the care is directed to the child (UNICEF, 2000).

Interval between pregnancies is important because the longer the interval the better the care the child receives from the parents (UNICEF, 2001). Physiologically, mothers’ bodies are prepared appropriately for the next pregnancy and hence healthy newborns are delivered (UNICEF, 2001).
2.5 Social factors

A. FAMILY COHESIVENESS AND ALTERNATIVE CAREGIVERS

Family togetherness is an important factor in the prevention of PEM in the under five-years-old children. Family members should share ideas concerning nutrition and health care behaviours among themselves to enhance better health status. In many households, the care of children is always left to the mothers who mostly lack a lot of experience in child care due to low education status (Maina, 2006).

Despite the fact that women are involved in a lot of economic activities, they are rarely involved in the control of resources and in decision making. The study done in rural Maragua district of Kenya showed that although women were the main workers in the farms, they were rarely involved in decision making regarding allocation of money from sale of farm produce. The study also showed that women especially those in the rural areas, face problems of gender inequality, illiteracy, and discrimination (Maina, 2006).

The characteristics of the care givers for example age, knowledge, their attitudes and practices goes a long way influencing the nutritional status of children. Skills and ability of the care givers are crucial to the quality of care, particularly the selection and preparation of food for the family including the children (FAO and WHO, 2002).

In most households the principle care givers are the mothers. However the responsibility is shared with others members of the house-hold as well as neighbours. A study done in Maragua district and another done in Tororo in Uganda observed that children are often left on their own or with siblings as young as 3 years who require care themselves (Maina, 2006 and Efata, 2000). In Tororo district in Uganda, it was found that the largest proportions (97.9%) of study children were left in the care of other people. Majority of these were left with the older siblings. Other care givers were the neighbours, grand
parents, step mothers and other relatives. Participation of the father in the child care was found to be minimal.

From the studies the chances of development of PEM is increased because the alternative care takers are less experience in the skills and knowledge of child care. They either ignore the feeding patterns of children or do not give them food at all. This is very common in the older children because they spent most of their time playing thus they forget to feed their younger ones (Maina, 2006).

B. HOUSE-HOLD SIZE

Studies done on the effect of house-hold size and presence of extended families on the nutritional status of the under five-years-old children have revealed that children from larger families who have some members of extended families are significant shorter for their age and nutritional poor quality and quantity food are given to them than children from smaller house-holds (Delpeuch, et al 2004).

Smaller families and nuclear families are said to allow mothers to spend more time interacting, stimulating, teaching, and disciplining children. In large family size or extended families, a part from limiting the amount of food per capita in the house-holds, it may lower the quality of care given to the children (Ayaya, et al 2004). A study done in Siaya district in Kenya, found that there was more underweight children in families with 5 to 8 children who were nuclear families than those families with 1 to 4 children (Musomi, 2004). A study done in Senegal showed that children from larger families who stay with extended families members were shorter for their ages and were fed on nutritionally poor quality and quantity foods than children from smaller nuclear house-holds (Simondon, et al 2005).

On the other hand, other studies have supported large house-holds arguing that the more they are, the more the economic contribution, by active house-hold members who labour for house-hold tasks, agricultural work and child care (Ray, et al 2004 and Maina 2006).
Also in larger house-hold there’s likelihood of adult women being available to take care of the young children (Tai, 2007)

The findings of a study carried out in Uganda, showed higher PEM levels in smaller house-holds than in larger house-holds. The difference was only significant in stunting where the levels were 39.2% in smaller house-holds and 22.7% in larger house-holds (Efata, 2000).

C. SOCIAL AMENITIES (HOUSING, WATER, AND SANITATION)

UNICEF estimates that about 1.1 billion people worldwide lack access to safe water, which is a fundamental requirement of good nutrition. It also estimates that about 2.9 billion people lack access to adequate sanitation with only 18% of rural dwellers having access to adequate sanitation services (UNICEF, 2000).

National health sub-sector strategic plan identified that more than half of all illness and death among young children is caused by germs, which get into the child’s mouth via food and water (UNICEF/WHO/UNESCO, 2002). Poor hygiene and lack of clean drinking water are the main source of infections.

Major causes of morbidity in Kenya are diseases and conditions arising from poor environmental management and hygiene conditions. These environmental problems relate to lack of safe water, poor hygiene and sanitation, and poor waste disposal system.

Proper use of latrines and safe waste disposal are some of the most important actions that families can use to prevent spread of germs. In fact, in a study in Egypt, it was found that poor house-hold sanitation was only significant predictor of diarrhoea in that population (Rahmanifar, et al 2005). Access to safe drinking water is the main strategy that may dramatically reduce the global burden of water borne disease. Studies have shown that where safe water was introduced diarrhoea disease were 48% lower than the control groups (Subsey, Handzel, and Venczel, 2003).
A study done in India confirmed that poor sanitation condition adversely affected the nutritional status of children (Golpadas, Patel, and Bakshi, 2005). Stunting and wasting levels were found to be significantly higher from households with mud and dung floor than among those from households of cemented floor. In a study done in Uganda, the levels of PEM were generally found to be higher among children from households whose water sources were unprotected than in households whose water sources were protected (Efata, 2000).

In Kenya, the study done in MTRH showed no significant difference between water source and PEM in children between the case group and the control group. The reason is that most of them used boreholes as their water source. In the same study also, there was no significant difference between the housing and nutritional status of the children because both the cases and the controls were from slums of Eldoret where the nature of the houses were the same (Ayaya, et al 2004).

D. CULTURAL AND RELIGIOUS PRACTICES
Beliefs related to the cause of illnesses and maintenance of health is the integral part of the cultural heritage of families. Often inseparable from religious beliefs, they influence the way families cope with health problems. Predominant among most cultures are beliefs related to natural forces, supernatural forces and imbalance between forces (Leininger, 1995).

There are numerous similarities among cultures regarding prevention and treatment of diseases. All cultures have some form of home remedies that they apply before seeking help from other people. Within ethnic communities, folk healers who are endowed with ability to “cure” maladies are sought for special situations and when home remedies are unsuccessful.

Religion affects the way people interpret and respond to illnesses (Spector, 2000). Among the many groups, illness, injury, or death is believed to be sent by God as a punishment for sin. Some may believe that health workers will be unable to help the child
whom God is punishing and may express a fatalistic attitude towards treatment. Other views it as a test for strength, like testing of Job in the Bible, and strives to remain faithful to overcome the conflict.

Food customs and symbolism are an integral part of various cultural, ethnic, and religious groups. In many cultures specific food practices are followed during childhood in belief that certain foods interfere with growth and development of the child. Others have religious restrictions such as vegetarian diet in the Seventh Day Adventists (Sekhon, 1996).

E. COMMUNITY FEEDING PRACTICES

1. BREASTFEEDING
Is an ideal way of providing food for healthy growth and development. It provides all the nutrients and energy an infant needs for the 1st 6 months of life and continue to provide up to half or more of the child nutritional needs during the 2nd half of the 1st year and up to a 1/3 during the 2nd year of life (UNICEF, 2001).

Breast milk contains unique immunologic properties, which protect against infections. It has a positive contribution towards the health of the mother and food security. It is ideal for harmonious physical and psychosocial development of the child (NAK, 1999).

Babies should be exclusively breastfed for the 1st 6 months of life (http://www.who.int/nut/inf.htm). Exclusively breastfed children are protected from diarrhoea, upper respiratory tract infections and PEM. They have been found to grow well mentally, physically, and psychologically due to close contact with the mother (NAK, 1999).

In a study in Busia, it was found that breast feeding initiation is quite high, with the average of 99% of the mothers’ initiating breastfeeding. The duration of breastfeeding is long with majority of women breastfeeding for 19-24 months. By the age of 3-4 months about 70% of the children were already being fed on other diets in addition to breast milk.
(Akwara, 2006). Despite the high initiation rate of breastfeeding, PEM continues to be a major problem since there is early introduction of complementary feeds that is, at the 3rd and 4th months when the child should be exclusively breast fed (NAK, 1999).

Exclusively breastfed infants have 2.5 times fewer episodes of childhood illnesses. Infants who are not breastfed are up to 25 times more likely to die from diarrhoea and PEM and nearly 3 times more likely to die from acute respiratory tract infections than those who are exclusively breastfed (WHO/BASIC/UNICEF, 2003).

In a study conducted in Uganda, it was found that wasting was highest among children breastfed only up to 3 months while stunting was highest among children breastfed for over 2 years (Efata, 2000). Children breastfed for a short duration for example 3 months, have insufficient nutrients which they get from breast milk and have a high risk of developing PEM. Long duration of breastfeeding minus supplementation with complementary feeds increases the chances of development of PEM because above 6 months the breast milk is insufficient to support the infant the nutritional requirement necessary for growth and development (WHO/BASIC/UNICEF, 2003).

For the HIV/AIDS positive mothers, where such benefits must be weighed against the risk of mother-to-child transmission of the virus, current policies aim to continue support for breast feeding, while ensuring informed choice on infant feeding options (WHO/BASIC/UNICEF, 2003).

It has been estimated that improved breastfeeding practices could save some 1.5 million children a year. Yet a few of the 129 million babies born each year receive optimal breastfeeding and some are not breastfed at all (WHO/UNICEF, 2003).

2. COMPLEMENTARY FEEDING

It is recommended that at about 6 months of age, breast milk should be complemented with appropriate solid feeds. Breast milk on its own is sufficient to meet all the nutritional
needs of an infant up to 6 months of age after which complementary feeds are required to meet the additional requirement of energy and nutrients (http://www.pediatriconcall.com).

The period when the complementary feeds are introduced is crucial to the child health and development. Children are particularly vulnerable at this particular transition period, and if their needs are not met appropriately, PEM and diseases follow. It is essential that complementary feeds are introduced at the right time, are nutritional adequate, hygienically prepared and fed and are in sufficient quantity (http://www.pediatriconcall.com).

The WHO warns that nutritional inadequate or contaminated foods and starting complementary food too early or too late are the major causes of PEM (http://www.who.int/nut/inf.htm).

Proper food hygiene during complementary feeding period is crucial in infections prevention especially diarrhoea (Tomkins, and Watson, 1994).

In a study done in Uganda, it was found that the mean age of introduction of complementary feeds was 4.9 months. The reasons given for early introduction of the complementary feeds were: breast milk was not enough, child was old enough and that the mother was too busy. Most mothers (70%), gave their children complementary feeds such as local starch foods and only 18% gave milk while 11.1% gave enriched porridge (Efata, 2000). This shows that complementary feeds are introduced on early age (4.9 months) yet WHO warns that it should be introduced after 6 months. The nutrients in the breast milk thus are not obtained by the babies and this makes them develop PEM. The baby who is still young and developing most of body parts cannot digest and absorb nutrients from the complementary feeds (http://www.who.int/nut/inf.htm).

Study done in slum area of Uganda showed that most children were introduced to complementary feeds at the age of 0 to 3 months and of which 7.5% were fed on complementary feeds before the age of 1 month. The study also showed that 20.4% were
given complementary feeds late at the age of 7 to 30 months. Underweight and stunted children were more among children who were given complementary feeds late (Efata, 2000). Late introduction of complementary feeds to the baby after 6 months increases the chances of development of PEM because of insufficient nutrients in the breast milk at that particularly period to necessitate growth and development (http://www.who.int/nut/inf.htm).

A study carried out in Kibera slum of Kenya in Nairobi, showed that children were given complementary feeds at the age of 1 to 12 months with the average of 4.8 months. The most used complementary feed was porridge. Use of a cup and spoon was found to be the most commonly used method (Tai, 2007). In Maragua district of Kenya, it was found that mothers introduced complementary feeds to their children at the age of 3 to 6 months. The reasons given for early introduction was that the children were crying a lot indicating they were hungry (Maragua, 2006).

From the studies, we can conclude that early and late introduction of complementary feeds increases the chances of development of PEM. Carbohydrates foods are the most frequently used yet they do have insufficient nutrients required by the child.

3. HEALTH SEEKING BEHAVIOUR

The interaction of infections and PEM has an impact on the health status particularly in the lower socio-economic groups (WHO/UNICE 2001). The ‘malnutrition-infection’ complex remains the most prevalent public health problem in the world to day (Tomkins, and Watsons, 1994). Out of 13 million infants and young children who die each year in the developing countries, majority of them are due to infectious and parasitic diseases and most of them die malnourished from PEM (Tomkins, and Watsons, 1994).

According to WHO report, communicable diseases take the 1st four positions among the five top causes of mortality, morbidity, and disability in Kenya. When they occur, either they precipitate or aggravate PEM especially in young children affecting their feeding patterns (WHO 2005). Evidence shows that malnutrition, even in its milder form can
increase the likelihood of morbidity and mortality from a number of different diseases entities (Tomkins, and Watsons, 1994).

Studies done in Kibera slums in Nairobi, found that nearly half of the study children in Kibera were found to be infested with gastro-intestinal parasites, with the prevalence of the Ascaris Lumbricoides being the highest. Infestation of Ascaris lumbricoides was found to affect the nutritional status of the study group significantly (Tai, 2007).

Reduced food intake during the period when calories and proteins are required most, due to increased depletion of body nutrients stores by increased metabolism such as fever, loss of appetite and reduced nutrient intake can lead to moderate and severe PEM. There is increased demand of nutrients and direct loss through vomiting, diarrhoea, mal-absorption and altered metabolism. Therefore the interaction between PEM, poor feeding practises and infections are closely linked (WHO, 2003).

It is important for mothers to recognize the signs and symptoms of infections early for medical help. The basic essentials for health, is the ability to access curative and preventive health services, that are affordable, accessible, acceptable and of good quality. UNICEF recommends that families should have access to a health centre within a reasonable distance and families should seek medical help on time (UNICEF, 2001). Breast feeding should continue even if the child has diarrhoea. Additional fluids should be given and they should receive small frequent meals, since infections affect appetite (Dearden, et al 2005).

A study done in Uganda, found that food with-holding during illness was reported in 50.5% of mothers and only 10% of the mothers were reported with-holding milk during diarrhoea (Efata, 2000). Withholding of food or breast milk during child hood illness increases PEM in the under five-years-old children due to increased loss of nutrients during vomiting, diarrhoea, and increased metabolism.
Every year, 3 million children are saved, thanks to routine vaccinations, but also 4 million die because they are not immunized (Genton, 2000). Immunization of children at the appropriate time reduces the incidence of preventable diseases.

High prevalence of these preventable diseases especially measles, reduces the immune status of the children. Recurrent infections due to low immunity may lead to low nutritional status of the child (Genton, 2000).

A study carried out in Gambia, found out that, despite high rate of immunization and high level of medical care, the infant mortality rate was still high and nutritional status of children was still very poor (UNICEF, 2000).

A study done in Uganda, found that occurrence of PEM was significantly lower in children who were fully immunized for age than those who were not. It also observed that, there were more sick children (92.5%) among those who were not fully immunized for age as compared to 68.7% sick children in those who were fully immunized (Musomi, 2004). In MTRH, lack of immunization of the children was a risk contributing to malnutrition (Ayaya, et al 2004).

2.6 Economic factors
A. HOUSE-HOLD INCOME AND RESOURCE OWNERSHIP
The nature of food eaten and the quality of diet is to a large level related to income. Studies have shown that as house-hold income increases, the food consumed increase both in quality and quantity.

According to study done in Botswana, children from house-holds of one or more working adults were more likely to be feed well due to availability of enough family income than those from families whose adults are not working (Marsh, et al 2005). Another study done in Ethiopia, showed relatively higher median duration of breast feeding among malnourished children from PEM, who were mainly from low income house-holds (Mackintosh, et al 2005). This confirms the fact that, mothers in these house-holds have
little choice other than depend mainly on breast feeding and starting complementary feeding late.

A study conducted in Maragua district, found that families of higher socio-economic status provided their children with better diet (Maina, 2006). In nutritional survey conducted in Kenya from 1993 to 1996, it was found that richness in terms of land and cattle ownership had little effect on efficiency of diet consumed (WHO/BASIC/UNICEF, 2003).

In MTRH, lack of ownership of land by the father, small grandfather’s land size, lack of ownership of cattle and sheep, and not growing maize and beans in either rural or urban homes were risk factors to PEM.(Ayaya, et al 2004). Also total family income continues to be of greater impact on the nutrition status of the children from the same study .Households whose either the father and the mother income is more than 5000 per month have low risk of their children suffering from PEM.

B. HOUSE-HOLD FOOD SECURITY

UNICEF defines house-hold food security as sustainable access to safe food of sufficient quality and quantity in order to ensure adequate intake and a healthy life for all members of the house-holds. House –hold food security depends on access to food financially, physically and socially rather than only the availability of the food (UNICEF, 2000). Access of food should be consistent and sustainable.

Most house-holds in Kenya are said to experience both transitory and chronic food insecurity. Transitory food insecurity is caused by erratic weather especially to those practising agriculture and rampant changes in food prices and wages. At the house-hold level, the socio-economic impact of the current economic crisis has continued to affect food security.

A study carried out in Maragua district, found out that on average, over 40% of the study house-hold spend between 800 and 1200 Kenya shillings per month on food (Maina,
2007). In MTRH, the study showed also fewer amounts is spent monthly on food compared to that earned; due to the presence of extended family members that have to be sent for certain amount for their use (Ayaya, et al 2004). As a consequence in all the two studies, the level of PEM in the study group was highly significant since less nutritious food would be available for the children.

In a study done in Uganda, it also revealed that wasting and underweight was high in house-hold that spent less amount of money on food per month (Efata, 2000).

2.7 **Summary of literature review**

From the literature review most of the demographics characteristics of parents have been found to cause PEM in the under-five-years old children. Also the socio-economic factors predispose them to PEM in the various areas of the studies. This could also pertain to KNH but these have not been studied yet.

2.8 **Gap in knowledge**

The literature reviews have not considered the influence of paternal age in relation to PEM. No research has been carried in KNH on socio-economic factors causing PEM in the under five-years-old children. Thus more research should be done to consider these in relation to PEM of the under five-years-old children in KNH.
CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Study design
A descriptive cross-sectional study was employed, aiming at establishing the socio-economic factors causing PEM in the under five-years-old children in KNH.

3.2 Study area
The study was carried out in medical paediatrics wards, paediatrics outpatient and MCH clinics of KNH, which serves as a teaching hospital for university of Nairobi and Kenya medical training college. It is a national referral hospital for the whole country. It also functions as a provincial and district hospital for the city of Nairobi.

The population served is mainly of low socio-economic status. It is located in the capital city of Kenya, Nairobi. The above mentioned departments’ admits and review children who are 5 years and below. In medical paediatrics wards, infants and young children of 5 years and below with various medical problems are admitted. Paediatrics outpatient and MCH have specialists that review children five years and below with various conditions, monitor their growth and developments and provide immunization to them.

3.3 Study population
The study population comprised of children aged below 60 months admitted in medical paediatrics wards or attending paediatric out-patient and maternal child health (MCH) clinics in KNH.

The under five years old children were chosen because they are the most vulnerable group of the population and they are the sensitive indicator of health and well being of the society (CBS 1998). Information on the socio-economic factors predisposing them to PEM provided useful glimpse on how to deal with the problem.
3.4 Inclusion criteria

1. Children aged below 60 months.
2. Children who were admitted in medical paediatric wards or attending paediatric outpatient and MCH clinics of KNH.
3. Children whose mothers gave consent.
4. Children without chronic diseases, malignancies, or any physical or mental conditions.

3.5 Exclusion criteria

1. Children whose ages were 60 months and above.
2. Children who were not admitted in medical paediatrics wards, not attending paediatrics outpatient and MCH clinics of KNH.
3. Children whose mothers did not give consent.
4. Children with chronic diseases, malignancies, or any physical or mental conditions.

3.6 Sample size determination

Sample size was calculated using the Fisher’s formula (Haynes, et al 2006))

\[ n = \frac{(ZXZ)P(1-P)}{(dXd)} \]

\( n \) = sample size.

\( P \) = estimated proportion of under five-years-old children with PEM who were admitted in KNH is 75% according to Nyandiko, (2000).

\( Z \) = 1.96 and is the table value for standard normal distribution curve at a significance level of 5%.

\( d \) = degree of precision value used is plus or minus 0.05 (5%).

\[ n = \frac{(1.96 \times 1.96)0.75(1-0.75)/(0.05 \times 0.05)}{288} = 288. \]

For population less than 10,000

\[ n = \frac{n}{1 + (n/N)} \] (Haynes, et al 2006))

\( n \) = desired sample size - population less than 10,000

\( N \) = Estimate of population size

\[ n = \frac{288}{1 + (288/200)} = 118 \]
3.7 **Sampling**

**SAMPLING FRAME**
The sampling frame was all the children aged below 60 months together with their biological mothers in the study area and those whose mothers gave consent for the study.

**SAMPLING UNIT**
It included all mothers with eligible children and mothers who consented for the study. This constituted a unit of analysis and had an equal probability of inclusion in the study.

**SAMPLING PROCEDURE**
Purposive non probability and systematic and random probability sampling were utilized. The eligible children were those aged below 60 months and had met the inclusion criteria. The selection was done as follows:

*Stage 1: Selection of hospital*
Kenyatta National Hospital (KNH) was selected purposive, since it is a National hospital receiving patients' country wide and where the highest cases of PEM were found.

*Stage 2: Selection of the departments*
Medical paediatrics wards, paediatrics outpatient and MCH clinics were selected purposive, since they were where children aged below 60 months were admitted and seen in KNH.

*Stage 3: Determination of the number of children aged below 60 months to be sampled from each department*
This was done proportional to the number of children aged below 60 months seen in each department monthly. Paediatrics medical wards admit 80, paediatrics out-patient clinic review 80 and MCH 40 children aged below 60 months. Total number of children aged below 60 months was 200, seen monthly according to 2007 KNH statistics. Table 1 below, illustrated the proportion of children aged below 60 months from each department that were sampled.
Table 1: Number of children aged below 60 months sampled from each department

<table>
<thead>
<tr>
<th>Departments</th>
<th>Total number of children aged below 60 months</th>
<th>Determination of sample size (proportion)</th>
<th>Number of children aged below 60 months that were selected.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Paediatrics medical wards.</td>
<td>80</td>
<td>80/200X118</td>
<td>47</td>
</tr>
<tr>
<td>2. Paediatrics outpatient clinic</td>
<td>80</td>
<td>80/200X118</td>
<td>47</td>
</tr>
<tr>
<td>3. MCH</td>
<td>40</td>
<td>40/200X118</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td></td>
<td>118</td>
</tr>
</tbody>
</table>

Stage 4: Selection of eligible children

In all the departments, systematic sampling was utilized to select eligible children who only meet the criteria of selection. Admission books in the paediatrics wards and register books in MCH and outpatient paediatrics clinics were utilized. The interval was every 2nd child in the admission books in the paediatrics wards and register books in the MCH and paediatrics outpatient clinics. The 1st two children in the register books and admission books in each department were selected by random by balloting to determine the starting point. Data was collected until the required number of eligible children in each department was reached.

3.8 Sampling interval

To determine the interval for systematic sampling, the sample size was divided by the total population of children aged below 60 months seen in paediatrics outpatient and MCH clinics and admitted in paediatrics wards monthly (200/118=1.69 rounded to 2).
3.9 Study instruments

QUESTIONNAIRES FOR THE INTERVIEW

The pre-tested questionnaires comprised of the following parts and were completed in the following sequence:

1. Parents socio-demographics characteristics.
   It provided information of maternal age, marital status and parity, marital education, marital occupation, paternal age, paternal education, and paternal occupation.

2. Child’s demographic characteristics.
   It provided information on the child’s age, sex, date of birth, birth order, immunization profile, weight, and height. Nutritional status of the child was determined using the three indicators: weight for age, weight for height, and height for age.

3. Social factors
   It provided information on feeding practices, family cohesiveness, alternative care givers, household size, health seeking behaviours, housing, sanitation, and water source.

4. Economic factors.
   It provided information on the resource ownership of the family (land and cattle), total monthly income and amount spent on food monthly by the family.

ANTHROPOMETRIC ASSESSMENT DEVICES

The devices for assessment of anthropometric measurements (weight and height/length) that were used were:

1. Portable hanging scales used for weighing the children.
2. Wooden length/height boards used for taking length/height of the children.

This helped in detecting children with PEM.

3.10 Pilot study

Twenty (20) questionnaires were completed during piloting. The questionnaires were structured and written in English. The pre-testing was done in Mbagati hospital medical paediatrics ward. The biological mothers of children less than five years admitted and who had met the inclusion criteria were interviewed in the month of April 2009, in duration of 20 days. They were not sampled for the main study. This was to ensure
validity of the questionnaires. Once the piloting was completed, the researchers jointly addressed any points that needed to be attended to before the actual study begins.

3.11 Recruitment and training of research assistants.

Nine interns of degree nursing (BSCN) were recruited to collect data. They were recruited for this purpose because of their frequent availability in the hospital, not fully involved in the hospital duties and competency in carrying out interviews and taking the anthropometric measurements. All the research assistants were trained by the investigator and two nutritionists. Prior to data collection the following areas were covered during the training:

a. Sampling.
b. Interview technique for collecting data.
c. Basics medical ethics.
d. Taking of anthropometrics measurements.

The objective of the training was to familiarize the research assistants with skills and knowledge of all the aspects of the study. The training also involved them doing some exercises and tasks to ensure a comprehensive understanding of the logistical and practical issues involved in implementation of a study. They were trained prior to pilot study for a period of 20 days in the month of March 2009.

3.12 Data collection, cleaning and entry

INTERVIEW

The study was carried out from Monday to Friday when most of the essential staff members were available in the hospital for 2 months period (May to June 2009). The same procedures were followed when collecting data from each child. The respondents (child’s mothers) were asked questions in interview sessions. Each child included in the study was selected randomly.
The procedures for interview were as follows:

a) The research assistants introduced themselves and explained to the respondents and the children the purpose of the study.

b) The interviewees were reassured regarding the confidentiality of the data and were requested to answer the questions truthfully.

c) An informed consent was obtained.

d) The questionnaires were filled and the anthropometric measurements of the children were taken and also filled in the right section in the questionnaires.

ANTHROPOMETRICS ASSESSMENT PROCEDURE

Trained research assistants used standardized and internationally described methodology and anthropometrically examined each subject. The following measurements were taken from each child:

1. Weight

Each research assistant was equipped with a portable hanging scale with a maximum capacity of 25 kilograms and demarcations at every 100 grams. Children were weighed without clothes, suspended in plastic bags until their feet were off the ground. The scales were suspended on wall units. Two readings that do not differ by more than 0.1 kilograms were taken and the average of the two computed later.

2. Height/length

A wooden length board was used to take the recumbent length of children who were less than two years old. Two research assistants were required to correctly position the child and ensure accurate measurement of length. Two readings that do not differ by 0.5 centimeters were taken and their averages computed. Height measurements were taken using a height board for children who were over 24 months.
3. Age
Respondents were asked when the child was born (date, month and year) and these were confirmed from the child’s immunization health card and the birth certificate. These were later computed to determine the age of the child.
The data then was cleaned and transformed into codes developed from the questionnaires and entered in the computer for analysis.

3.13 Data analysis and presentation
Analysis was done using statistical package for social sciences (SPSS). Frequencies of all the variables were generated and used for checking the outliers.
The anthropometric statistical programme was employed to convert raw anthropometric measurements or data (weight, height or length of the children) into anthropometric indices and compared them with the National centre Health statistics (NCHS) reference figures.

Using the statistical package for social sciences (SPSS) analysis of each variable was done. Bivariate analysis was used to explain the relationship between the independent variable and the outcomes. The chi-square was used to test the significance of the relationship between independent variables and the outcomes.
Presentation of the descriptive data was done in the form of descriptive statistics, frequency distributions, and graphic forms.

3.14 Ethical considerations
1. Consents were given by respondents (child’s mother) to take data, measurements, and examine the child after explanation of the purpose, any procedures to be taken, benefits and risks of the study. The respondents were also assured that any information that they gave was treated confidential and that their names or information that would identify them as respondents was not given to any one at all.
2. Any child who was found malnourished and had any other condition not diagnosed, was referred for medical review for further management.
3. Approval was sought from KNH ethical and research committee.
4. Authority was sought from the ministry of health, KNH administrators, and unit managers among others.

3.15 Limitations of the study

1. Language barrier among some of the respondents hindered accurate data collection.
2. Attitudes of the respondents interfered with provision of the correct information.

3.16 Dissemination plan
The findings of the study were kept in the university library so that it was used as base line data for other studies. The results were distributed to policy makers, NGO’s, nutritionists, health planners, health workers and other stake holders who used it in planning and implementing of relevant activities for alleviation of PEM.
CHAPTER FOUR: RESULTS

4.1: INTRODUCTION

This chapter presents both descriptive and inferential analytic results of the study. The descriptive results avail information on demographic, social and economic factors of the study population such as age, sex, marital status, education, household size, household income, household food security, religion, community feeding practices and health seeking behaviours. The way these variables interact with the nutritional status of the study children (PEM) is also outlined. Multivariate analyses of significant variables found from bivariate analysis were computed to remove confounding variables.

4.2: MOTHERS' DEMOGRAPHIC CHARACTERISTICS

A. MARITAL AGES

The ages of the mothers covered in the study, ranged from 18 to 41 years with a mean of 27 years (sd 5.14). Over 41% of the mothers were between the ages of 25 – 29 years (figure 3).

Figure 3: Distribution of age groups of the mothers in years

There were higher proportions of underweight, stunted and wasted children of younger mothers (ages < or equal to 29 years) than those of older mothers (ages > than 29 years). These were statistical insignificant (p>0.05) (table 3).
B. MARITAL STATUS
Among the 118 mothers interviewed, majorities were married and minorities were single and separated (figure 4).

Figure 4: Distribution of marital status of respondents

![Distribution of marital status of respondents](image)

The prevalence of underweight and wasting in children among mothers who were married was higher compared to those who were not married (single and divorced/separated). Among the children who were stunted, the proportion among married was 57% compared to 64% in those who were not married. The findings were not statistically significant (p>0.05) (table 4).

C. LEVEL OF EDUCATION
Majority of the respondents 59.3% had secondary school education and minority 5.9% had attended formal education up to primary school level (figure 5).
The proportions of underweight and wasted children were lower among mothers with formal education compared to those without formal education. The rate of stunting in children of mothers with formal education was 62% compared to 31% of their counterparts. These findings were found to be statistically significant (p=0.03) (table 4).

D. EMPLOYMENT STATUS

Almost more than a half of all mothers 52.5% were unemployed and 1.7% had formal employment (table 2).

<table>
<thead>
<tr>
<th>Type of employment</th>
<th>Frequency N=118</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farming</td>
<td>3</td>
<td>2.5</td>
</tr>
<tr>
<td>Formal employment</td>
<td>2</td>
<td>1.7</td>
</tr>
<tr>
<td>Casual laborer</td>
<td>24</td>
<td>20.3</td>
</tr>
<tr>
<td>Self employment</td>
<td>27</td>
<td>22.9</td>
</tr>
<tr>
<td>Unemployed</td>
<td>62</td>
<td>52.5</td>
</tr>
<tr>
<td>Total</td>
<td>118</td>
<td>100</td>
</tr>
</tbody>
</table>

Unemployed mothers had a higher proportion of children in both underweight and wasted compared to their counterparts. Among the employed mothers, the prevalence of children
who were stunted was 62% while those who were not employed the prevalence was 55%. The results were insignificant in both cases (p>0.05) (table 3).

Table 3: Bivariate analysis of maternal demographic characteristics and PEM in under five-years-old children

<table>
<thead>
<tr>
<th>Weight -for-age</th>
<th>Height-for-age</th>
<th>Weight-for-height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal n (%)</td>
<td>Under Weight n (%)</td>
<td>Normal n (%)</td>
</tr>
<tr>
<td>Maternal age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; or = to 29 yrs</td>
<td>34(39) 53(61)</td>
<td>0.4 0.55</td>
</tr>
<tr>
<td>&gt; than 29 yrs</td>
<td>14(45) 17(55)</td>
<td>13(46) 15(54)</td>
</tr>
<tr>
<td>Married</td>
<td>33(37) 57(63)</td>
<td>2.5 0.11</td>
</tr>
<tr>
<td>Not married</td>
<td>15(54) 13(46)</td>
<td>9(36) 16(64)</td>
</tr>
<tr>
<td>Gone to school</td>
<td>44(43) 59(57)</td>
<td>1.3 0.24</td>
</tr>
<tr>
<td>Did not go</td>
<td>4(27) 11(73)</td>
<td>9(69) 4(31)</td>
</tr>
<tr>
<td>Employment</td>
<td>26(46) 30(54)</td>
<td>19(38) 31(62)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>22(36) 40(64)</td>
<td>26(45) 32(55)</td>
</tr>
</tbody>
</table>

4.3: FATHERS’ DEMOGRAPHIC CHARACTERISTICS

A. FATHERS’ AGES

The ages of the fathers ranged from 22 to 68 years with a mean of 33 years (sd 6.47). Of the 118 mothers, only the ages of 81 (68.6%) fathers were given. Over 33% of the fathers were between the ages of 30 – 34 years (figure 6).

Figure 6: Distribution of age groups of the fathers in the year

![Figure 6: Distribution of age groups of the fathers in the year](image-url)
All the three nutritional indices of PEM (underweight, stunted and wasting) had the highest proportion of children among fathers who were older (ages > than 29 years) than among fathers who were younger (ages < or equal to 29 years). These findings were insignificant (p>0.05) (table 5).

B. LEVEL OF EDUCATION

Among the 118 mothers interviewed, only 85 (72%) gave the education level of the father of the child. More fathers 58.8% had tertiary level education (figure 7).

![Figure 7: Distribution of level formal education of fathers](image)

All the three nutritional indices of PEM (underweight, stunting and wasting) had the highest proportion of children in fathers who had formal education than among those fathers without formal education. The result for stunting and education level of paternal was however significant (p=0.001) (table 5).

C. EMPLOYMENT STATUS

Almost more than a half of 88 of the fathers, were casual laborers 52.3% and minority each 2.3% were farmers and others were not employed (table 4).
Underweight and wasting had the highest prevalence of children in fathers who had employment (62% and 39%) than among those who were not employed. Stunting proportion among employed fathers was 56% and that of their counterpart was 100%. The results however were insignificant (p>0.05) (table 5).

**Table 4: Distribution of employment status of fathers**

<table>
<thead>
<tr>
<th>Type of employment</th>
<th>Frequency N=88</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farming</td>
<td>2</td>
<td>2.3</td>
</tr>
<tr>
<td>Formal employment</td>
<td>11</td>
<td>12.5</td>
</tr>
<tr>
<td>Casual laborer</td>
<td>46</td>
<td>52.3</td>
</tr>
<tr>
<td>Self employed</td>
<td>27</td>
<td>30.6</td>
</tr>
<tr>
<td>None</td>
<td>2</td>
<td>2.3</td>
</tr>
<tr>
<td>Total</td>
<td>88</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table 5: Bivariate analysis of paternal demographic characteristics and PEM in under five-years-old children**

<table>
<thead>
<tr>
<th>Weight-for-age</th>
<th>Normal n (%)</th>
<th>Under Weight n (%)</th>
<th>Chi</th>
<th>P value</th>
<th>Height-for-age</th>
<th>Normal n (%)</th>
<th>Stunted n (%)</th>
<th>Chi</th>
<th>P value</th>
<th>Weight-for-height</th>
<th>Normal n (%)</th>
<th>Wasted n (%)</th>
<th>Chi</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>father's age</td>
<td></td>
<td></td>
<td>1.9</td>
<td>0.16</td>
<td>1.9</td>
<td></td>
<td></td>
<td>0.3</td>
<td>0.58</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; or = to 29</td>
<td>11(52)</td>
<td>10(48)</td>
<td></td>
<td></td>
<td>9(47)</td>
<td>10(53)</td>
<td>0.3</td>
<td>0.58</td>
<td></td>
<td>16(71)</td>
<td>6(29)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 29 years</td>
<td>21(35)</td>
<td>39(65)</td>
<td>0.2</td>
<td>0.29</td>
<td>22(40)</td>
<td>33(60)</td>
<td>0.3</td>
<td>0.58</td>
<td></td>
<td>37(64)</td>
<td>21(36)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gone to school</td>
<td>31(37)</td>
<td>53(63)</td>
<td></td>
<td></td>
<td>33(42)</td>
<td>45(58)</td>
<td>4.27</td>
<td>0.001</td>
<td></td>
<td>51(63)</td>
<td>30(37)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not go</td>
<td>1(100)</td>
<td>0</td>
<td>0</td>
<td>1.00</td>
<td>0</td>
<td>0</td>
<td>0.3</td>
<td>0.58</td>
<td></td>
<td>1(100)</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment</td>
<td>33(38)</td>
<td>53(62)</td>
<td></td>
<td></td>
<td>35(44)</td>
<td>45(56)</td>
<td>0.02</td>
<td>0.89</td>
<td></td>
<td>51(61)</td>
<td>32(39)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>1(50)</td>
<td>1(50)</td>
<td>0.2</td>
<td>0.69</td>
<td>0</td>
<td>1(100)</td>
<td>0.2</td>
<td>0.69</td>
<td></td>
<td>2(100)</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**4.4: CHILD'S DEMOGRAPHIC CHARACTERISTICS**

**A. CHILD'S AGE AND SEX**

The index children were children aged 0 – 59 months in the study population and whose mother’s gave consent to take part in the study. The number of index children included in the study was 118, of which 55.9% (66) were male and 44.1% (52) were female, giving a ratio of approximately 1:1. Over 59% of the children ages were less than 12 months (figure 8).
In the underweight and wasted children, the proportion among the younger children (ages < or equal to 35 months) were higher than that of older children (ages > than 35 months). Stunting results was significant (p=0.03), whereby its proportion in younger children was 61% and that of the older children was zero. All the results of nutritional indices of PEM were statistically insignificant considering sex of the child. Underweight and wasting proportions among male children were lower than among females (table 5).

B. BIRTH ORDER AND INTERVAL

Majority of children in the study population 39.8% were first borne in their family (figure 9). Of those who were not 1st borns, majority of them 60 (84.5%) had a birth interval 2 years between them and the older child they followed. The remaining 11(15.5%), the birth interval was 1 year.
Among those children who were 1st borns, the proportions of underweight and wasting were lower than those who were not 1st borns. Stunting prevalence among those children who were 1st borns was 60% and that of their counterparts was 57%. These were however not statistically significant (p>0.05). No statistically significant relationship was found between the birth interval and PEM (table 6).

Table 6: Bivariate analysis of child’s demographic characteristics and PEM in under five-years-old children

<table>
<thead>
<tr>
<th></th>
<th>Weight -for-age</th>
<th>Height for age</th>
<th>Weight-for-height</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal (%)</td>
<td>Underweight (%)</td>
<td>Chi value</td>
</tr>
<tr>
<td>Child’s sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>28(42)</td>
<td>38(58)</td>
<td>0.19</td>
</tr>
<tr>
<td>Female</td>
<td>20(39)</td>
<td>32(61)</td>
<td></td>
</tr>
<tr>
<td>&lt; 35 month</td>
<td>41(38)</td>
<td>66(62)</td>
<td>1.70</td>
</tr>
<tr>
<td>&gt; 35 month</td>
<td>7(64)</td>
<td>4(36)</td>
<td></td>
</tr>
<tr>
<td>1st born</td>
<td>21(45)</td>
<td>26(55)</td>
<td>0.52</td>
</tr>
<tr>
<td>Not 1st born</td>
<td>27(38)</td>
<td>44(62)</td>
<td></td>
</tr>
<tr>
<td>Birth interval</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 year</td>
<td>41(38)</td>
<td>66(62)</td>
<td>1.70</td>
</tr>
<tr>
<td>2 years</td>
<td>7(64)</td>
<td>4(36)</td>
<td></td>
</tr>
</tbody>
</table>
4.5: SOCIAL FACTORS
A. FAMILY COHESIVENESS/ALTERNATIVE CARETAKERS

111 of the respondents (94.1%), reported care of the children as a family. Fathers assisted in the care of the child in majority of respondents 45.9% (Figure 10). 27.1% (32) of the respondents reported living with members of extended family in the past 3 months prior to the study.

Majority of respondents who reported not to have family cohesiveness had a high proportion of their children in stunting and wasting than their counter parts (those with family cohesiveness). Unlike the difference, there was no statistical significance in the above results (p>0.05) and also staying with members of extended families (table 7).

Over 65% of the mothers reported leaving their children in care of others people while they went to work or shopping. The average number of hours in a day in which the mothers left their children in care of others was 5 hours with a range of 0 to 24 hours a day and a standard deviation 4.8 hours. Most mothers 11% (13) left their children for at least 2 hours in a day followed by 9.3% (11) for 3 hours per day.

The main alternative child care givers reported by 75 of the mothers, included relatives 36%(27); neighbors 26.7% (20); father 13.3% (10); friends 8% (6); older children 9.3% (7) and house help 6.7%(5). Of those of leave their children in the care of alternative care givers 66.2%% (51) reported that their children got quality care. To improve this, most of the mothers suggested they decided to stay with their children alone while others sort out other means such as preparing for the children meal before leaving and looking for house helps.

There was a higher prevalence of underweight and wasted children among respondents who reported leaving them with alternative caretakers. Among those who left their children with others (neighbors, friends and relatives), there was higher proportion of children with underweight than among those who left them with nuclear family members. The result was statistically significant (p=0.01). The number of hours the children were
left with alternative care takers and the quality of care given were not statistical insignificant (table 7).

**Figure 10: Distribution of members who assisted in child care**

![Distribution of members who assisted in child care](image)
Table 7: Bivariate analysis of family cohesiveness and alternative care takers and PEM in under five-years-old children

<table>
<thead>
<tr>
<th>Weight-for-age</th>
<th>Height for age</th>
<th>Weight-for-height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal, n (%)</td>
<td>Under weight n (%)</td>
<td>Chi</td>
</tr>
<tr>
<td>Cohesiveness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>44(40)</td>
<td>67(60)</td>
</tr>
<tr>
<td>No</td>
<td>4(57)</td>
<td>3(43)</td>
</tr>
<tr>
<td>Nuclear members</td>
<td>31(41)</td>
<td>44(59)</td>
</tr>
<tr>
<td>Others</td>
<td>13(36)</td>
<td>23(64)</td>
</tr>
<tr>
<td>Relatives present</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>13(41)</td>
<td>19(59)</td>
</tr>
<tr>
<td>No</td>
<td>35(41)</td>
<td>51(59)</td>
</tr>
<tr>
<td>Child left</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>29(38)</td>
<td>48(62)</td>
</tr>
<tr>
<td>No</td>
<td>19(46)</td>
<td>22(54)</td>
</tr>
<tr>
<td>Nuclear members</td>
<td>11(65)</td>
<td>6(35)</td>
</tr>
<tr>
<td>Others</td>
<td>17(29)</td>
<td>41(71)</td>
</tr>
<tr>
<td>Hours of left</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; or = to 6</td>
<td>23(43)</td>
<td>30(57)</td>
</tr>
<tr>
<td>&gt; than 6 hrs</td>
<td>6(25)</td>
<td>18(75)</td>
</tr>
<tr>
<td>Care quality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>20(39)</td>
<td>31(61)</td>
</tr>
<tr>
<td>Poor</td>
<td>9(35)</td>
<td>17(65)</td>
</tr>
</tbody>
</table>

B. HOUSE-HOLD SIZE

The number of persons living in the respondents’ household ranged between 2 to 12 persons, with an average of 5 persons per household. The number of children under five years of age ranged between 1 to 4 children per household. The average number of children under 5 years of age was 2 children per household with majority of household 60.2% (71) having 1 child under 5 years old.

In underweight, the prevalence among household size less or equal to 6 members was lower but in both stunted and wasted the prevalence was higher. The prevalence among number of under five-year-old children greater than one was higher in all the three nutritional indices of PEM. Despite this, there were no statistically significant relationships (table 8).
Table 8: Bivariate analysis of household size and PEM in under five-years-old children

<table>
<thead>
<tr>
<th>Weight-for-age</th>
<th>Height-for-age</th>
<th>Weight-for-height</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal (%)</td>
<td>Weight value (%)</td>
</tr>
<tr>
<td>Family size</td>
<td>n (%)</td>
<td></td>
</tr>
<tr>
<td>&lt; or = 46(43)</td>
<td>46(62)</td>
<td>1.11 0.29</td>
</tr>
<tr>
<td>&gt; than 6 2(20)</td>
<td>8(80)</td>
<td></td>
</tr>
<tr>
<td>1 child</td>
<td>29(41)</td>
<td>0.002 0.96</td>
</tr>
<tr>
<td>More than one</td>
<td>19(40)</td>
<td></td>
</tr>
</tbody>
</table>

C. SOCIAL AMENITIES (HOUSING, WATER, TOILET FACILITIES)

53.4% (63) of all the respondents lived in permanent houses (iron sheet roofed, cemented floor and stoned or brick wall); 43.2% (51) lived in semi-permanent houses (mud or wooden wall, iron sheet roofed and cemented floor) and 3.4% (4) lived in temporary houses (grass roofed, mud/cartons/tin wall and non-cemented floor).

There was no statistical significance between the nutritional indices of PEM and the type of housing. However, there was a significantly higher rate of underweight and wasting among those living in houses which were not permanent (semi-permanent and temporary housing). Overall children from permanent housing were better nourished compared to those from semi-permanent and temporary housing (table 9).

Among the 118 mothers interviewed, majority of them reported use of tap water as their source of water 79.6% (figure 11). Over 33% (39) of the respondents said that the water they used was safe for drinking direct from the source without doing anything further to make it safer. Of those who thought the water was unsafe for drinking straight from the source, most of them 96.2% (76) reported to treat the water before drinking. Majority used boiling as their method of treating water 55.1% (65) and minority reported to use chemicals 9.3% (11).
There was a significant relationship between the household source of water and stunting in the study children \( p=0.01 \). The prevalence of underweight and wasting among those whose household used tap water and those who do not was approximately in ratio of 1:1. Whether the water was taken directly from the source minus treatment, or if boiling or use of chemicals was the method of treatment did not have a statistical significant to development of PEM (table 9).

**Figure 11: Distribution of water sources**

![Distribution of water sources](image)

Majority of the respondents (90.7%) stated that they had access to toilet facilities. The distribution of the type of toilet facilities is shown in figure 12. Only 55.1% (65) of the children did not make use of the toilets because they were said to be too young to use the toilet and also the toilet was considered too dirty for the children.

**Figure 12: Distribution of type of toilet facilities**

![Distribution of type of toilet facilities](image)
There was a higher prevalence among all the three nutritional indices of PEM among those children who come from households without access to toilet facilities. The rate of underweight and wasted children was higher in those households using pit latrine compared to those using flash toilet. The prevalence of underweight and stunted children was higher among those children who did not use the toilet facilities compared to those who used (table 9).

Table 9: Bivariate analysis of social amenities and PEM in under five-years-old children

<table>
<thead>
<tr>
<th></th>
<th>Weight -for-age</th>
<th>Height for age</th>
<th>Weight-for-height</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal N (%)</td>
<td>Under weight n (%)</td>
<td>Chi P value</td>
</tr>
<tr>
<td>Housing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permanent</td>
<td>27(43)</td>
<td>36(57)</td>
<td>0.27 0.61</td>
</tr>
<tr>
<td>Not permanent</td>
<td>21(38)</td>
<td>34(62)</td>
<td></td>
</tr>
<tr>
<td>Tap water</td>
<td>38(40)</td>
<td>56(60)</td>
<td>0.01 0.91</td>
</tr>
<tr>
<td>Not tap water</td>
<td>10(42)</td>
<td>14(58)</td>
<td></td>
</tr>
<tr>
<td>Water safe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>15(39)</td>
<td>24(61)</td>
<td>0.12 0.73</td>
</tr>
<tr>
<td>No</td>
<td>33(42)</td>
<td>46(58)</td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>33(43)</td>
<td>43(57)</td>
<td>0.81 0.37</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
<td>3(100)</td>
<td></td>
</tr>
<tr>
<td>Boiling</td>
<td>29(45)</td>
<td>36(55)</td>
<td>0.03 0.86</td>
</tr>
<tr>
<td>Chemicals</td>
<td>4(36)</td>
<td>7(64)</td>
<td></td>
</tr>
<tr>
<td>Toilet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>47(44)</td>
<td>60(56)</td>
<td>3.68 0.06</td>
</tr>
<tr>
<td>No</td>
<td>1(9)</td>
<td>10(91)</td>
<td></td>
</tr>
<tr>
<td>Pit latrine</td>
<td>29(41)</td>
<td>42(59)</td>
<td>0.81 0.37</td>
</tr>
<tr>
<td>Flush toilet</td>
<td>18(50)</td>
<td>18(50)</td>
<td>0.81 0.37</td>
</tr>
<tr>
<td>Child uses toilet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>23(43)</td>
<td>30(57)</td>
<td>0.3 0.59</td>
</tr>
<tr>
<td>No</td>
<td>25(39)</td>
<td>40(61)</td>
<td></td>
</tr>
</tbody>
</table>

52
D. RELIGIOUS PRACTICES

Majority of the respondents had religious affiliations 98.3% (116). Among these, majorities were Protestants 63.6% (75) (figure 13).

Figure 13: Distribution of religious affiliations

Among those who had religious affiliations, the rates of underweight and wasting among their children were higher. The rate of stunting in those with religious affiliations and those without was approximately in ratio of 1:1. In all the three nutritional indices of PEM, the prevalence was higher in those children whose respondents reported being Muslims. There was no statistical significance relationship between religion and PEM (table 10).

Table 10: Bivariate analysis of religious practices and PEM in under five-years-old children

<table>
<thead>
<tr>
<th>Religious affiliations</th>
<th>Weight -for-age</th>
<th>Height for age</th>
<th>Weight-for-height</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal N (%)</td>
<td>Under weight n (%)</td>
<td>Chi</td>
</tr>
<tr>
<td>Yes</td>
<td>46(40)</td>
<td>70(60)</td>
<td>0.99</td>
</tr>
<tr>
<td>NO</td>
<td>2(100)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Christians</td>
<td>45(41)</td>
<td>66(59)</td>
<td>0.2</td>
</tr>
<tr>
<td>Muslims</td>
<td>1(20)</td>
<td>4(80)</td>
<td></td>
</tr>
</tbody>
</table>

E. COMMUNITIES FEEDING PRACTICES
1. BREASTFEEDING PATTERN

Majority of the respondents were still breast feeding their children at the time of study 66.1% (78). 79.5% (62) were breastfeeding their children on demand while 20.5% (16) had scheduled time for breastfeeding.

Among the 66.1% (78) mothers interviewed who reported still breastfeeding their children, the number of time they breastfed their children in ascending pattern are: once were 6.5% (5); twice 17.9% (14); thrice 17.9% (14) four times 39.8% (31) and greater or equal to five times 17.9% (14).

The duration of breastfeeding was between the 1st day of birth and 36 months with mean of 17.1 months.

The prevalence of underweight and wasting were higher among the children who were not breastfeeding at the time of the study. Despite the fact that there was no statistically significant difference between PEM and children who were either breastfed on demand or scheduled time, there was a higher prevalence in all the three nutritional indices of PEM in children breastfed on scheduled time than those on demand. Highest rates in all the three nutritional indicators were found in children breastfed twice or less than in a day and for duration of less or equal to 12 months (table 11).
Table 11: Bivariate analysis of breastfeeding pattern and PEM in under five-years-old children

<table>
<thead>
<tr>
<th></th>
<th>Weight -for-age</th>
<th></th>
<th>Height for age</th>
<th></th>
<th>Weight -for-height</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal n (%)</td>
<td>Under weight n (%)</td>
<td>Chi</td>
<td>P value</td>
<td>Normal n (%)</td>
<td>Stunted n (%)</td>
</tr>
<tr>
<td>Breastfeeding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>35(45)</td>
<td>43(55)</td>
<td>1.68</td>
<td>0.2</td>
<td>31(40)</td>
<td>46(60)</td>
</tr>
<tr>
<td>No</td>
<td>13(33)</td>
<td>27(67)</td>
<td></td>
<td></td>
<td>14(45)</td>
<td>17(55)</td>
</tr>
<tr>
<td>Demand</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scheduled</td>
<td>31(50)</td>
<td>31(50)</td>
<td></td>
<td></td>
<td>25(41)</td>
<td>36(59)</td>
</tr>
<tr>
<td>Frequency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; or = to 2</td>
<td>6(32)</td>
<td>13(68)</td>
<td>1.79</td>
<td>0.18</td>
<td>7(39)</td>
<td>11(61)</td>
</tr>
<tr>
<td>&gt; than 2 times</td>
<td></td>
<td></td>
<td>29(49)</td>
<td>30(51)</td>
<td>24(41)</td>
<td>35(59)</td>
</tr>
<tr>
<td>Duration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2(13)</td>
<td>13(87)</td>
</tr>
</tbody>
</table>

2. COMPLEMENTARY FEEDING

By the time of the study 83.1% (98) of the study children had been introduced to other foods or fluids other than breast milk. The age at which complementary feeding was introduced ranged between 1 day to 20 months while the mean age was 4.3 months sd (2.6). Majority of the mothers 29.6% (29) gave the reason for complementary feeding as breast milk was not enough; 28.6% (28) child was old enough; 14.3% (14) child was crying; 15.3% (15) advised by health worker; 2% (2) advised by other mothers and 10.2% (10) because the child had another twin brother or sister.

Among the 83.1% (98) mothers interviewed who reported to have started weaning their children, the number of times they fed their children on other foods apart from breast milk daily in ascending manner were: twice 13.3% (13); thrice 28.6% (28); four times 27.5% (27) and greater or equal to five times 30.6% (30).

Most respondents 79.6% (78) started with plain water, followed by tea 13.3% (13) and lastly by cows milk 7.1% (7) as fluid. The sequence of semi-solid food which respondents started with in descending manner is: mashed fruits 60.3% (59); plain uji 35.7% (35); and enriched uji (enriched with for example, milk products, groundnuts) and
mashed food (for example, potatoes) each 2% (2). 65 (66.3%) of respondents reported to use cup and spoon as method of feeding; 23 (23.5%) used cup; and nursing bottles were used only by 10 (10.2%) of respondents.

The prevalence of underweight and wasting was higher among children who were already on complementary feeding at the time of study. There was a statistical significance between children who had been started on complementary feeding at the time of study and PEM (stunting and wasting) (p values of 0.001 and 0.015 respectively).

No statistically significance was computed between period of commencement and frequency of complementary feeding and PEM of the children. In general, proportions of underweight and wasting increased with increase of feeding frequency while stunting rate increased with decrease in feeding frequency (table 12).

Table 12: Bivariate analysis of complementary feeding pattern and PEM in under five-years-old children

<table>
<thead>
<tr>
<th></th>
<th>Weight -for-age</th>
<th>Height for age</th>
<th>Weight-for-height</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal n (%)</td>
<td>Underweight n (%)</td>
<td>Chi</td>
</tr>
<tr>
<td><strong>Complementary feeding</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>36(37)</td>
<td>62(63)</td>
<td>3.37</td>
</tr>
<tr>
<td>NO</td>
<td>12(60)</td>
<td>8(40)</td>
<td></td>
</tr>
<tr>
<td>Started at</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 months</td>
<td>34(37)</td>
<td>58(63)</td>
<td>0.11</td>
</tr>
<tr>
<td>&gt; 6 months</td>
<td>2(40)</td>
<td>3(60)</td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 times</td>
<td>6(46)</td>
<td>7(54)</td>
<td>0.2</td>
</tr>
<tr>
<td>&gt; 2 times</td>
<td>30(35)</td>
<td>55(65)</td>
<td></td>
</tr>
</tbody>
</table>

3. DIETARY CARE DURING ILLNESS

Most mothers 84.7% (83) reported feeding their children less times during illness compared to when the child was well. Only 2% (2) reported feeding their children more times than usual; 10.2% (10) fed them as usual and 3.1% (3) gave them special food.

Over 96% (75) of the mothers who were breastfeeding continued breastfeeding their children during diarrhea episodes. Majority of mothers 79.6% (78) continued feeding
their children with other foods other than breast milk during diarrhea. 41.8% (41) reported giving their children special foods during diarrhea. The foods considered special included fruits, mala, special uji, yoghurt and oral rehydration salt (ORS). 30 % (29) of the mothers were for the opinion that some types of foods should not be given to children during illness for various reasons as shown (Table 13).

**Table 13: Type of food or fluid and reasons for not giving the child during illness**

<table>
<thead>
<tr>
<th>Type of food or fluid</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meat</td>
<td>• Has a lot of cholesterol.</td>
</tr>
<tr>
<td></td>
<td>• Culturally was not child food</td>
</tr>
<tr>
<td>Mixture of beans and maize</td>
<td>• Are hard for chewing and child has less strength.</td>
</tr>
<tr>
<td>Plain beans or maize</td>
<td></td>
</tr>
<tr>
<td>Beverages</td>
<td>• Has a lot of acid.</td>
</tr>
<tr>
<td>Alcohol</td>
<td>• Can damage child liver</td>
</tr>
</tbody>
</table>

The prevalence of PEM was higher in underweight and wasting in mothers who reported feeding their children not less than normal (normal and more than normal). There was a statistical significance relationship between the times of feeding during illness and wasting in the children (p=0.02) (table 14).

It was in underweight children where the prevalence was higher among mothers who reported withdrawing breastfeeding during diarrhea illness. Those who continued on complementary feeding during diarrhea showed high prevalence in all the three nutritional indicators of PEM. Notably the prevalence of PEM was highest in children reported to be fed on special food during diarrhea episodes (table 14).
Table 14: Bivariate analysis of dietary care during illnesses and PEM in under five-years-old children

<table>
<thead>
<tr>
<th>Illness dietary</th>
<th>Weight -for-age</th>
<th>Height for age</th>
<th>Weight-for-height</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal n (%)</td>
<td>Underweight n (%)</td>
<td>Chi P value</td>
</tr>
<tr>
<td>Illness dietary</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; normal</td>
<td>31(37)</td>
<td>52(63)</td>
<td>0.08 0.77</td>
</tr>
<tr>
<td>Not &lt; normal</td>
<td>5(33)</td>
<td>10(67)</td>
<td></td>
</tr>
<tr>
<td>Breastfeeding diarrhea</td>
<td>Yes 34(45)</td>
<td>41(55)</td>
<td>0.03 0.86</td>
</tr>
<tr>
<td></td>
<td>No 1(33)</td>
<td>2(67)</td>
<td></td>
</tr>
<tr>
<td>complementary feeding diarrhea</td>
<td>Yes 28(36)</td>
<td>50(64)</td>
<td>0.12 0.74</td>
</tr>
<tr>
<td></td>
<td>No 8(40)</td>
<td>12(60)</td>
<td></td>
</tr>
<tr>
<td>special food during diarrhea</td>
<td>Yes 11(27)</td>
<td>30(73)</td>
<td>2.98 0.09</td>
</tr>
<tr>
<td></td>
<td>No 25(44)</td>
<td>32(56)</td>
<td></td>
</tr>
<tr>
<td>Some food not given</td>
<td>Yes 8(28)</td>
<td>21(72)</td>
<td>1.48 0.22</td>
</tr>
<tr>
<td></td>
<td>No 28(41)</td>
<td>41(59)</td>
<td></td>
</tr>
</tbody>
</table>

F. HEALTH SEEKING PATTERN

Mothers reported that more than 96% (114) of their children had suffered an illness two weeks prior to the study. Majority of the children 60.5% (69) had suffered gastrointestinal infections (Figure 14). The study also established that 16.9% (20) of the index children were suffering from one or more of persistent illnesses (asthma, epilepsy, and tuberculosis).

There was higher proportion in all the nutritional indices of PEM in those children reported suffering from childhood morbidity. The proportions among children suffering from persistent illnesses in underweight and wasted children were higher (60% and 45%) respectively. In stunting, the proportion among those suffering from persistent illnesses was 50% and those not suffering were 60%. In all these however, there was no statistically significance (table 15).
The information on the index child immunization status was obtained from the child’s
immunization card or from mother’s where such cards were not available. Majority of
respondents reported that their children were fully immunized for age 90.7% (107). Of
those whose children were not fully immunized for age, 90.9% (10) gave the reason for
failure of immunization as “child was sick”. The remainder 9.1% (1) said the clinic was
too far and they had no money for bus fare.

66.9% (79) of the respondents reported that they still took their children to maternal and
child health clinic (MCH) for the routine services. Of those who had stopped, 46.2% (18)
reported to have stopped taking the children to MCH when they were 8 -9 months, while
51.3% (20) when the children were greater than 9 months in age.

Higher proportions in all the three nutritional indices of PEM were among children who
were fully immunized and were also still attending MCH clinics. For example among
those who were fully immunized for age, the proportion of those who were underweight
was 61% and among those who were not fully immunized for age the proportion for
underweight was 45%. The ages at which the respondents stopped taking their children to
MCH clinics showed no relationship with PEM (P>0.05). Higher proportion of children
in the categories of underweight and stunting, were stopped being taken to MCH when
they were between 8 and 9 months (table 15).
2.5% (3) of the children who suffered from the above illness stayed at home the first week of the illness; 0.8% (1) tried to use herds first before seeking medical advice; 7.6% (9) bought drugs and tried to use before seeking medical advice and the majority 89% (105) took their children to health facilities.

Most respondents 48.3% (57) reported that they sought health care from dispensaries; 25.4% (30) health centers; 21.2% district, provincial and national hospitals and lastly 5% (6) local pharmacies.

Higher proportion of children who sought medical attention had underweight and wasting. However in stunting the highest proportion was seen in those children who did not seek medical attention, but stayed at home during the 1st week of illness. This was statistically insignificant (p>0.05) (table 15).
### Table 15: Bivariate analysis of health seeking patterns and PEM in under five-years-old children

<table>
<thead>
<tr>
<th></th>
<th>Weight-for-age</th>
<th>Height-for-age</th>
<th>Weight-for-height</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal n (%)</td>
<td>Under Weight n (%)</td>
<td>Chi P value</td>
</tr>
<tr>
<td>Morbidity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>46 (40)</td>
<td>68 (60)</td>
<td>0.02</td>
</tr>
<tr>
<td>No</td>
<td>2 (50)</td>
<td>2 (50)</td>
<td></td>
</tr>
<tr>
<td>Gastro-intestinal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>infections</td>
<td>28 (41)</td>
<td>41 (59)</td>
<td>0.004</td>
</tr>
<tr>
<td>Others</td>
<td>18 (40)</td>
<td>27 (60)</td>
<td></td>
</tr>
<tr>
<td>Persistence illness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>8 (40)</td>
<td>12 (60)</td>
<td>0.01</td>
</tr>
<tr>
<td>No</td>
<td>40 (41)</td>
<td>58 (59)</td>
<td></td>
</tr>
<tr>
<td>Immunized</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>42 (39)</td>
<td>65 (61)</td>
<td>0.44</td>
</tr>
<tr>
<td>No</td>
<td>6 (55)</td>
<td>5 (45)</td>
<td></td>
</tr>
<tr>
<td>Attending MCH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>34 (43)</td>
<td>45 (57)</td>
<td>0.55</td>
</tr>
<tr>
<td>No</td>
<td>14 (36)</td>
<td>25 (64)</td>
<td></td>
</tr>
<tr>
<td>Stoppage age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 to 9</td>
<td>5 (28)</td>
<td>13 (72)</td>
<td>0.63</td>
</tr>
<tr>
<td>&gt; 9 months</td>
<td>8 (40)</td>
<td>12 (60)</td>
<td></td>
</tr>
<tr>
<td>Stayed home</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical assistance</td>
<td>46 (40)</td>
<td>69 (60)</td>
<td>0.11</td>
</tr>
</tbody>
</table>

### 4.6: ECONOMIC FACTORS.

**A. HOUSE-HOLD MONTHLY INCOME**

68 of the respondents (57.6%) reported their monthly households’ incomes. Majority of the house-hold monthly income was above 10,000 Kenyan shillings per month 33.8% (23) (figure15).

Out of 118 respondents, 43.2% (51) stated that they had only one source of income whereas 56.8% (67) indicated that they had several sources of income (including relatives, loans, and business profits).
The proportion of underweight and stunting were highest (57.8% and 70.7% respectively) for those children coming from households with monthly income of greater than Kshs 4000 per month. Children coming from households with two or more sources of income had the highest rate in underweight and wasting. Among the stunted children, the highest proportion of children was from those with only one source of income 72.3%. There was a statistical significance association between number of sources of income and stunting in the children (p=0.01) (table 16).

B. RESOURCE OWNERSHIP
1. LAND OWNERSHIP
Minority of the respondents 46.6% (55) reported they owned no land and thus most of their food they bought. The acreage of land ranged between 0.25 acres to 30 acres with an average of 2.7 acres sd (4.2).

Among those who owned land, 6.3% (4) reported that the land they owned provided them with their daily requirements and they were satisfied. Majority 93.7% (59) had to sort for other alternatives means of survival (purchase or receive from relatives and friends additional food).
In all the three nutritional indicators, the highest proportions of children were among those households not owning any piece of land. Those children coming from families owning less or equal to 5 acres of land showed the highest proportion in underweight 60%. Despite this difference, there is no statistical significant association between land ownership and PEM in the children (p>0.05) (table 16).

2. LIVESTOCK OWNERSHIP
43.2% (51) of respondents owned livestock (cows, goats, chicken). Almost 75% (38) of those who owned livestock reared mostly chicken. Households not owning any kind of livestock had the highest prevalence of PEM in all the three nutritional indicators. The prevalence was 60%, 61%, and 36% for underweight, stunting and wasting respectively. This was however statistical insignificant (table 16).

C. FOOD SECURITY
Almost more than three quarters of respondents 86.4% (102) obtained their food supply mainly from purchase (figure 16).

Figure 16: Distribution of households main food supply

The house-hold monthly expenditure on food varied among respondents. Majority of respondents 15.3% (18) spent between Kshs 2001 and 4000 on food monthly (figure 17).
There was highest proportion of children with stunting and wasting coming from families whose main source of food was from purchase unlike in underweight whose main source of food was from farming. 56% and 65% were the highest rate of children with underweight and stunting among the families spending more than Kshs 4,000 per month on food (table 16)
Table 16: Bivariate analysis of economic factors and PEM in under five-years-old children

<table>
<thead>
<tr>
<th></th>
<th>Weight-for-age</th>
<th></th>
<th>Height-for-age</th>
<th></th>
<th>Weight-for-height</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal n (%)</td>
<td>Under Weight n (%)</td>
<td>Chi P value</td>
<td>Normal n (%)</td>
<td>Stunted n (%)</td>
<td>Chi P value</td>
</tr>
<tr>
<td>Monthly income</td>
<td>11(48)</td>
<td>12(52)</td>
<td>0.19 0.66</td>
<td>10(46)</td>
<td>12(54)</td>
<td>1.65 0.2</td>
</tr>
<tr>
<td>&gt; than 4000</td>
<td>19(42)</td>
<td>26(58)</td>
<td>0.23 0.64</td>
<td>12(9)</td>
<td>29(71)</td>
<td>6.72 0.01</td>
</tr>
<tr>
<td>Source of income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One</td>
<td>22(43)</td>
<td>29(57)</td>
<td>0.02 0.89</td>
<td>25(43)</td>
<td>33(57)</td>
<td>0.11 0.75</td>
</tr>
<tr>
<td>&gt; one</td>
<td>26(39)</td>
<td>41(61)</td>
<td>0.11 0.75</td>
<td>23(34)</td>
<td>30(66)</td>
<td>0.11 0.75</td>
</tr>
<tr>
<td>Acreage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; or = to 5 acres</td>
<td>23(40)</td>
<td>34(60)</td>
<td>0.01 0.92</td>
<td>22(45)</td>
<td>27(55)</td>
<td>0.39 0.54</td>
</tr>
<tr>
<td>&gt; 5 acres</td>
<td>3(50)</td>
<td>3(50)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Livestock ownership</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>21(41)</td>
<td>30(59)</td>
<td>0.01 0.92</td>
<td>22(45)</td>
<td>27(55)</td>
<td>0.39 0.54</td>
</tr>
<tr>
<td>No</td>
<td>27(40)</td>
<td>40(60)</td>
<td>0.01 0.92</td>
<td>23(39)</td>
<td>36(61)</td>
<td>0.39 0.54</td>
</tr>
<tr>
<td>Source</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farming</td>
<td>5(31)</td>
<td>11(69)</td>
<td>0.68 0.41</td>
<td>9(64)</td>
<td>5(36)</td>
<td>3.39 0.07</td>
</tr>
<tr>
<td>Purchase</td>
<td>43(42)</td>
<td>59(58)</td>
<td>0.55 0.46</td>
<td>36(38)</td>
<td>58(62)</td>
<td>0.61 0.44</td>
</tr>
<tr>
<td>Amount on food /month</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; or = to 4000</td>
<td>19(53)</td>
<td>17(47)</td>
<td>0.06 0.46</td>
<td>15(44)</td>
<td>19(56)</td>
<td>0.61 0.44</td>
</tr>
<tr>
<td>&gt; 4000</td>
<td>14(44)</td>
<td>18(56)</td>
<td>0.06 0.46</td>
<td>10(35)</td>
<td>19(65)</td>
<td>0.61 0.44</td>
</tr>
</tbody>
</table>

4.7: RESULTS OF MULTIPLE REGRESSIONS

4.7.1: ADJUSTING FOR THE CONFOUNDING FACTORS AND TESTING FOR THE EFFECT OF MODIFICATION

The variables that were found to be associated with the three main study outcomes in bivariate analysis were included in logistic regression analysis. Adjustment for age and sex was made for the associations observed between variables and the outcomes of interest namely; underweight, stunting and wasting.
4.7.2: LOGISTIC REGRESSION

STUNTING

After adjusting for the effect of age and sex the associations observed in bivariate analysis between stunting in children and complementary feeding was significant. The odds of a stunted child being feed on complementary feeds was approximately a third (OR=0.28 (95% CI 0.12-0.65; P=0.003)) that of a non-stunted child. The results of logistic regression for stunting and other variables adjusted for child’s age and sex are presented in the table 17.

Table 17: Logistic regression for stunting

<table>
<thead>
<tr>
<th>Variables</th>
<th>Odds ratio</th>
<th>Std. Err.</th>
<th>P value</th>
<th>95% conf. interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child’s age</td>
<td>0.90</td>
<td>0.31</td>
<td>0.76</td>
<td>0.43-1.83</td>
</tr>
<tr>
<td>Child’s sex</td>
<td>1.60</td>
<td>0.95</td>
<td>0.423</td>
<td>0.52-5.13</td>
</tr>
<tr>
<td>Maternal education</td>
<td>1.87</td>
<td>1.03</td>
<td>0.25</td>
<td>0.63-5.51</td>
</tr>
<tr>
<td>Paternal education</td>
<td>1.17</td>
<td>0.096</td>
<td>0.053</td>
<td>1.0-1.37</td>
</tr>
<tr>
<td>Complementary feeding</td>
<td>0.28</td>
<td>0.12</td>
<td><strong>0.003</strong></td>
<td><strong>0.12-0.65</strong></td>
</tr>
<tr>
<td>Number of sources of income</td>
<td>1.50</td>
<td>0.40</td>
<td>0.121</td>
<td>0.90-2.52</td>
</tr>
<tr>
<td>Type of water source</td>
<td>1.22</td>
<td>0.34</td>
<td>0.473</td>
<td>0.71-2.11</td>
</tr>
</tbody>
</table>

WASTING

Only the times of feeding during illness remained significantly associated with wasting after logistic regression. The odds of a wasted child feeding less than normal during illness was approximately a third (OR=0.31 (95% CI 0.13-0.75; P=0.009)) that of a non-wasted child (table 18).

Table 18: Logistic regression for wasting

<table>
<thead>
<tr>
<th>Variables</th>
<th>Odds ratio</th>
<th>Std. Err.</th>
<th>P value</th>
<th>95% conf. interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child’s age</td>
<td>0.89</td>
<td>0.51</td>
<td>0.84</td>
<td>0.29-2.71</td>
</tr>
<tr>
<td>Child’s sex</td>
<td>1.51</td>
<td>1.23</td>
<td>0.61</td>
<td>0.31-7.43</td>
</tr>
<tr>
<td>Complementary feeding</td>
<td>0.37</td>
<td>0.40</td>
<td>0.367</td>
<td>0.45-3.11</td>
</tr>
<tr>
<td>Times of feeding during illness</td>
<td>0.31</td>
<td>0.14</td>
<td><strong>0.009</strong></td>
<td><strong>0.13-0.75</strong></td>
</tr>
</tbody>
</table>

66
UNDERWEIGHT
After adjusting for the effect of age and sex the associations observed in bivariate analysis between underweight in children and type of alternative caregivers was statistically insignificant (table 19)

Table 19: Logistic regression for underweight

<table>
<thead>
<tr>
<th>Variables</th>
<th>Odds ratio</th>
<th>Std. Err.</th>
<th>P value</th>
<th>95% conf. interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child’s age</td>
<td>0.85</td>
<td>0.50</td>
<td>0.88</td>
<td>0.3-1.83</td>
</tr>
<tr>
<td>Child’s sex</td>
<td>1.49</td>
<td>1.33</td>
<td>0.71</td>
<td>0.41-6.45</td>
</tr>
<tr>
<td>Type of alternative care giver</td>
<td>0.34</td>
<td>0.27</td>
<td>0.17</td>
<td>0.07-1.58</td>
</tr>
</tbody>
</table>

4.8: PROTEIN ENERGY MALNUTRITION (PEM) STATUS OF CHILDREN UNDER FIVE-YEARS-OLD AT KNH
The protein energy malnutrition status of the children under five-years-old in KNH was assessed using anthropometric indicators of weight-for-age (wt/age), height-for-age (ht/age) and weight-for-height (wt/ht). -2 SD was used as the cut-off point below which children were considered malnourished. The prevalence of underweight (weight for age < -2 Z scores) was 59.3%; the prevalence of stunting (height for age < -2 Z scores) was 53.3% and the prevalence of thinness (wasted) (weight for height < -2 Z scores) was 33.9% (Table 20).

Table 20: Protein energy malnutrition status of children under five-years-old at KNH

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Cut off parameters</th>
<th>Nutritional Status</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight-for-age</td>
<td>&lt; -2 Z scores</td>
<td>Underweight</td>
<td>70</td>
<td>59.3</td>
</tr>
<tr>
<td>Height-for-age</td>
<td>&lt; -2 Z scores</td>
<td>Stunting</td>
<td>63</td>
<td>53.3</td>
</tr>
<tr>
<td>Weight-for-height</td>
<td>&lt; -2 Z scores</td>
<td>Wasting</td>
<td>40</td>
<td>33.9</td>
</tr>
</tbody>
</table>
CHAPTER FIVE: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter presents discussions, conclusions and recommendations of the main findings of the study, on socio-economic factors causing PEM in under five-years-old children at KNH.

5.2 DISCUSSION OF THE FINDINGS

5.2.1: MATERNAL DEMOGRAPHIC CHARACTERISTICS

MATERNAL AGE

Most of the mothers were young with over 41% of mothers within the age group of 25-29 years. This kind of age distribution was expected since only mothers with children aged between 0 – 59 months were included in the study. Age specific fertility rates have been found to be higher within the age range of 20 – 29 years in most parts of the world (KDHS, 2003). It is thus possible that most mothers in the current study had their children in this age range and hence were the majority.

The finding that there was no significant association between maternal age and PEM of the children is in support of previous studies done in Uganda and Nairobi (Efata, 2000 and Tai, 2007). The fact that there was a higher proportion of children with underweight, stunting and wasting among younger mothers (< or equal to 29 years) is same as study done in Mbarara Uganda (Efata, 2000).

This could be attributed to the fact that younger mothers do not have more experience as the older mothers in child care. Being most of them that this was their 1st pregnancy, they lacked the skill in breastfeeding and proper weaning. They also lacked adequate assistance and support which in rural areas was provided by older women in communities. Younger mothers also lacked the basic resources which older mothers have
as most of them are unemployed and thus cannot provide for the child's daily requirements.

MATERNAL MARITAL STATUS
There were a high percentage of married mothers (76.3%) in the study population which is 16.3% more than the National level of 60%. The 16.1% of mothers who were single (never married at all) in the current study was slightly higher than half of the National level of 30% (KDHS, 2003).

In the current study no association was found between maternal marital status and PEM of the children. This is in support of findings of a study carried out in Makuyu Division, Maragua District (Maina, 2006). Children whose mothers were married showed higher rates of underweight and wasted children than whose mothers were single, divorced and separated. These findings support the above study. This is attributed to the low socioeconomic status despite both parents of the children staying together. The current economic crisis in the country due to post election violence has also increased the number of children suffering from acute PEM.

Among the stunted children, higher rates were seen among mothers who were not on marriage relationship. This may be due to poor quality of child care in households where both parents do not live together, and cannot jointly monitor the development of the child. The income is less as one parent alone is providing and this cannot facilitate the purchase of both quality and quantity food for the family. The finding was in support of various previous studies conducted elsewhere. For example in Uganda, a study showed that childhood malnutrition was higher among children of single mothers than among those of married mothers (Mehangye, 2001).

MATERNAL EDUCATION
The maternal education levels in the study population can be said to be relatively low with only 22% of the mothers attaining tertiary education. Maternal education is said to
increase the mothers’ ability to earn income. The low level of maternal education could explain why most of the mothers are either housewives or casual laborers.

Results of the current study showed no statistical significance between maternal education and stunting in the study children. The prevalence of stunting was higher among children of educated mothers than among those not educated. This was similar to study carried out in lower Nyakach region in Kisumu (Opiyo, 2005). This is attributed to the fact that educated mothers spent most of their time outside the home leaving the child in care of alternative caregivers. Also weaning is introduced early as mothers have to go back to work since majority of them were the ones who had formal employed.

The prevalence of underweight and wasted children was higher among mothers who have no formal education than those with formal education. This also applies to findings of several studies. For example the study conducted in Makuyu Division, Maragua District (Maina, 2006). The above results could be explained by the fact that less educated mothers earn less or no income and that is why most of them were casual laborers and housewives. Also their ability to appreciate the importance of child care is low due to lack of knowledge.

MATERNAL EMPLOYMENT STATUS
The low levels of mothers, who were engaged in formal employment (1.7%) in the current study, could be explained by the fact that maternal education levels were quite low with only 22% of the mothers having attained post secondary education. This low level of education could explain why most mothers in the study are either housewives (52.5%) or casual laborers (20.3%).

The current study findings showed that children whose mothers had no employment had the highest proportion of PEM. The findings are in contrast with the findings of a study done in rural Iran where the nutritional status of children of mothers working outside the home was found to be poorer than that of children of non working mothers (Fatimeh, and Catherine, 2000). This could be attributed to the fact that non employed mothers earn no
income and thus they depend on either the husband, friends or relatives for their daily living, making the household food security non-reliable. Due to economic crisis in the country the amount earned by the other spouse cannot sustain the food demand of the household and thus the children end up having low quality and quantity food.

5.2.2: PATERNAL DEMOGRAPHIC CHARACTERISTICS

PATERNAL AGE

Majority of the fathers were between the ages of 30 to 34 years. This is expected since most of mothers were in the age group of 25 to 29 years. It is the tradition of Africa, that the age difference between the father and the mother should be at least 5 years. This is because from scientific studies done early, women have been found to have a higher mental capability than men, and only this age difference in the family can bring mutual understanding between the two.

Although there was no significant association between PEM among the study children and paternal age, the prevalence of PEM was higher among fathers whose ages were above 29 years. This is attributed to the large household size because of high productivity rate as partners continue to live together. Hence the children have to share food with the household members and this lowers the quantity and quality of food they are access to. No studies have been done in this area.

LEVEL OF EDUCATION

The paternal education level in the study population can be said to be relatively higher with only 1.2% of the fathers not having access to formal education. Paternal education is said to increase the fathers’ ability to earn income. The high level of paternal education could explain why most of the fathers had employment.

Although the findings of the current study shows no significant association between paternal education level and PEM in the study children, the prevalence of PEM was higher among children of fathers with formal education than among those without. These findings are conflicting with studies done in Kenya and Ethiopia where there was a
positive relationship between paternal education and nutrition status of children (KDHS 2003 and Reifen, et al 2003). The reasons for the above results is, even if most fathers have formal education, most of them were casual labourer (52.2%) and there earning was less. Thus food securities in these families were poor. Also the fathers spent most of their time outside their homes doing their jobs, thus allocate less time to their children which is inadequate for proper child rearing. The money they earned in shared with the members of extended families leaving less for their own household use.

EMPLOYMENT STATUS
The high level of fathers who were casual laborers (52.2%) and the low level of fathers who had formal employment (12.5%) could be explained by the fact that most of the study population were residing in Nairobi, which is a city with high competition in job market. The same findings were found in a study done in Kibera slum, Nairobi (Tai 2007).

Although no significant association was found between paternal employment status and PEM in the study children, significant association have been reported in studies done in MTRH, Eldoret and lower Nyakach, Kisumu district (Ayaya, et al 2004 and Opiyo, 2005).

The prevalence of stunting children was higher in the current study among fathers without employment than fathers with employment. These findings support findings from others studies done in Kibera slum, Nairobi and lower Nyakach, Kisumu district (Tai, 2007 and Opiyo, 2005). Prolong drought and post election violence in the year 2007 in the country made food prices to go up and lack of access to proper income hinders food security.

Among the underweight and wasted children the prevalence was higher among children whose fathers had employment. These findings support studies done in Nairobi and Uganda (Tai, 2007 and Efata, 2000). This is because fathers who are employed are involved so much in economic activities at the expense of children welfare, leaving most
of the child care activities to mothers who have low education and do not have adequate knowledge in child care. Also these fathers have a large household size and being most of them were casual labourer their income was less and could not sustain adequate food supply.

5.2.3: CHILD DEMOGRAPHIC CHARACTERISTICS

CHILD’S AGE AND SEX

Majority of children in the study population were less than 12 months (59%) and were boys (55.9%). Male children have low immunity status compared to their age mate female children. Also the younger children immunity is still immature and these increase their chances of contracting infections (UNICEF, 2001).

Other studies conducted earlier in Kenya have revealed high prevalence of stunting among older children than among younger children. For example, in Vihiga Division of Kakamega district, malnutrition was found to be more advanced in older children than younger children while in a study done in Lower Nyakach, Kisumu, older children were found to be significantly more underweight and stunted than younger children (Ettyang, 2004 and Opiyo, 2005).

The fact that prevalence of underweight, stunting and wasting was lowest among the older children (ages > than 35 months) and that there was no significant association between stunting and children ages were contradicting from the previous studies. Younger children were probably weaned earlier. The age at which complementary feeding was introduced ranged between 1 day to 20 months while the mean age was 4.3 months sd (2.6). The early introductions of complementary feeds predispose them to infections as a result of cessation of breastfeeding earlier, which provide them with maternal antibodies.

The current study also revealed that more girls than boys were suffering from underweight and wasting. Such results were also different from study done in Lower Nyakach, Kisumu (Opiyo, 2005). This could be attributed to the low socioeconomic
status of the study population, despite the proven high immunity in the female children. It is also the tradition of Africans to value male children as compared to female children and this could have contributed to their PEM status as they are neglected in child care.

**BIRTH ORDER AND INTERVAL**

Majority of the children under study were 1\textsuperscript{st} borns (39.8%) in their families. This supports the findings of the age range of most mothers and fathers in the study (25 to 29 and 30 to 34 years respectively). These age groups are for those who are starting family life and these finding supports the Kenya statistics of the appropriate age at which youths should start marriage life (KDHS, 2003).

The fact that proportion of underweight and wasting increased with the birth order could be explained by the fact that the family pot is shared among a large number of people in the households, leading to inadequate dietary intake and hence PEM. It could also be due to, the fact that the child may be receiving inadequate care from the caregivers because the caregivers have to share their time among other household members. The result was similar to study done in Makuyu Division, Maragua District (Maina, 2006).

Underweight and stunting rate among children increased with decrease in birth interval. This is attributed to poor maternal physiological capacity because their bodies do not have adequate time to restore the used elements by the previous fetus. The next child (index child) is therefore prone to many childhood infections because they do not receive adequate supply of nutrients from the mother.

**5.2.4: SOCIAL FACTORS**

1. **FAMILY COHESIVENESS/ ALTERNATIVE CAREGIVERS**

Majority of the respondents reported to care for the child together as a family (94.1%). In African societies, it’s tradition for child rearing to be shared among household members. It is not surprising that families that lacked family cohesiveness had the highest rate of children with stunting and wasting. This results from lack of experience in child care due
to low education status among mothers who are often left to care for the children singly. These findings support study done in semi arid area in Kenya (Maina, 2006).

The principal child caregiver in the study population was reported to be the mother. 65% of the mothers reportedly left their children under the care of other people while they went for work. The main alternative care givers included the relatives (36%) and neighbors (26.7%).

The findings that the primary alternative caregivers in the study population were relatives contrast a study done in Tororo district in Uganda where the primary alternative caregivers were older siblings (Efata, 2000). This is because most of the study population were still young and hence had either a single or two children. The older child goes to school and this resulted in children being left with neighbours. Since the study population were staying in a city, there was rural to urban migration of relatives to come to look for jobs, hence most of them landed assisting in child care as they wait for a chance of jobs.

The proportion of PEM was high among children who were left with alternative care givers especially those who were not nuclear family members and those left for more than 6 hours. These findings support study done in Maragua district, Kenya (Maina, 2006). This is attributable to the fact that the alternative care takers are less experience in the skills and knowledge of child care, as most of them were either the younger sisters or cousins to the respondents. They either ignore the feeding patterns of children or do not give them food at all.

2. HOUSEHOLD SIZE
The household size of between 2 to 12 persons with an average of 5 persons per household in the study population can be termed as large. The mean household size of 5 persons per household is higher than the mean size of a Kenyan household of 4 persons (KDHS, 2003). Such large household size was found in another study carried out in Siaya District, Kenya where the mean size of the household was 7 persons (Musomi, 2004).
In the current study, underweight rates were found to be higher among children from larger households than those from smaller households. This is in support of the previous study findings whereby it was revealed that children from larger households weighed lesser for their age (Shirima, et al 2001). These findings could be attributed to the fact that children from large households may lack access to enough food since food is shared among many household members and are thus said to eat nutritional poorer quality and quantity foods than children from smaller households. Children from such large households are deprived off enough time for care especially from their mothers since the mother has to attend to all of them.

Stunting and wasting rates were higher among children from smaller families in the current study. This is in support of a study done in Uganda where higher malnutrition levels were found among children from smaller households than among larger households (Mehangye, 2001). These findings could be attributed to the fact that smaller families have less income compared to larger household as fewer individuals are employed thus low quality and quantity food for the children. Also in smaller families children do not interact adequately with other children and therefore lack motivating factor to increase their eating habits.

Although there was no statistical significance between PEM and the number of children under 5 years of age in the families, the proportions of underweight, stunting and wasting were higher among households with more than one child. This finding of lack of statistical significance between PEM and the number of children under 5 years of age support the findings of a study carried out in Siaya District in Kisumu (Musomi, 2004).

The high proportion of PEM among households with more than 1 child under 5 years of age could be explained by the fact that when children under 5 years of age are more in a household, they get divided attention from the mother and hence may not receive adequate care. The per capita food consumption for such children may also be less since they have to share the food available.
3. SOCIAL AMENITIES (HOUSING, WATER AND TOILET FACILITIES)

The housing situation in the current study is comparable to urban Kenyan housing. In the current study, the high proportion of underweight and wasting among children from houses which are not permanent is in support with a previous study done in MTRH, Eldoret (Ayaya, et al 2004). This is attributable to the fact that poor housing conditions for example poor ventilation predispose children to infections leading to poor health and thus inadequate intake of food.

At least majority of respondents use tap water as their source of water 79.6%, with 15.3% obtaining water from boreholes while 5.1% from streams. This reflects the Kenyan National level where about 80% of urban populations have access to safe drinking water (KDHS, 2003).

There was a no significant relationship between the household source of water and PEM. It is interesting that those children from household using tap water had a prevalence of stunting of 64.4% and those households using boreholes, streams and rainfall catchments had a prevalence of 33.3%. This is in contrast to the study done in MTRH, Eldoret which showed no significant association (Ayaya, et al 2004).

This could be as a result of poor storage of the water despite its source being tap water, thus exposing it to impurities that cause infections to children especially gastrointestinal infections which were recorded as being the highest morbidity in the study children. These in turn have direct or indirect influence on the children nutritional status. Also the respondents reported they frequently bought the tap water and due to economic factors they are forced to maximally use the minimal water they have, thus increasing the level of micro-organisms in the water.

The high presence of latrines (90.7%) reported by respondents is comparable to the Kenyan National situation where over 90% of urban households are said to have some
type of sanitary facility (KDHS, 2003). The findings in the current study of high prevalence of PEM among children coming from households without toilet facilities and those using pit latrines compared to those using flash toilets is in support with a study done in India (Golpadas, Patel, and Bakshi, 2005).

Poor sanitation are said to affect the nutritional status of children. This could be due to the fact that poor sanitary conditions predispose children to illness especially diarrhoea which in turn has direct or indirect influence on nutritional status of children. Pit latrines harbour a lot of flies that do carries micro-organisms to food resulting in increased diarrhoeal cases in children.

4. RELIGIOUS PRACTICES

The religious wellbeing of the study population is said to be high. The distribution of religious affiliations in the current study is similar to that recorded of Kenya, with majority of people being Protestants and few Muslims (KDHS, 2003). The reasons being that Protestants churches are more compared to their counterparts and the city being dominated mostly by non Muslims.

Despite no statistical significant relationship between religious practices and PEM in the current study, the prevalence of PEM was higher among those children from families with religious affiliations than those without. This is attributed to the fact that religion affects the way people interpret and respond to illnesses. Many African communities believe in their religions in the expense of medical advice and therefore they do not seek medical advice incase of any childhood illness. Food customs and symbolism are an integral part of various religious groups. Like in Muslim religion eating of pork is forbidden.

Among those children coming from Muslims families the proportion of PEM was higher compared to those from Protestants families. These findings support the findings from a study done in India that found Muslims children suffering more from malnutrition than non Muslims children (Golpadas, Patel, and Bakshi, 2005). This is attributed to the food
taboos in Muslim religion. It could also result from Muslim culture of sharing food using hands from one serving plate that could easily lead to diarrhoeal diseases. Their communal living styles increase the spread of communicable infections for example, polio which further lowers the immune status of children predisposing them to PEM.

5. COMMUNITY FEEDING PRACTICES

5.1. BREASTFEEDING

The study findings of high levels of initiation of breastfeeding but few practice of exclusive breastfeeding is not surprising. This situation reflects the situation in Kenya where breastfeeding is almost universal with 97% of children being breastfed but only 13% of children under 6 months being exclusively breastfed (KDHS, 2003). Such findings were also found in a study done in Busia (Akwara, 2006).

The frequency of breastfeeding in the study population can be said to be low with only 17.9% of mothers' breastfeeding more or equal to five times. This is far much lower than the Kenyan situation where the frequency of breastfeeding is a common occurrence with 92% of infants under 6 months of age breastfeeding for 5 or more times in a day (KDHS, 2003).

The duration of breastfeeding was between the 1st day of birth and 36 months with mean of 17.1 months in the current study. This is comparable to findings of study done in Busia (Akwara, 2006). These findings are also comparable to the situation in Kenya, where the mean duration of breastfeeding is 17.6 months (KDHS, 2003)

The high prevalence of PEM found among children who were breastfed twice or less than in a day could be associated with lack of adequate energy and nutrients from breast milk since such children were breastfed less frequently and for shorter duration. This increases their chances of contracting childhood infections since they have less maternal antibodies to fight the intruding antigens and their bodies have less stores for nutrients which are depleted faster in case of a disease. These findings support study done in MTRH, Eldoret (Ayaya, et al 2004).
The findings that the prevalence of PEM was higher among children breastfed for less or equal to 12 months contrasts the finding of a study done in Uganda where stunting was highest among children breastfed for over 2 years (Efata, 2000). This is attributed to inadequate nutrients or energy to the children due to shorter duration of breastfeeding as breast milk is the best source of these. Also the rate of these children contracting infections is increased because of less maternal antibodies to fight the foreign antigens.

5.2. COMPLEMENTARY FEEDING
In the current study children were given complementary feeds too early (mean age was 4.3 months). This practice of early complementary feeding is well documented as a practice in Kenya. By the age of 2 to 3 months almost half of the children are given complementary feeds (KDHS, 2003). The findings are also comparable to findings of another study done in Uganda where the mean age of introduction of complementary feeds was 4.9 months (Efata, 2000). Early introduction of complementary feeds deprive infants off breast milk nutrients.

Although there was a statistical association (p=0.003) between stunting and whether the child had started on complementary feeds after logistic regression, this was in contrast with a study done in Uganda which showed no association between the two (Mehangye, 2001). The null hypothesis of no relationship between the socio-economic factors and PEM is therefore not true. The probability of a child on complementary feeds being stunted was a third. Complementary feeds are not nutritious as breast milk. Most are prepared locally, not considering their quality because of the economic crisis in the country. Also the process of preparation is not usually hygienic, predisposing the children to pathogens which have direct and indirect effect in development of PEM.

Although there was no statistical significance between the period at which complementary feeding was commenced and PEM of study children, prevalence of underweight and stunting was high (63% and 52% respectively) among those children introduced to complimentary feeds less or equal to 6 months. PEM in these children can
be explained by the fact that such children are deprived of maternal breast milk nutrients and are at increased risk of infections due to poor immunity and unhygienic complementary feeds. However, the above findings contradict those of a study done in Tanzania where underweight and stunted children were more among children who were given complementary feeds late (Paali, Manongi, and Wepp, 2004).

5.3. DIETARY CARE DURING ILLNESS

The study findings that most mothers (84.7%) feed their children less times during illness, contrasts the recommendation that a sick child requires to be given small frequent meals, since infections affect the child’s appetite (Tomkins, and Watsons, 1994). Majority of mothers (96% and 79.6%) in the current study continued breastfeeding and feeding their children on complementary feeds during diarrhea respectively. These findings are similar to those done in Kibera slum in Kenya (Tai, 2007).

The number of feeding during illness and wasting was found to be statistically significant (p=0.009) after adjusting for child’s age and sex. Therefore the null hypothesis of no relationship between socio-economic factors and PEM is not true. The probability of a child who was feed on less feeds than normal during illness becoming wasted was a third. Wasting resulting from acute malnutrition has increased in the country due to the post election violence of the year 2007 that brought economic crisis in the country. During illness the body metabolic rate increases as it fights the intruding antigens and tries to bring homeostatic balance. The body demand out way the supply due to poor appetite, vomiting and poverty and hence the stored nutrients are utilized. The body muscles eventually atrophies. The findings are in contrast with study done Kibera that showed no statistical significance (Tai, 2007).

It is interesting that those children whose mothers continued breastfeeding, given complementary and special feeds during diarrheal episodes showed high rates of PEM. This could be attributed to the less frequency of feeding the children reported by most mothers (84.7%) during illness. Also because most of respondents were living below the standard of living, they could not afford nutritious foods necessary for children who were...
sick. As a result they end up giving the children special feeds which were not nutritious enough. These findings are in contrast with the study done in Tanzania (Hussein, 2005), where malnutrition rate were lower in children who continued breastfeeding and were given special feeds during diarrheal episodes.

6. HEALTH SEEKING BEHAVIOURS
Mothers reported that more than (96%) of their children had suffered an illness in the two weeks prior to the study. The most common illnesses reported were respiratory tract infections (32.5%) and gastrointestinal infections (60.5%). These illnesses are among the major childhood illnesses in Kenya (KDHS, 2003). Similar childhood illnesses have been reported in a study done in Kibera slum, Nairobi (Tai, 2007).

Although there is no statistical significance between childhood illnesses and PEM, the prevalence of stunting and wasting was higher among children who had not suffered any illness two weeks prior to the study than those who had suffered. This finding contradicts a study done in Kibera slum where it was found that the prevalence of malnutrition was higher among those children suffering from other illnesses (Tai, 2007). The findings of the study could be attributable to other factors apart from childhood illnesses such as lack of adequate access to quality and quantity foods; improper knowledge in child’s care and large households.

The current study findings depict a high percentage of immunization 90.7% against the common childhood diseases. This high proportion of immunization is higher than the reported National rate of 57% (UNICEF, 2000). The high immunization rate in the study population could be due to immunization campaigns which have been going on in the country.

The proportion of underweight and stunting were higher among those children who were fully immunized for age than those who were not fully immunized. These findings are in contrast with studies done in Siaya district, Kenya and MTRH where they found the occurrence of PEM was higher among children who were not fully immunized for age
(Musomi, 2004 and Ayaya, et al 2004). This is attributable to other factors despite the fact that the children are fully immunized for age such as short duration of breastfeeding and early commencement of complementary feeding.

Attending maternal and child health clinics visits is very important. High proportion of respondents (66.9%) reported they still take their children to MCH clinics as ordered. There was high rate of children suffering from PEM among those who do not attend MCH clinics visits and those who stopped at age of between 8 to 9 months. This is attributable to the fact that these children are not monitored for growth and development by the health team members, and therefore are at a risk of childhood illnesses which in turn have a great impact on their nutritional status. The findings support other studies done in Siaya district, Kenya and MTRH (Musomi, 2004 and Ayaya, et al 2004).

Majority (89%) of respondents took their children to health facilities during the 1st week of illness. These findings concur with the findings of a study done in Siaya district, Kenya where it was found that most sick children sought medical assistance in health facilities (Musomi, 2004). It is surprising that the rate of underweight and wasting was higher among children who were taken to health facilities during their 1st week of illness as compared to those who stayed at home. This could be contributed to the fact that the PEM was caused by other factors apart from not taking the child to health facilities during their 1st week. It is an outcome resulting from multiple factors. These finding is in contrast to the findings of the above study.
5.2.5: ECONOMIC FACTORS

1. HOUSEHOLD INCOME

Low proportion of respondents (33.8%) monthly income was above 10,000 Kenyan shillings. This means that most of the study populations are living below the standard of living in Kenya (KDHS, 2003). This is supported by the fact that most mothers were housewives and fathers were causal laborers. More than one source of income means the availability of family income and its amount is increased. In the current study, high proportion of respondents reported to have more than one source of income.

The prevalence of underweight and stunting was higher among families earning more than Kshs 4,000 per month than those earning less or equal to Kshs 4,000 per month. This is in contrast to a study done in Maragua district that found that families of higher household income provide their children with better diet and thus are not malnourished (Maina, 2006). The reason for the above findings is because of the household size. Most families earning more than Kshs 4,000 per month had household members greater than 6 and they reported staying with extended family members. The money is used to purchase food, but the amount the child gets is less because this has to be divided among the household members.

The prevalence of underweight and wasting was higher among children from families with more than one source of income. This does not support other studies, for example that done in Maragua district (Maina, 2006). The reason for this pertain the large household size among these families which reported having more than one source of income. It is also the culture of African communities to share with the extended families members whatever they earn. Thus despite the increase in number and hence the amount of income less quality and quantity food is availed to the children.

2. RESOURCE OWNERSHIP

Ownership of land and livestock as assert for the family is an ideal situation. The study being conducted in Nairobi, support the finding of minority of respondents owning livestock (43.2%). This could be attributed to the fact that most respondents were living
in town, an urban area, and thus no enough area for grazing the livestock. However, it was found that the highest proportion of respondents (53.4%) owned land. The pieces of land they owned mostly were in their rural areas which were given to them by their parents as what they earned could not enable them to purchase land. These findings support the study done in MTRH, Eldoret (Ayaya, et al 2004), which revealed land ownership by majority of the study population.

The prevalence of PEM in the current study was higher among children from families not owning land and livestock. This support the previous study done in MTRH, where lack of ownership of land by the father and lack of ownership of cattle and sheep were risk factors to PEM (Ayaya, et al 2004). The above findings were attributed to food insecurity. Agriculture is the main source of food in the country and therefore lacks of ownership of either land or livestock leads to purchase as the main source of food. The country economic crisis and low proportion of respondents earning more than 10,000 Kenyan shillings per month leads to purchase of low quality and quantity of food for the family.

Those owning land of greater than 5 acres had the highest proportion of their children suffering from PEM. This is in conflict with the findings of the above study. The high prevalence of PEM is attributed to the large household size among these families and thus what they owned have to be shared among the members.

3. FOOD SECURITY
More than 75% of respondents obtain their food supply mainly from purchase points towards food insecurity. This is because of the low proportion of respondents earning more than Kshs.10, 000 per month and this being a city, food prices are high and this money can not sustain them through the whole month. It is not surprising that only 2.5% of the respondents do spend more than Kshs 10,000 per month on food. This further signifies the food insecurity state in the study population. House –hold food security depends on access to food financially, physically and socially rather than only the availability of the food (UNICEF, 2001).
The prevalence of stunting and wasting was higher among children from families where the main source of food was from purchase. This is attributed to low income being earned and thus poor access to adequate quantity and quality of food. Another contributing factor is the economic crisis in the country and thus the food prices have increased drastically. These findings support findings from studies done in Maragua, district Kenya and Uganda (Maina, 2006 and Mehangye, 2001). The rate of underweight and stunting was high among children from families that spent more than Kshs 4,000 per month on food. These findings conflict findings from the above studies. The PEM in the children is brought about by the large household size among these families and hence the foods bought have to be shared among the members.

5.2.6. PROTEIN ENERGY MALNUTRITION STATUS OF THE STUDY CHILDREN

The prevalence of underweight was 59.3%, stunting 53.3% and wasting 33.9%. These findings seem to suggest deterioration in the PEM status of under five-years-old children compared to earlier studies. Worldly, it is estimated that about 182 million or 33% of the children under 5 years of age in the developing countries are stunted while 27% are underweight (UNICEF, 2001). For instance in Kenya, an estimate of the prevalence of PEM indicates that about 30.6% of the Kenyan children are stunted, 19.1% are underweight while 4.8% are wasted (KDHS, 2003).

Protein energy malnutrition in the under five-years-old children is common in developing countries. The increasing levels of PEM could be contributed to the fact that the socio-economic status of the study population is low as reflected by low education levels, low income levels, low employment status, and poor housing conditions.

The high prevalence of underweight could be attributed to the post election violence of the year 2007. Post election violence resulted in economic crisis in the country. Stunting being as a result of chronic malnutrition has resulted from prolong drought in the country. Prolong drought has made agricultural production to decrease drastically, enhancing
importation of food products from other countries. The food imported in the country cannot sustain the children population leading to high rates of stunting.

5.3 CONCLUSIONS

The study found moderately high prevalence of underweight (59.3%) and stunting (53.3%) and low prevalence of wasting (33.9%) among children aged 0 to 59 months in KNH. This PEM status level is said to be generally higher than that expected in a normally well fed population. The main factors found to be associated with childhood PEM in the study population were complementary feeding and times of feeding during illness.

The mothers in the study were younger with over 41% being in the age group of 25 to 29 years. The proportion of PEM among the children was higher among mothers whose ages were less or equal to 29 years than among those of their older counterparts. Generally, there was higher prevalence of underweight and wasting among children, whose mothers were married than among mothers who were single, divorced or separated. Maternal education in the study population was low with only 22% attaining tertiary education.

The prevalence of underweight and wasting was higher among children whose mothers did not have formal education than among those who had. The prevalence of underweight and wasting was generally higher among children whose mothers had no employment than among those who had.

Majority of the fathers were in the age group of 30 to 34 years. Generally the prevalence of PEM was higher among fathers who were in the age group of above 29 years. Children whose fathers had formal education had the highest proportion of PEM. In underweight and wasting the prevalence was higher among fathers who had employment than among those who did not have.
Generally the prevalence of stunting increased as the age of the children under study decreased. More female children suffered from PEM than male children. The rate of wasting and underweight were higher in children who were not 1\textsuperscript{st} born but for stunting it was higher in children who were 1\textsuperscript{st} born. Birth interval played an important part in development of PEM as decrease in birth interval enhanced PEM.

Family cohesiveness rate in the study population was higher (94.1\%). In stunting and wasting the rate were higher among children from families without cohesiveness and vise versa for underweight children.

Household size in the study population ranged between 2 to 12 persons with a mean of 5 persons per household. The prevalence of stunting and wasting were higher among children coming from small household size; however in underweight it was higher among children coming from large household size. Overall, the proportion of PEM was higher among children from families with more than one child under five years of age.

The general sanitation of the study population was found to be good with majority of respondents (90.7\%) reporting having access to toilet facilities. Underweight and wasting among children were higher among children living in semi-permanent and temporary housing. In underweight and stunting the prevalence were higher among children who come from families whose main source of water is tap water.

Majority of the study population had religious affiliations. Generally, being in a religious affiliation especially Muslims, contributed to high rate of their children suffering from PEM.

There were high levels of initiation of breastfeeding. The frequency of breastfeeding in the study population can be said to be low with only 17.9\% of mothers’ breastfeeding five times or more than in a day. The prevalence of PEM was higher among those children breastfed for less or equal to two times in a day and among those children breastfed for less or equal to 12 months duration only.
Complementary feeding was generally commenced too early with children receiving complementary feeds as early as in the first day of life and with an average of 4.3 months. There was a significant relation between stunting and complementary feeding (p=0.003). The proportion of underweight and stunting were higher among children introduced to complementary feeding less or equal to 6 months.

The frequency of feeding children during illness in the study population was low. Most of the mothers reportedly fed their children less time than usual during illness (84.7%). Among the wasted and underweight children, the rates were higher among children who were fed not less times than normal during illness. Wasting was significantly associated with the times of feeding during illness (p=0.009) (p<0.05). The practice of breastfeeding and complementary feeding during diarrhea episodes was however high (96% and 79.6% respectively).

The rate of underweight was higher among children who suffered from other illnesses two weeks prior to the study but vise versa for stunting and wasting. For those who suffered from persistent illnesses the rate were higher in underweight and wasting. Immunization levels were high as depicted by the proportion of 90.7% of the study children who were fully immunized for age. In underweight and stunting the prevalence were higher among children who were fully immunized for age, but vise versa for wasting. Majority of respondents reported they sought health care from health centers.

Generally the economic status of the study population was low, as shown by the low proportion of respondents (33.8%) whose monthly income was more than Kshs 10,000 per month. Hence there was food insecurity within the study population as the main source of food was from purchase.

Some questions required re-call on the part of respondents and answers of these might have been influenced by attitude of respondents that might have brought re-call bias. There was nothing to be done about the respondents’ attitude during the study. However,
the interviewers were trained to ask the questions exactly as written and probe or provide explanation whenever it seemed the interviewee did not understand.

5.4 RECOMMENDATIONS

1. Health education and nutrition education programmes should be enhanced in the hospital setting. This can be done by the medical staffs especially the nurses and nutritionists. These programmes should be initiated in an integrated approach. Nutrition education for example, should be introduced in the hospital through the already existing maternal child health clinics. Nutrition education programs should especially target the promotion of under five-years-old children feeding practices such as: -

- Promotion of proper breastfeeding practices such as exclusive breastfeeding during the 1st 6 months of infant’s life, breastfeeding on demand as opposed on scheduled time, high frequency of breastfeeding daily and continued breastfeeding to two years or beyond.

- Promotion of appropriate complementary feeding such as beginning it at the 6th month of infant’s life, proper preparation and hygiene during complementary feeding and ensuring that the complementary feeds are balanced nutritionally.

- Promotion of adequate feeding of the child during illness (that is, giving small and frequent feeds)

The health education programs should target on issues such as promotion of proper sanitation practices and health seeking behaviors especially for children, for example, timely immunization and frequent attending the MCH clinics services until the child is 5 years old. In terms of the study limitation, attitude modification of respondents should be enhanced.

2. The study population should be encouraged on achieving higher education levels. This can be achieved through the initiative by the ministry of education and all the stake holders in education nationally, for example, the non government organizations (NGOs). This is by encouraging young people in schools to attain high levels of education. Emphasis should be placed in promotion of education for the girl child. Such girls in future would be better placed for better
employment opportunities and hence the food insecurity will decrease and would also have knowledge on proper nutrition care for their children.

3. Emphasis should be laid on health care services. For example, the ministry of health and medical staffs should be involved in sensitizing the study population on the basis of integrated management of childhood illnesses (IMCI).

4. Intersectoral collaboration should be encouraged so as to bring essential services to the study population. For example, the study population local authorities should improve the housing, sanitation and access to job opportunities for the people.

5. The ministry of Agriculture should encourage irrigation schemes in many parts of the country to decrease the problem of food insecurity.

6. More studies should be done in rural areas and on the influence of paternal age to PEM status of children under five-years-old
REFERENCES


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TOPIC: SOCIO-ECONOMIC FACTORS CAUSING PEM IN THE UNDER FIVE-YEARS-OLD CHILDREN AT THE KNH, NAIROBI, KENYA

INSTRUCTIONS TO INTERVIEWER

1. Ensure respondents to this questionnaire are biological mothers of the child who at the moment is aged below 60 months.
2. For questions with alternatives fill in the number bearing the response in the brackets provided at the end of each question.
3. Don’t suggest responses for the respondent.
4. Anthropometrics measurements will be taken for all the index children included in the study during the session.

Questionnaire No ---------------
Date of interview (dd/mm/yyyy).
Name of the interviewer---------------
Province-----------------
District-----------------
Location-----------------
Village-----------------
SOCIO-DEMOGRAPHIC INFORMATION OF THE PARENTS.

1. Name of the respondent (initials) --------------------------------------
2. Age of the mother (in completed years) --------------------------------
3. Marital status. ( )
   1 = Married monogamous.
   2 = Married polygamous.
   3 = Single (never married).
   4 = Divorced/separated.
   5 = Widowed.
   6 = Others (specify) ------------------------
4. Age of the father if a member of the household ----------------------- years (in completed years).
5. Religion. ( )
   1 = Catholic.
   2 = Protestant.
   3 = Muslim.
   4 = Others (specify) ------------------------
6. Maternal educational level. ( )
   1 = No formal education
   2 = Primary education-not completed
   3 = Primary education-completed
   4 = Secondary education-not completed.
   5 = Secondary education-completed.
   6 = College/university education.
   7 = Others (specify) ------------------------
7. Paternal educational level. ( )
   1 = No formal education
   2 = Primary education-not completed.
   3 = Primary education-completed
   4 = Secondary education-not completed.
5=Secondary education-completed.
6=College/university education
7= Others (specify) ---------------

8. Maternal occupation. ( )
1=Cash crop farming.
2=Subsistence farming.
3= Formal employment
4=Casual labourer.
5=Self employed.
6=House-wife.
7=Others (specify) ---------------

9. Paternal occupation. ( )
1=Cash crop farming.
2=Subsistence farming.
3= Formal employment
4=Casual labourer.
5=Self employed.
6= House-wife.
7=others (specify) ---------------

INFORMATION ON THE INDEX CHILD
10. Date of birth (dd_ /mm_ /yy- ) and sex --------
12. What is the age difference between this child and the next one? ------ months.

<table>
<thead>
<tr>
<th>Weight (kgs)</th>
<th>1st reading</th>
<th>2nd reading</th>
</tr>
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<tbody>
<tr>
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</table>

<table>
<thead>
<tr>
<th>Height (cm)</th>
<th>1st reading</th>
<th>2nd reading</th>
</tr>
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<tbody>
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</tbody>
</table>
CHILD HEALTH INFORMATION.

14. Does the child have an immunization card?  
1= Yes.  
2= No.

15. Ask the card and check the primary vaccinations. (Tick the vaccines the child has received in the space provided by the dotted lines).

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Birth</th>
<th>6 weeks</th>
<th>10 weeks</th>
<th>14 weeks</th>
<th>9 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. BCG</td>
<td>------</td>
<td>--------</td>
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<tr>
<td>2. Polio</td>
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<tr>
<td>3. DPT</td>
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<tr>
<td>4. Measles</td>
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</tbody>
</table>

16. Is this child fully immunized for age?  
1= Yes.  
2= No.

17. If no, why?  
1= Mother is too busy.  
2= Clinics is far.  
3= Mother does not know the child should be immunized.  
4= Child is sick  
5= No money for vaccination services  
6= Others (specify) 

18. Is the child still attending baby clinics?  
1= Yes  
2= No

19. If no, at what age did you stop taking the child to the baby clinics?  
1= 2 to 3 months  
2= 3 to 5 months  
3= 6 to 7 months  
4= 8 to 9 months  
5= > 9 months.
20. Why did you stop taking the child? ( )
   1= Child was old enough
   2= Told by traditional birth attendants
   3= Told by the clinics
   4= Clinics too far
   5= Mother busy
   6= Mother lack knowledge
   7= Others (specify)  

21. Has the child suffered from any illness in the last 2 weeks? ( )
   1= Yes
   2= No

22. If yes, which illness? (Tick all that apply after checking clinic booklet if available).
   1= Ear Nose and Throat diseases
   2= Gastrointestinal diseases
   3= Respiratory diseases
   4= Haematological diseases
   5= Skin disease
   6= Others (specify)  

23. Has the child had any persistent illness? ( )
   1= Yes
   2= No

24. If yes, which one?  

25. If the child has had any of the illness mention above what was done? ( )
   1= Stayed at home
   2= Used herbs to treat
   3= Bought and used drugs
   4= Child taken to hospital
   5= Others (specify)  

26. Where do you seek health care from? ( )
   1= Local pharmacies
   2= Dispensaries
3. Health centres
4. Hospital
5. Others (specify) ------------

27. Do you participate as a family in the child care? ( )
   1. Yes
   2. No

28. If yes, which kind of child care activities do you do together? ---------------------

29. If no why not? --------------------------

30. Who participate in the child care activities mention above? ( )
   1. Older siblings.
   2. Relatives
   3. Neighbours.
   5. Father.
   6. Friends
   7. Others (specify) -----------

HOUSE-HOLD INCOME AND SOURCE

31. What is the main source of live-hood for the house-hold? ( )
   1. Food crop production.
   2. Cash crop production.
   3. Salaried employment.
   4. Self employment.
   5. Casual worker.
   6. Formal employment
   7. others (specify) -------------------

32. What was the last month total income from the main source of live-hood? ( )
   1. Less than 1,000 Kenyan shillings.
   2. 1,000 to 4,000 Kenyan shillings.
   3. 4,001 to 7,000 Kenyan shillings.
   4. 7,001 to 10,000 Kenyan shillings.
33. Do you have any other source of income? ( )
   1= Yes.
   2= No.

34. If yes, from where? ( )
   1= Friends.
   2= Relatives.
   3= Others (specify) 

35. How much did you receive from these other sources last month? ( )
   1= Less than 1,000 Kenyan shillings.
   2= 1,000 to 4,000 Kenyan shillings.
   3= 4,001 to 7,000 Kenyan shillings.
   4= 7,001 to 10,000 Kenyan shillings.
   5= More than 10,000 Kenyan shillings.
   6= don’t know.

HOUSE-HOLD RESOURCE OWNERSHIP
36. Does the house-hold own any acreage of land? ( )
   1= Yes.
   2= No.

37. What is the total acreage of the farm? acres

38. Does your house-hold own any of the following? If yes, how many?
   1= Yes.
   2= No.

<table>
<thead>
<tr>
<th>LIVESTOCK</th>
<th>YES/NO</th>
<th>NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cows</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Goats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Sheep</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Chicken</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Donkeys</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
FOOD SECURITY

39. Where does the food for the household mainly come from? ( )
   1= From the farm.
   2= From friends.
   3= From relatives.
   4= Buying.
   5= Others (specify) ---

40. If the household grows its own food, is the food enough to feed the household members? ( )
   1= Yes.
   2= No.

41. If no, how does the household meet the deficit? ( )
   1= Purchase.
   2= From relatives.
   3= From friends.
   4= Others (specify) ---

42. Approximately how much money did you spend on food last month? ( )
   1= < 1,000 Kenyan shillings.
   2= 1,001 to 2,000 Kenyan shillings.
   3= 2,001 to 4,000 Kenyan shillings.
   4= 4,001 to 6,000 Kenyan shillings.
   5= 6,001 to 8,000 Kenyan shillings.
   6= 8,001 to 10,000 Kenyan shillings.
   7= > 10,000 Kenyan shillings.
   8= don’t know.

FEEDING PRACTICES

IF THE CHILD IS NOT BREASTFEEDING SKIP QUESTION 43-47

43. Is this child currently breastfeeding? ( )
   1= Yes.
44. When do you breast feed the child?  
   1= On demand.  
   2= Scheduled time.  

45. How often do you breast feed the child in a day?  
   1= Once.  
   2= Twice.  
   3= Thrice  
   4= Four times.  
   5= > five times.  

46. In your own opinion, how long do you think an infant can strive on breast milk alone?  
   ----------- months.  

47. If this child has diarrhoea, do you continue breast feeding?  
   1= Yes.  
   2= No.  

48. Have you introduce this child to any other foods/fluids apart from breast milk?  
   1= Yes  
   2= No  

49. At what age did you introduce this child to other foods apart from breast milk?  
   ---- months  

50. What made you introduce these other foods to the child at that time?  
   1= Breast milk was not enough  
   2= Child was old enough  
   3= Child was crying  
   4= Advised by health worker  
   5= Advised by other mothers  
   6= Others (specify)  

51. What kind of food/fluids did you 1st introduced to this child, at what age and what kind of method was used? Please indicate the number on fluids, semi-solid foods and
method of feeding.

<table>
<thead>
<tr>
<th>FOOD/FLUID</th>
<th>AGE (MONTHS)</th>
<th>METHOD OF FEEDING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semi-solid foods</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluids</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fluids</th>
<th>Semi solid foods</th>
<th>Method of feeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>1= Plain water</td>
<td>1=Plain uji</td>
<td>1=Hand</td>
</tr>
<tr>
<td>2= Water with sugar/glucose</td>
<td>2=Enriched uji</td>
<td>2=Cup</td>
</tr>
<tr>
<td>3=Tea</td>
<td>3=Mashed food</td>
<td>3=Cup and spoon</td>
</tr>
<tr>
<td>4=Cows milk</td>
<td>4=Mashed fruits</td>
<td>4=Nursing bottle</td>
</tr>
<tr>
<td>5= others (specify)</td>
<td>5=others (specify)</td>
<td>5=others (specify)</td>
</tr>
</tbody>
</table>

52. How many times is this child fed in a day? (Do not include the breast feeds for those who are breast feeding).

1= Once.
2= Twice.
3= Thrice
4= Four times.
5= > five times.

53. How do you feed your child during illness?

1= As usual.
2= Give special foods.
3= Feed the child less times than usual.
4= Feed the child more times than usual.
5= Others (specify) ----------------

54. Do you continue giving your child other foods apart from breast milk during diarrhoea?

1= Yes.
2= No.

55. Do you give your child any special food during diarrhoea?

1= Yes.
56. If yes, what foods?
   1. ------------
   2. ------------
   3. ------------

57. In your own opinion, are there any foods/drinks that should not be given to a child any time for any reason? 
   1= Yes. 
   2= No.

58. If yes, what foods/drinks should not be given and why?

<table>
<thead>
<tr>
<th>FOODS/ DRINKS</th>
<th>REASONS FOR WITH-HOLDING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foods</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
</tr>
<tr>
<td>Drinks</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
</tr>
</tbody>
</table>

IF THE MOTHER IS NOT BREAST FEEDING ANSWER QUESTIONS 59-60.

59. How long did you breast feed this child? ---------months

60. What were the reasons for stopping breast feeding?
   1= Child refused to breast feed.
   2= Child refused to eat other foods.
   3= Mother was busy at work.
   4= Mother was sick.
   5= Next pregnancy.
   6= Others (specify) ------------
ALTERNATIVE CARE TAKERS

61. Do you leave the child in the care of others? ( )
   1= Yes
   2= No

62. If yes, how long in the day do you leave the child in the care of others? --------- hours

63. Who do you leave to take care of the child? ( )
   1= Neighbours
   2= Older children
   3= Relatives
   4= Friends
   5= Father
   6= House help
   7= Others (specify) -------------------

64. What are the reasons why you leave the child in the care of others?
   1. ---------------
   2. ---------------

65. In your own option, do you think they get good quality of care under the care of others? ( )
   1= Yes
   2= No

66. If no, what can you do to hinder this problem?
   1. ---------------
   2. ---------------

HOUSE-HOLD SIZE

67. How many people are living in the house-hold? (Include the father, mother, children, and all those living in the house-hold at least for the past 3 months) ---------

68. Do you stay with any extended family members ( )
   1= Yes
   2= No
69. How many of these people in total you are living with, are children under 5 years of age? 

SOCIAL AMENITIES

70. What is the type of house that the family lives in? 
   1= Permanent (stoned walled, cemented floor, and iron sheets or bricks roofing).
   2= Semi-permanent (mud/plastered walls with iron sheets roofing).
   3= Temporary (mud/cartoons/tin walls and grass thatched).

71. Do you have toilet facility? 
   1= Yes.  
   2= No.

72. What is the type of the toilet facility? 
   1= Pit latrine. 
   2= Flying toilets. 
   3= Flash toilets. 
   4= Others (specify) 

73. Do the children in the house-hold use the toilet facility? 
   1= Yes.  
   2= No.

74. If no, what prevents them from using the toilet facility? 
   1. 
   2. 
   3. 

75. Where do you get water from for the usage in the house-hold? 
   1= Bore-holes. 
   2= Roof catchments. 
   3= Protected springs. 
   4= Piped water. 
   5= Streams. 
   6= Others (specify) 

76. Do you think the water you use is safe for drinking? 
   ( )
1= Yes.
2= No.

77. If no, do you do anything to make it safe? (  )
   1= Yes.
   2= No.

78. If yes, how do you make it safe? (  )
   1= Boiling.
   2= Filtering.
   3= Use of chemicals.
   4= Others (specify) ---------------
APPENDIX II: CONSENT FORM FOR PARTICIPATION IN THE STUDY.

Study title.
Socio-economic factors causing protein energy malnutrition (PEM) in under five-year-old children at Kenyatta National Hospital (KNH), Nairobi, Kenya.

Investigators
1. Oluchina Sherry – MscN paediatrics student.
3. Dr. Omunga – supervisor, lecturer school of Nursing, university of Nairobi.

Investigator’s statement
We are asking you and your child to participate in a research study. The purpose of this consent form is to give you information you will need to help you decide whether to participate in the study. Please read this form carefully. You may ask questions on the risks and benefits of the study on your child and yourself.

Introduction
Malnutrition is a world wide public problem affecting the growth and development of our children who are under five-years-old and it also leads to high mortality rate in this age group. The prevalence of PEM is higher in developing countries, hence the need to carry out a study on this issue affecting our society. You will be interviewed by research assistants on various socio-economic factors predisposing the under five-years-old children to PEM and the index child will be weighed and their heights will also be taken to assess their nutritional status. The investigator will be available to answer any questions that arise during the study and afterwards.

The benefits of the study
Your participation in this study will help us identify those socio-economic factors that predispose under five-years-old children to moderate and severe PEM, therefore developing specific nutritional guidelines and nutritional interventions to reduce
malnutrition in under five-years-old children and develop policies and guide program managers.

The risks of the study
The equipment that will be used to take weight and height of the children are not invasive and thus will cause no harm to your child.

Information about confidentiality
All the information obtained will be held in strict confidentiality. No information of any kind will be released to any other person or agency without your permission expressed in writing. We will not publish or discuss in public anything that will identify your child and you. You are free to withdraw from the study if you so wish without any penalty.

Do you have any questions? Yes --------- No ---------
Do you agree to participate? Yes --------- No ---------

Investigator signature Investigator name Date

Subject statement (mother)
The study described above has been explained to me. I agree to have my child and I participate in the study. I have had a chance to ask questions about the research, to which satisfactory answers have been given. I have further been assured that if I have future questions about the research or my rights and those of my child, I can ask the investigator. I understand I can withdraw from the study at my wish without any penalty.

Mother signature/ Printed name of the mother. Date
left thumb print of the mother.

Witness’s signature (or left thumb print) Printed name of the witness. Date
### APPENDIX III: WHO AND WELLCOME CLASSIFICATIONS WHO CLASSIFICATION

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>STANDARD DEVIATIONS</th>
<th>NUTRITIONAL OEDEMA</th>
<th>PEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight-for height/length</td>
<td>&lt; -2 SDS</td>
<td>Absent</td>
<td>Wasted.</td>
</tr>
<tr>
<td></td>
<td>&lt; -3 SDS</td>
<td>Absent/present</td>
<td>Severely wasted</td>
</tr>
<tr>
<td>Height /length-for age</td>
<td>&lt; -2 SDS</td>
<td></td>
<td>Stunted</td>
</tr>
<tr>
<td></td>
<td>&lt; -3 SDS</td>
<td></td>
<td>Severely stunted</td>
</tr>
</tbody>
</table>

### WELL-COME CLASSIFICATION

<table>
<thead>
<tr>
<th>PEM</th>
<th>WEIGHT-FOR-AGE % AND STANDARD DEVIATIONS</th>
<th>OEDEMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Under weight</td>
<td>80-60</td>
<td>None</td>
</tr>
<tr>
<td>2. Marasmus</td>
<td>&lt;60 ( = -4 SDS)</td>
<td>None</td>
</tr>
<tr>
<td>3. Kwashiorkor</td>
<td>80-60</td>
<td>Presence</td>
</tr>
<tr>
<td>4. Marasmic-kwashiork</td>
<td>&lt;60 ( = -4 SDS)</td>
<td>Presence</td>
</tr>
</tbody>
</table>
Oluchina Sherry  
Dept. of Nursing Sciences  
School of Medicine  
University of Nairobi

Dear Sherry

Research proposal “Social-economic factors causing Protein Energy Malnutrition (PEM) in under five years-old children at Kenyatta National Hospital, Nairobi, Kenya” (P58/3/2009)

This is to inform you that the Kenyatta National Hospital Ethics and Research Committee has reviewed and approved your above revised research proposal for the period 14th May 2009 – 13th May 2010.

You will be required to request for a renewal of the approval if you intend to continue with the study beyond the deadline given. Clearance for export of biological specimen must also be obtained from KNH-ERC for each batch.

On behalf of the Committee, I wish you fruitful research and look forward to receiving a summary of the research findings upon completion of the study.

This information will form part of database that will be consulted in future when processing related research study so as to minimize chances of study duplication.

Yours sincerely

DR. L. MUCHIRI  
AG. SECRETARY, KNH/UON-ERC

c.c. The Chairperson, KNH/UON-ERC  
The Deputy Director CS, KNH  
The Dean, School of Medicine, UON  
The Chairman, Dept. of Nursing Sciences, UON  
Supervisors: Mrs. Eunice Ojode Odhimo, Dept. of Nursing Sciences, UON  
Dr. Blasio Osogo Omuga, Dept. of Nursing Sciences, UON
RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on "Socio-economic factors causing protein energy malnutrition (PEM) in under five years - old children at Kenyatta National Hospital, Nairobi, Kenya" I am pleased to inform you that you have been authorized to undertake your research at Kenyatta National Hospital, Nairobi for a period ending 30th September 2010.

You are advised to report to The Director, Kenyatta National Hospital before embarking on your research project.

Upon completion of your research project, you are expected to submit two copies of your research report/thesis to our office.

Copy to:
The Director
Kenyatta National Hospital