



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



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**The Risk Factors Contributing To Protein-Energy Malnutrition Among
Children Under Five Years Old At Bashair Teaching Hospital Khartoum
Sudan 2018.**

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قال تعالى:

(وَالْعَصْرِ (1) إِنَّ الْإِنْسَانَ لَفِي خُسْرٍ (2) إِلَّا الَّذِينَ آمَنُوا وَعَمِلُوا الصَّالِحَاتِ وَتَوَّصَوْا بِالْحَقِّ وَتَوَّصَوْا بِالصَّبْرِ (3))

سورة العصر

صدق الله العظيم



Dedication

To my parents those I wanted to see me developing my Knowledge.

To my family who by their patient

Tolerance made my schooling possible.

*To the soul of my colleague “**Yasser Alkheir Alabwabi**”*

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I would also like to extend my thanks to my brothers for their support.

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Also I'm greatly grateful to the Family of Aljwda Hospital and members of Bashair Hospital for Children admission"

ABSTRACT

The aim of the study is to identify the risk factors contributing to protein–energy malnutrition among children under five years admitted to Bashair Hospital. Study group consists of all mothers, children (337) attending Bashair Hospital (Sudan), the children are under five years of age, clinically diagnosed with protein energy malnutrition. The survey was conducted through questionnaires. From this study several risk factors were found to be associated with Protein Energy Malnutrition (PEM) including, Several risk factors were found to be associated with PEM including: mother social status; parents economic, education level of the mother; pregnancy duration; vaccination history; types of vaccination; Old and small brother interval; baby feed; duration of breast feeding; supplementary feeding; number of meals; child weaning; time of weaning; cause of weaning; kind of inherited diseases; mood before sick ; checking the weight of baby; prohibited foods in family; types of food and reasons for prevent some foods. The study showed that; Malnourished was significantly compared to those who started breast feeding more occurred among not breast feed Childs (57.1%) after 6 months (33.3%); after 1 year (51%) and after 2 years (32.2%). Malnourished was significantly more prevalent among Childs who refuse breast feeding (83.3%). Childs who exposed to sudden weaning were more malnourished (48.5%). Childs who having diabetic mellitus were significantly greater malnourished (42.6%). Childs with nervous mood before sick were higher malnourished. Childs whose weight not taken was significantly more malnourished (44.4%). Childs who facing prohibition foods in family higher (39.4. Childs whose foods was prevent eggs were significantly more malnourished (81.3%).Childs with belief for prevent some food were significantly higher malnourished (50%) compared to logical reasons (48.6%) and other reasons (21.2%). Also, Childs who starting supplementary feeding after 1 year were significantly more malnourished (57.1%) compared to other periods. Increasing mother's awareness related to risk factors of PEM and how to manage the different infections among their children and encourage vaccination at the appropriate time is also recommended.

Key words:

Risk factors to (PEM) among children under “5” years admitted to Bashair Teaching Hospital, Khartoum state 2018.

المستخلص

الهدف: من هذه الدراسة هو تحديد عوامل الخطر التي تسهم في سوء التغذية الناجمة عن نقص البروتين والطاقة بين الأطفال دون سن الخامسة الذين تم ادخالهم لمستشفى بشائر. تتكون مجموعة الدراسة من جميع الاطفال دون الخامسة من العمر الذين يحضرون مستشفى بشائر (السودان) مع مرافقيهم ، الذين تم تشخيصهم سريريا بسوء تغذية الناجمة عن نقص البروتين والطاقة. تم إجراء مسح بالاستبيانات ضمن هذه الدراسة و تم دراسة العديد من عوامل الخطر التي ترتبط بسوء التغذية الناجمة عن نقص البروتين والطاقة (PEM) ، تتضمن: الوضع الاجتماعي للأم. المستوى الاقتصادي للأباء والمستوى التعليمي للأم ؛ مدة الحمل ، تاريخ التطعيم أنواع التطعيم، الفاصل الزمني بين الطفولا الأخ الأصغر وبين الطفل والأخ الأكبر ؛ تغذية الطفل ، مدة الرضاعة، التغذية التكميلية عدد الوجبات، فطام الطفل ، وقت الفطام ، سبب الفطام. أنواع الأمراض الوراثية، مزاج الطفل قبل المرض، التحقق من وزن الطفل، الأطعمة المحظورة في الأسرة ؛ أنواع الطعام وأسباب منع بعض الأطعمة. أظهرت الدراسة أن الاصابة بسوء التغذية بشكل ملحوظ في أولئك الذين لم يرضعوا طبيعيا (57.1%) بعد 6 أشهر (33.3%) ؛ بعد عام واحد (51%) وبعد سنتين (32.2%). حيث كان سوء التغذية أكثر انتشارا بين الأطفال الذين يرفضون الرضاعة الطبيعية (83.3%). و نجد الأطفال الذين تعرضوا للفطام المفاجئ كانوا أكثر اصابة بسوء تغذية (48.5%). من ناحية اخرى الأطفال الذين يعانون من مرض السكري كانوا يعانون من سوء التغذية بشكل كبير (42.6%). و الأطفال الذين يعانون من مزاج عصبي قبل المرض كانوا أكثر اصابة بسوء التغذية. بالاضافة لذلك الأطفال الذين لم تراجع وتفاسواوزانهم كانوا أكثر اصابة بسوء التغذية بشكل كبير (44.4%). وايضا الأطفال الذين يحرمون من بعض الأطعمة في الأسرة (39.4%). من جانب اخر الأطفال الذين حرموا من البيض يعانون من الاصابة بسوء التغذية بدرجة كبيرة (81.3%). الأطفال الذين لديهم معتقدات للحرمان من بعض الاغذية كانوا يعانون من سوء تغذية أعلى بكثير (50%) مقارنة بالذين لديهم أسباب منطقية لمنع بعض الأطعمة (48,6%) . كذلك ، فإن الأطفال الذين بدأوا التغذية التكميلية بعد عام واحد كانوا يعانون من الاصابة بسوء التغذية بشكل كبير (57.1%) مقارنة بالفترات الأخرى ، ضرورة زيادة وعي الأم فيما يتعلق بعوامل خطر سوء التغذية الناجمة عن نقص البروتين والطاقة وكيفية علاج الأمراض المختلفة بين أطفالهم وتشجيعهم، يوصى أيضا بالتطعيم في الوقت المناسب.

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LIST OF ABBREVIATIONS

Abbreviation	Meaning
DFID	Department For International Development
EPI	Expanded Programme Immunization
FMOH	Federal Ministry of Health
GHF	Global Health Foundation
HIV	Human Immuno-deficiency Virus
IUA	International University Of Africa
MUAC	Mid-Upper ArmCircumference
NGOs	National Government Organization
PEM	Protein Energy Malnutrition
UNICEF	United Nations International Children's Emergency Fund.
WHO	World Health Organization
SES	Social Emergency Service
SFP	Supplementary Feeding Program

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CHAPTER ONE

INTRODUCTION, JUSTIFICATION AND OBJECTIVES

1-1 Introduction and justification:

WHO estimates that 113.4 million children affected by protein energy malnutrition “PEM” as measured by weight for age. The majority of these cases living in developing countries with “70%” of these children in Asia particularly south central region and “26%” in Africa. More than half of young children in South Africa have” PEM” which is 6.5-time prevalence in the western hemisphere. In sub-Saharan Africa 30% of children have “PEM” (1). Despite marked decrease globally in the prevalence of malnutrition, rates have continued to increase in Africa. Kwashiorkor and Marasmus are two forms of “PEM”. Marasmus involves inadequate intake of protein and calories while Kwashiorkor fair normal calories intake with inadequate protein. Malnutrition is globally the most important reason for illness and death, contributing to more than half of deaths in children worldwide; child malnutrition was associated with 54% of deaths in children in developing countries (1,2,3).

1-2 Problem Statement:

The bad economic situation in the last fifteen years with food insecurity due to drought affect agricultural scheme with overpopulation in Khartoum the main reasons led to inadequate food intake. In turn lead to malnutrition which can further hamper development (4). In addition to that, the bad economic situation may cause poor environmental conditions may increase malnutrition cases due to illness, and contribute to environmental deficiencies in micronutrients.

1-3 Study Justification:

A nutritional survey held 2007, Outbreaks in Refugee Camps by Care Sudan, revealed that more than 15% children of fewer than 5 years of age are malnourished, depending on those findings and according to the World Health

Organization recommendations on such a situation which recommends for a supplementary feeding programme under the following circumstances (5) :

- When the general rations are less than 1.500 kcal/person.
- When the nutritional assessment reveals that greater than 20% of children under 5 years of age acutely malnourished as determined by a Z – score less than -2) falls between 10% - 20% and the general rations is less than 1.900 kcal.
- Where there is a high incidence of measles or diarrheal diseases (6).

Care Sudan in collaboration with Global Health Foundation (GHF)

Created a Supplementary Feeding Program (SFP) for the under 5 year's malnourished children.

An additional report from Ministry of Health Khartoum State (annual report) stated that, the incidence of gastroenteritis is very high in the area- Hai Elbaraka (Karton Kassala) – displaced under 5 children. According to the above reasons, the researcher has decided to study risk factors associated with Protein - Energy Malnutrition (PEM) among children under 5 years of age. So that the researcher can find out those mentioned factors and recommend some interventions, which from the under five children within the area can benefit. (7)

Why Bashair hospital is selected to conduct the study in?

Bashair hospital serves areas where displaced citizen of the civil war were allocated (Mandella - Suba alaradi -& Angola).

These areas are congested according to EPI records the number of under five children is 32,134 children. is tackled to the health team serving this area as the targeted population for vaccination for 2010. Those children are living in poor living conditions, unhealthy environment that facilitates infection especially during winter.

1.4. Objectives:

1.4.1 General Objective

To assess the risk factors contributing to protein – energy malnutrition among under five years' children admitted to Bashair Hospital.

1.4.2 Specific objectives: -

- (1) To assess the demographic factors in magnitude of protein-energy malnutrition among admitted under five years to Bashair Hospital.
- (2) To identify the association between common diseases in winter, chronic diseases, supplementary feeding, weaning age and the disease.
- (3) To assess the role of socio-economic status of the family in developing the disease.

CHAPTER TWO
LITERATURE REVIEW

LITERATURE REVIEW

2.1 Malnutrition: is the cellular imbalance between supply of nutrients and energy and the body's demand for them to ensure growth, maintenance and specific functions. Malnutrition results from either under-nutrition or over-nutrition and has for long time remained a public health problem both in developed and developing nations (8). Numerous studies on child malnutrition by several authors have evidenced this global problem (9). The first five years of life are critical stages for a child's growth and development and all necessary measures should be taken to prevent nutritional deficiencies during this period. Nutritional deficiencies cause permanent mental and physical impairment and even death leading to huge loss to individual children and massive loss to nations' development. Giving enough attention to Nutrition as individuals, planners and leaders will result to effective nutrition care process provision (10).

Lack of enough attention to nutrition as individuals, planners and leaders was acknowledged during a National Nutrition Symposium held in February, 2015 in Nairobi, Kenya. It was noted that 2.8 million of children aged less than five years were stunted and over 19,000 of these children die every year due to underweight in Kenya. As a significant contribution to efforts of scaling up nutrition a four-year Nutrition Resilience programme was launched during the Symposium whose theme was step up commitments to Scale up Nutrition in Kenya (11).

Nutrition care process is the systematic approach to providing high quality nutrition care. The process includes various steps first, nutritional assessments which involve obtaining data about a client or population and then interpreting the data using evidence based standards. Secondly, nutrition classification or diagnosing which refers to identifying the problem and determining the causes or contributing risk factors. Thirdly, are nutrition intervention which involves

selecting, planning and implementing appropriate action such as counseling, treating or referring the client for further management. Fourthly, nutrition monitoring and evaluation of the client is done. The results of the client's nutrition assessment and classification of nutritional status then determines all the other elements of nutrition care process which include counseling, support treatment, or referral to food security and any other support (10).

2.2 Nutrition assessment

Nutrition assessment is collecting information about a client's medical history, anthropometric measurements, clinical and biochemical characteristics, dietary practices, current treatment, and socioeconomic situation including food security. This information identifies medical complications that affect nutrition. It also tracks growth and weight, detects dietary habits that increase the risk of disease, informs nutrition education and counseling, and establishes a framework for an individual nutrition care plan. Nutrition assessment requires training and should be done by clinicians, dietitians, nutritionists and other appropriately trained health workers for it to result to a positive impact on child nutrition. For instance, a systematic review of interventions across 25 countries demonstrated a reduction in child malnutrition in areas where nutrition assessment was carried out and nutrition education interventions implemented (12).

2.2.1 Nutrition assessment methods

Types of nutrition assessment are varied such as Anthropometric assessment which involves for instance, weight and height taking and also measurement of Mid-Upper Arm Circumference (MUAC). Biochemical assessment is another type used and requires laboratory test that involve checking the levels of nutrients in a person's stool, urine and blood. Clinical assessment is another type of assessment that checks for any visible signs of nutritional deficiencies for instance emaciation, hair loss, bilateral pitting edema and hair colour change. It also includes asking about symptoms of infections that can increase

nutrients needs such as fever and nutrients loss such as diarrhea and vomiting as well as medical conditions that impair digestion and nutrients absorption and increase the risk of developing malnutrition. Dietary assessment is the method where food and fluid intake is assessed so as to get the dietary quantity and quality information. The results are then compared with the recommended intake such as recommended dietary allowance (10).

2.2.2 Importance and frequency of nutrition assessment

Nutrition assessment is very necessary for it helps to identify people at risk of malnutrition who require early interventions or referral before they become malnourished as well as those already malnourished clients who urgently need treatment. It helps detect practices that increase the risk of malnutrition and infection and establishment of appropriate nutrition care plans (8). A study by Cuizat and Mattinen, (12) for instance, demonstrated that cultural values and beliefs especially those affect the children and mothers mediate the impact of risk factors of malnutrition on members of the household.

Bhutta *et al.*, (13) described nutrition assessment of children under five years as an effective platform to deliver nutrition counseling and referrals for children identified as affected by malnutrition. (14).

The frequency of nutrition assessment depends on a client's age, pregnancy, disease status and also on national policies. The recommendations however should be adjusted based on national guidelines of each country. In Kenya the assessment is based to WHO guidelines whereby pregnant and postpartum women should be assessed on every antenatal/postnatal visit, infants aged less than 6 months of age is at birth and on every scheduled post-natal visit also termed as growth monitoring. Infants aged 6–59 months of age should be assessed during the monthly growth monitoring sessions recommended for children under 2 years and every 3 months for older children. Children over 5 years of age need to be assessed on every clinic visit whereas adolescents and adults should be assessed on every clinic visit. However, people with HIV

should be assessed on every clinic visit and when initiating or changing antiretroviral therapy (14).

Malnutrition has remained a major Public Health problem globally posing grave health and economic consequences in population especially now the world is facing double burden of over-nutrition and under-nutrition.

2.3. Under- nutrition and classifications

Under-nutrition is a consequence of consuming too few essential nutrients or using or excreting them more rapidly than they can be replaced. In children, the outcome is growth (weight or height) faltering and/ or specific symptoms and signs of micronutrients deficiency disorder (14).

According to UNICEF framework developed in 1998 causes of malnutrition are number of direct determinants of nutrition termed as immediate causes, followed by a further group, the underlying causes and at the periphery, the basic causes. Basic causes include political, ideological, economic, environmental resource and technology factors (8).

According to Golden, (15) under-nutrition is classified into type I and type II nutrient deficiencies.

Type I nutrients includes iron, calcium, iodine, selenium and all the vitamins. These nutrients are stored in the body and mainly required for specific metabolic functions (biochemical, pathways) in the body, rather than for metabolism in general. When a person's diet is deficient in type I nutrients, the person initially continues to grow normally. The body store of the nutrient is consumed first. The concentration of the nutrients in the tissue then falls until the specific metabolic function that depends on the nutrient declines and the person becomes ill. The illness is recognized by characteristic sign and symptoms and after this stage is reached, growth may or may not be affected secondary to the overt illness. Types II nutrients includes proteins, energy, zinc, magnesium, potassium and sodium. When there is deficiency in one of the type II or "growth" nutrients, the person stops growing. The body starts to conserve

the nutrients; its excretion falls to very low levels so that there is no reduction in the tissue concentration. With continued or severe deficiency, the body starts to break its own tissues to release the nutrients for use by the rest of the body and this process is associated with reduced appetite. The nutrients have no body store that can be called on in an emergency and into which excess nutrients can be deposited. There are three kinds of type II under- nutrition in children; stunting, underweight and wasting (15).

UNICEF 1998, (8) revealed that stunting affects approximately 195 million children under 5 years old in the developing world, or about one in three children. That study revealed Africa and Asia were the continents with high stunting rates of 40% and 36%, respectively and had more than 90% of the world's stunted children. UNICEF estimates that 129 million children under 5 years old in the developing world are under-weight nearly one in four. 10% of children in the developing world are severely underweight. The prevalence of underweight is higher in Asia than in Africa, with rates of 27% and 21%, respectively. Children who suffer from wasting face a markedly increased risk of death. Also 13% of children who are under 5 years old in the developing world are wasted and 5% are extremely wasted according to the same report.

2.3.1 Risk factors for child under- nutrition

According to Hoddinatt *et al.*, (16) there are proximal and distal risk factors:

2.3.1.1 Proximal Risk Factors

These are factors that act directly or almost directly to cause malnutrition. These risk factors are addressed by Nutrition-specific interventions or programs such as adequate food and nutrients intake, feeding, care-giving and parenting practices and low burden of infectious diseases (16).

2.3.1.1.1 Inadequate energy and nutrient intake

Inadequate energy and nutrient intake lead directly to child under-nutrition. Specifically, chronic energy and /or nutrients depletion in young children leads to slowed skeletal growth and a loss of or failure to accumulate muscle mass

and fat. Deficiencies of specific nutrients including vitamin A, iron, iodine, zinc and thiamine are also directly associated with increased risk of morbidity and mortality in infants and young children as follows; Vitamin A deficiency may lead to blindness and is also directly associated with increased risk of death before the age five years. Iron deficiency is associated with anemia and increased severity of infectious diseases like Malaria. Iodine deficiency is associated with goiter and cretinism, a condition of severely stunted physical and mental growth whereas Zinc deficiency is associated with impaired growth and increased mortality associated with diarrhea. Thiamine deficiency is associated with infantile beriberi, which may prove fatal by causing cardiac failure (16).

2.3.1.1.2 Infectious Diseases

There is a strong correlation between infectious diseases such as acute respiratory infections, malaria and measles and under-nutrition in children. Infectious diseases negatively affect child nutrition status, with the impact proportional to the severity of infection (17).

Infectious diseases can lead directly to child under-nutrition in four ways; Infections increase a child energy or nutrients requirement, making it difficult for them to consume sufficient food such as HIV positive children have 50-100% greater energy requirement than their HIV negative counterparts, because of the increased energy requirement to combat opportunistic infections (18). Infections common in low-income settings can also reduce the capacity of a child's body to absorb energy or nutrients from food. Intestinal helminthic infestations can lead to malabsorption and helminthic infection in early childhood has been associated with a growth shortfall of 4.6 cm at 7 years of age (19). Infections including helminthes and HIV can directly reduce food consumption by reducing appetite. Symptoms like vomiting, abdominal pain and dry mouth can also decrease the capacity or desire of children to eat.

Diseases can also lead to centrally controlled appetite suppression through the release of the cytokine interleukin-1 which is secreted by certain cells of the immune system in response to infection. Parents also withhold food and drinks from sick children in the belief that this will assist in their recovery from illness and this can lead to under-nutrition through restricted food intake (20).

2.3.1.1.3 Inadequate care and feeding practices including health care seeking behaviors

The dependent status of infants and young children has made food intake and disease to be very strongly influenced by the feeding, care-giving and health care-seeking practices of the caregiver. It is not conceptually therefore meaningful to separate for example, food intake from feeding practices (DFID, 2012). Inappropriate infant and young child feeding practices have a negative impact on child nutrition status. WHO recommends breastfeeding initiation within 1 hour of birth, exclusive breastfeeding for the first 6 months and appropriate complementary feeding beginning at 6 months with breastfeeding continued for 2 years and beyond (10). Negative impact on child nutrition are seen where WHO's recommendations are not followed such as a study done in Ghana found that 22% of neonatal deaths could have been averted through early initiation of breastfeeding within the first hour of birth (16).

Health care-seeking practices of caregivers are key to whether or not infants and young children are protected from the harmful impact of infectious diseases on nutritional status (Bhutta *et al.*, 2008). In Sri Lanka, high rates of health care-seeking have been associated with low child mortality in a setting with a high prevalence of child under-nutrition and this suggests that appropriate health care seeking can reduce the risks of illness and death associated with under-nutrition (21). On the other hand, poor health care seeking has been implicated in 60-70 % of child deaths across diverse settings (22).

Findings by Reyes *et al.*, (23) found that children whose caregivers seek health care in a timely way are 19.5 times less likely to die than children whose caregivers do not seek timely care.

2.3.1.1.4 Inequitable intra household food allocation

Inequitable food allocation between girls and boy's children, women and men is a major contributing factor to child under-nutrition and can be considered a leading proximal cause of child under-nutrition at the global level. There is evidence in some rural areas of India that food intake of girl child is consistently of lower quality and/or quantity than that of male children in the same household (24). This inequitable allocation of food between boy and girl child within household has also been recognized by the UNICEF regional office for South Asia (24). Inequitable intra-household allocation of food also affects women and has been reported that food intake of women in South Asia is routinely of low quality and quantity than that of men and boy children within the same household (25).

2.3.1.1.5 Inadequate maternal, neonatal and child health service

There is an association between the quality and accessibility of maternal, neonatal and child health services and child nutritional status. This is because care seeking can have a protective effect on child health and survival outcomes associated with nutritional status (17).

Improvement in the quality and accessibility of health services lead to substantial improvements in child nutritional status and this was evident in Colombia and Ghana whereby a cross-country review of successful community based primary health care services found that there was an average fall in the prevalence of child underweight of 1-2% per year (26). DFID, (16) India found out that institutional discrimination in health services and among nutrition workers which excludes children from socially marginalized groups from accessing care contributed to a substantially higher prevalence of underweight in children within these groups.

2.3.1.2 Distal Risk Factors

These are factors that are further back in the causal chain and act via a number of intermediary causes. These factors at household level place children at risk of inadequate food intake, disease, inadequate care and feeding practices. These factors are addressed by Nutrition- sensitive interventions or programs such as food security, adequate care- giving resources at maternal level, household and community level, access to health services and safe and hygienic environment (16)

2.3.1.2.1 Unhealthy household environment, water, sanitation and hygiene

Insufficient access to safe water, adequate sanitation facilities and basic hygiene practices results in exposure to repeated water-related diseases, including enteric and helminthes infections (20). Exposure to these diseases in early childhood is associated with stunting. A substantial proportion of wasting in children is caused by acute and chronic diarrhea that is attributable to inadequate water, sanitation and hygiene practices. It is estimated that 50% of total disease burden of under- nutrition is attributable to environmental factors, including inadequate water, sanitation and hygiene practices (20).

2.3.1.2.2 Low agricultural productivity and inadequate access to food

There is a strong relationship between agricultural productivity, household food sufficiency and poverty such that a 1 % increase in agricultural yield reduces the percentage of a country's population living on less than \$1 per day by 0.64-0.91% (16). Thus low agricultural productivity can be expected to restrict the financial capacity of households to access food. Also where agricultural yields are insufficient to provide adequate food throughout the year a hungry season occurs among food producers and groups within the rural economy who rely on producers for their livelihood and this season is associated with substantial acute under- nutrition in children (27). A multicounty study in Mynamar, Ethiopia, Bangladesh and Tanzania found that the minimum cost of healthy diet is beyond the means of most households indicating that the required quality or quantity of

food is not being consumed in these households (28). Most of the undernourishment globally is attributable to food insecurity since it results from the inability of households to access sufficient food during the annual ‘hungry season’ when food stock is at their lowest preceding the harvest season (27).

2.3.1.2.3 Low socio-economic status of women

There is a strong and well-established correlation between the status of women and child nutrition status in developing countries. Based on data from 36 developing countries, it is estimated that the regional prevalence in South Asia of underweight in children aged less than 3 years would drop by 13% if men and women had equal status. For Sub-Saharan African countries where existing gender disparities are generally less sharp, the estimated effect is nearly 3%. One key explanation for the impact of women status on child nutrition is the role of women as caregivers. Women are almost always the primary caregivers of infants and young children in developing countries and are closely involved with the quality of feeding, exposure to diseases and care of infants and young children. Consequently, under-nutrition results where women lack the capacity to support child nutrition. Social stressors on mothers, such as poverty, violence and heavy workloads can increase under-nutrition in children (29).

Additionally, where women have little control over how resources are allocated within the household, resources are less likely to be allocated to children’s nutrition and health. Also inability of women to access control of the use of resources for their own wellbeing has a significant negative impact on the nutrition and health of their children (8).

A study in Uganda further demonstrated that mother’s education is the best prediction of the child’s health in a community and not the household assets, land ownership or father’s education (30).

2.3.1.2.4 Poverty and household level factors

At national level in any country, poverty is strongly associated with child under-nutrition. Countries with high proportions of their populations living in poverty

have substantially higher levels of child under-nutrition. Inequitable distribution of wealth also influences child under-nutrition within national populations. A review of 50 developing countries found that severe stunting in children is almost three times higher among the poor than among the rich (31).

Poverty places direct constraints on households' ability to access food and health services and provide care in the immediate term. A study in South India found that poor rural household typically select low-risk, low-return crops rather than investing in high-risk, high-return crops, because they do not have the financial reserves to manage the higher risk of high yield (32).

Value, beliefs, strategies and trade-offs within individual households can mediate the impact of risk factors on household members' nutrition. For example, the impact of household food insufficiency on child nutrition is mediated by intra-household decisions about the allocation of food and feeding practices for young children hence resulting to negative or positive impact on child nutritional status. Cultural beliefs can play a significant role in determining the diet for pregnant and lactating women, infants and children. Traditional food taboos are common in some communities and are passed on from generation to the next. A study of eight minority ethnic groups in two remote Northern provinces of the Lao People's Democratic Republic found that certain nutrition behaviors such as food taboos may contribute to the high prevalence of child malnutrition and micronutrients deficiencies (24).

2.3.1.2.5 Weak governance

Numerous studies have found a correlation between governance and child nutrition status. A robust multivariate analysis of 82 countries found a correlation between lower rates of child under-nutrition and higher levels of government effectiveness, political, stability and rule of law. An in-depth study of governance and child under- nutrition in Madagascar found that political commitments, accountability, demand for nutrition and nutrition governance

and effective financing led to substantial reduction in child under- nutrition (11).

Reducing malnutrition in a country is not just a health priority but also a political choice that calls for a multi- sector focus driven by a political will that acknowledges and respects the integral role that nutrition plays in ensuring a productive workforce and healthy population. Communities should also be empowered to demand their right to good nutrition and be encouraged and guided to play their part towards realizing their rights (11).

2.3.2 Consequences of child under-nutrition

In general under nourished or hungry children cannot learn as much as fast or as well because chronic under-nutrition harms their cognitive development during this critical period of rapid brain growth. This changes the fundamental neurological architecture of the brain and central nervous system hence make them do more poorly in school and have lower academic achievement because they are not well prepared for school and cannot concentrate (33).

2.3.2.1 Under-nutrition and illness/cancer and mortality

Under-nutrition increases the risk of infection and infectious diseases for instance, is a major risk factor in the onset of active tuberculosis. In communities that lack access to safe drinking water, these additional health risks also present a critical problem (17). Cancer is now common in developing countries. According to a study by the International Agency for Research on Cancer, in developing countries, cancers of the liver, stomach, and esophagus were common, often linked to consumption of carcinogenic preserved foods such as smoked or salted food and parasitic infections that attack organs (33).

2.3.2.2 Under-nutrition and future generation and nation progress

Hunger respects no age barrier. It is wreaking a disproportionate impact on children with dire consequences for current and future generations. In many communities' chronic hunger is “inherited.” For instance, the impact of under-

nutrition on pregnant and lactating women severely restricts their children's lifelong capacity for physical growth, intellectual development and economic productivity, perpetuating a vicious cycle of inter-generational hunger and poverty. Under-nutrition has a negative impact on a country's production capacity as a result of a higher prevalence of mortality and lower level of education attained by the population suffering from under-nutrition. It hampers the progress and process of economic development of any nation which are essential to economic growth. Economic growth is essential for increasing incomes, reducing under-nutrition, poverty and improving food security. The manner in which development strategies achieve growth, is to recognize that all the number of people who participate in and benefit from it are as important as the growth itself. A healthy labour force is therefore needed to boost the progress of the nation (34).

2.3.2.3 Under-nutrition and psychological disorders

Under-nutrition also creates psychological disorders. According to the Lancet, (2013) under-nutrition in the form of iodine deficiency is the most common preventable cause of mental impairment worldwide. Even moderate iodine deficiency, especially in pregnant women and infants, lowers intelligence by 10-15 IQ points, posing an incurable potential loss to a nation's development. Research indicates that improving the awareness of nutritious meal choices and establishing long term habits of healthy eating have a positive effect on a cognitive and spatial memory capacity, potentially increasing a student's potential to process and retain academic information (29).

2.3.3 Diseases associated with under-nutrition

Kwashiorkor is one of the serious forms of protein energy malnutrition (PEM). It is most frequently seen in children aged one year to three years of age, but can occur in any age. It is found in children who have a diet that is usually insufficient in energy and protein. Often the food provided to the child is mainly carbohydrates. Kwashiorkor is often associated with or even precipitated by

infectious diseases. Diarrhea, respiratory infections, measles, whooping cough, intestinal parasites and other infections are common underlying causes of PEM and may precipitate children into either kwashiorkor or marasmus. These infections result into loss of appetite which is important as a cause of serious PEM. Infections especially those resulting in fever, lead to an increased loss of nitrogen from the body which can only be replaced by protein in the diet. Marasmus is the other severe form of PEM. In marasmus, the deficiency is food in general, energy inclusive. It may occur in any age, most common up to about three to three and half years, contrary to kwashiorkor which is more common during the first years of life. Marasmus is a form of starvation and the possible underlying causes are numerous. But whatever the cause the child does not get enough supplies of breast milk or of any alternative food. A very common cause is early cessation of breastfeeding. Children with features of both marasmus and kwashiorkor are diagnosed as having marasmic-kwashiorkor. These are children with severe malnutrition who are found to have both edema and a weight-for-age below 60% of expected for his/ her age. Marasmic-kwashiorkor child has all features of marasmus including severe wasting, lack of subcutaneous fat, poor growth, edema, as well as features of kwashiorkor like diarrhea (35).

2.4 Over- nutrition

Overweight and obesity among the under five children are also on rise and have become a public health concern of the century low and middle income countries included. Globally, in 2013, 42 million under five children were overweight up from 32 million in the year 2000. In terms of regional breakdowns it was estimated that 18 million overweight children were in Asia, 11 million in Africa and 4 million in Latin America and the Caribbean. Countries with increased prevalence in overweight between the year 2000 and 2013 are such as South Eastern Asia which has an increase from 3% to 7% and South Africa from 1% to 19% (9). All these children are likely to develop non-communicable diseases

like diabetes and cardiovascular diseases and even death all of which are largely preventable.

For instance, during a Scaling up Nutrition national symposium in 2013, the Kenya government revealed that non-communicable diseases contribute to 33% of total mortality with prevalence of diabetes being reported at 4.2% and hypertension at 12.7% nationally. The government also revealed that 18% of the preschool children were overweight and 4 % of them were obese (17). The fundamental causes behind the rising levels of the childhood obesity and overweight are shift in diet towards increased intake of energy dense foods that are high in fats and sugars but low in vitamins, minerals and other healthy micronutrients and a trend towards decreased levels of physical activity (9). Parents focus on what their children love and not what is essentially vital as well as crucial to their children's nutrition and health in general for instance, consumption of greasy and fast foods. As malnutrition remains a significant public health problem various studies focusing on the same have been carried out. In Anambra State, Nigeria, a study on children aged 3-5 years termed malnutrition as a major public health problem among preschool children after observing 4.8% of wasting, 6.8% underweight and 2.5% of severe stunting (36). A study on prevalence of under-nutrition done in Malappuram, Kerala, on under five children observed that majority (87.9%) of undernourished children aged between 3-5 years whereby 24.1% of children were stunted 22.9% underweight and 15.1% wasted (37). Another study in Cameroon among Banging community found out that the prevalence of stunting, underweight and wasting of preschool children was 41.26%, 10.52% and 3.58% respectively (38).

A study in Dehradun, India found that 41.2% of preschool children suffered from some degree of malnutrition (39).

Akorende and Abiola, (40) in their study in Nigeria, Ondo State, found that the prevalence of stunted, wasted and underweight was 12.59%, 14.8% and 8.5%

respectively. In Ludhiana, Punjab, a study on children aged 3-5 years revealed that 74% were stunted, 42% wasted, and 29.5% underweight (41).

Ansuman and Sai, (42), in their study involving children aged 3-5 years in Bhubaneswar, India found that 23.3%, 57.4%, and 45.4% were wasting, stunting, and underweight respectively. A study by ACF in Isiolo County, Kenya revealed that the major casual factors of acute child malnutrition is linked to inadequate access to safe water for household use, poor access to appropriate age- specific foods and impacts of recurrent drought (43).

2.5. Breast feeding and weaning practice:

Breast milk composition may vary dramatically between women and from the beginning and month six (44). Breast milk contains everything a newborn child needs to grow. Breastfeeding should continue throughout gradual weaning process through at least the first year of life and for two years if possible in order to provide the best nutrition for the growing child, with the exception of cases where there may be the risk for HIV transmission from mother to child (45). Weaning is the process of transition from a breast feeding to a semi solid diet for the infant. A reduction in breast milk consumption and the protection it provides during gastrointestinal infection can increase the risk for illness due to diarrhea in children during weaning (46). Poor quality of weaning foods and improper weaning practices predispose infants to malnutrition, growth retardation, infection, diseases and high mortality. (47)

The World Health Organization recommends a gradual weaning period from 6 months to 2 years, this allows for the child to still receive the benefits from breastfeeding, while also consuming the necessary nutrients from the complementary foods. Foods should be prepared adequately containing the required nutrients as well as appropriately with a suitable texture and temperature (48).

Without the knowledge of proper weaning practices as well as a perception of the child's hunger needs, malnutrition and illness may ensue. The weaning

period is therefore a vulnerable time when the child should be attentively cared for and observed so as to maintain health (12).

Complementary foods in sub-Saharan Africa and in Sudan in particular, comprise thin gruels made from maize, millet, sorghum and cassava. These gruels have low levels of energy, protein and micronutrients and high concentrations of factors inhibiting absorption of nutrients (49).

CHAPTER THREE

METHODOLOGY

METHODOLOGY

3-1 Study design

Descriptive cross-sectional hospital based study.

3-2 Study Area:

Bashair teaching Hospital is located Mayo was established in 2003, square number 31, Jebel Awalaya Locality, Khartoum state. It approximately “3250 m²”. Whit 25 specialists, 30 general practioners, 25 house officers, one public health officer, 19 nutrition assistance, 4 pharmacists and one psychologist. There are 48 beds in emergency rooms and 135 beds in wards, 30 beds for children. The water services from general supply network of Khartoum, there is one cafeteria, and one point of nutrition, waste disposal through well system and bin for solid and medical waste and the collection is through municipality cars.

3-3 Study duration:

study was conducted from September to December 2018.

3-4 Study population:

The study was conducted among children under “5” years of age at Bashair Hospital during the study duration.

3.4.1 Inclusion Criteria:

All male/female children under 5 years of age admitted at Bashair Hospital during the study duration.

3.4.2 Exclusion Criteria:

All male/female children age more than 5 years admitted at Bashair Hospital during the study duration.

3.5 Variables under the study:

3.5.1. dependent variables: Protein - energy malnutrition case among children under five years admitted to Bashair Hospital .

Backgrounded such as: Age, sex, weight, height, weaning age and Socioeconomic status/environment.

3.5.2. Independent variables: Backgrounded such as: Age, sex, weight, height, weaning age and Socioeconomic status/environment.

3-6. Data collection techniques and tools:

The data was collected by using Questionnaire (to mothers) which contain age, gender, education level of parents, work and incomes, family brothers, feeding of child, vaccination, family environmental, method of food saving ...etc. (P 60-66)

3-7. Sampling procedures and sample size:

The sample size was determined using the following formula:

$$n = \frac{Z^2 \times P \times Q}{d^2}$$

- Any patient under five years of age admitted in Bashair teaching hospital starting on September till the end of this sample.
- Where Z is the value of the standard normal variable corresponding to 95% level of significance. $(1.96)_2 = (3.846)$
- P prevalence of (PEM).it equals 32.5%(FMoH)
- Q (1- P). = $(1-0.325) = 0.675$
- D is a marginal error ($d=0 .05$). $d^2= 0.0025$

So $n = \frac{3.846 \times 0.325 \times 0.675}{0.0025} = 337.4 = 337$ patient

0. 0025

3-8. Data Analysis:

The data was analyzed by using a computer “SPSS” program version 26. A descriptive statistic was used and chi-square also was used to find an association between variables. P-value considered significant when set at less than 0.05 levels.

3-9. Ethical consideration:

Approval from International University of Africa was taken, Khartoum state ministry of health research department, and Bashair hospital and verbal consent from the mothers of children.

CHAPTER FOUR

RESULTS

RESULTS

4.1 Socio-demographic characteristics:

Table 4.1: gender Distribution among under 5 children at Bashair Teaching Hospital, Khartoum state 2018(n=337)

Child gender	Frequency	%
Male	167	49.6
Female	170	50.4
Total	337	100.0

Table 4.1 showed that More than half of the children were female 170 (50.4%).

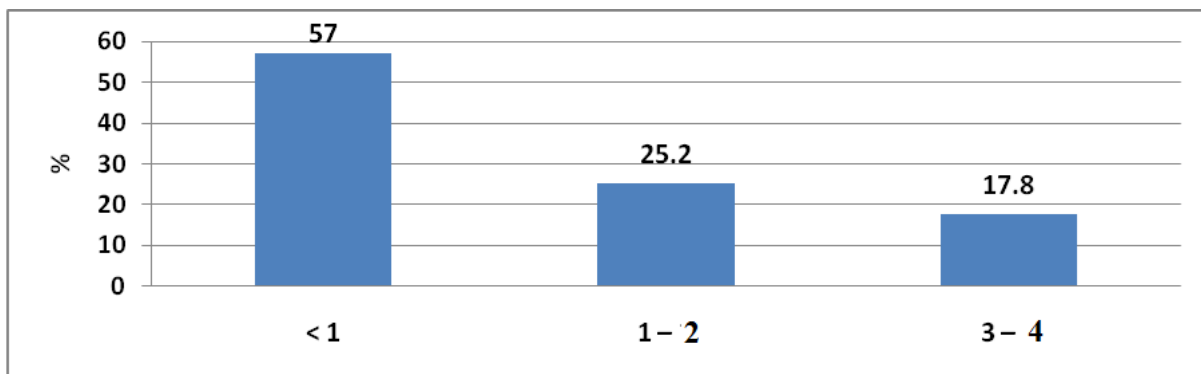


Fig. 4.1 Distribution of child age by years at Bashair Teaching Hospital, Khartoum state 2018 (n=337)

Figure 4.1 showed that a number of 192 (57%) of the respondents aged < 1 year; 85 (25.2%) were aged between 1-2 years and 60 (17.8%) aged between 3-4 years.

Table 4.2 Socio-demographic characteristics of Mothers child at Bashair teaching hospital, Khartoum state 2018 (n=337)

Characteristics	Variable	Frequency	%
Mother social status	Married	286	84.9
	Divorce	42	12.5
	(Other)	9	2.7
	Total	337	100.0
Mother work	Employee	29	8.6
	Not work	230	68.2
	Business	64	19.0
	(Other)	14	4.2
	Total	337	100.0
Mother economic	Low	197	58.5
	Medium	65	19.3
	Good	12	3.6
	not fits	63	18.7
	Total	337	100.0

Table 4.2 Sowed The majority of mothers were married 286 (84.9%). Regarding mother work, more than two thirds of mothers were not working 230 (68.2%). More than one half of mothers have low income 197 (58.5%). While mothers with no income were 63 (18.7%); medium income 65 (19.3%) and only 12 (3.6%) of mothers have good income.

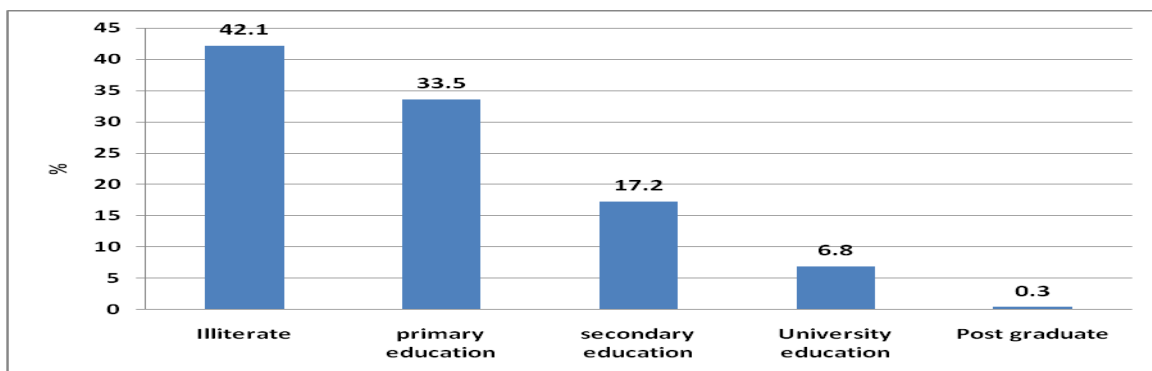


Fig. 4.2 Distribution of respondents according to educational level of mother's child at Bashair teaching hospital, Khartoum state 2018 (n=337)

Figure 4.2 showed that more than two fifth 40% of mothers 42.1% were illiterate and one third (113) 33.5% have primary education.

Table 4.3: Socio-demographic characteristics of Fathers child at Bashair teaching hospital, Khartoum state 2018 (n=337)

Father	Variable	Frequency	%
Education	Illiterate	101	30.0
	Primary	113	33.5
	Secondary	76	22.6
	University	42	12.5
	Postgraduate	5	1.5
	Total	337	100.0
Work	Employee	49	14.5
	Worker	264	78.3
	(Other)	24	7.1
	Total	337	100.0

Table 4.3 showed that one third of the fathers was illiterate 101 (30%); 113 (33.5%) have primary education. The majority of workers were workers 264 (78.3%).

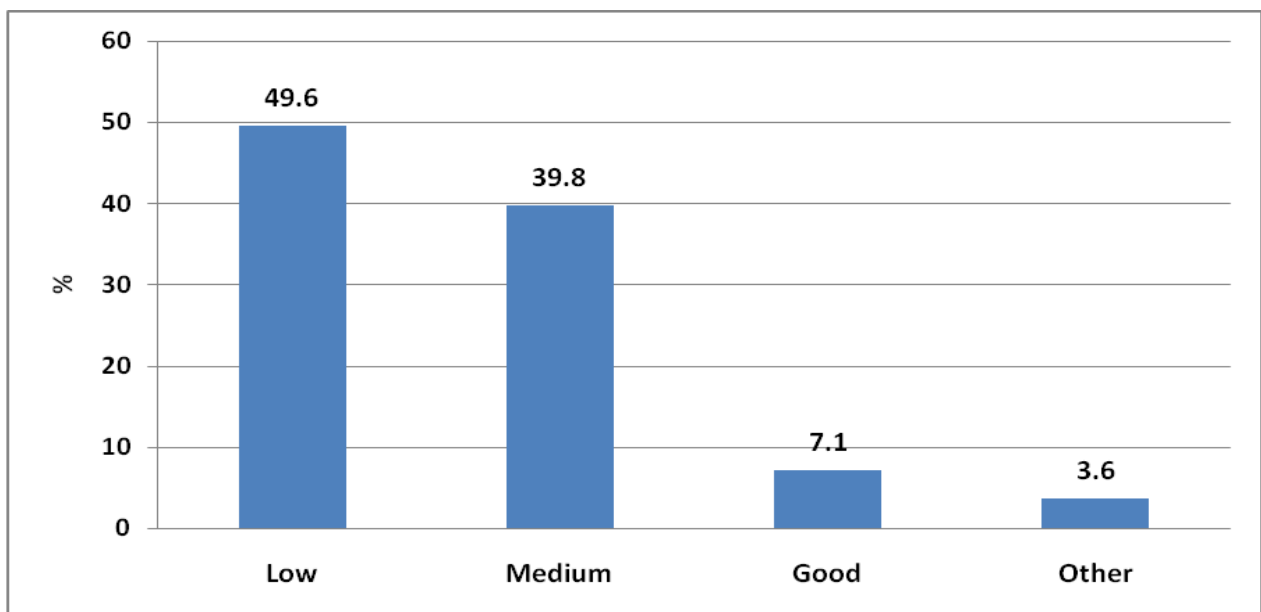


Fig. 4.3: Distribution of respondents according to father's child economic at Bashir teaching hospital, Khartoum state 2018 (n=337)

figure 4.3 showed that Nearly half of the respondents 167 (49.6%) have low incomes.

Table 4.4 health information about Child and mothers at Bashair teaching hospital, Khartoum state 2018 (n=337)

Variable	Response	Frequency	%
Child age (months)	< 6	105	31.2
	7 - 12	88	26.1
	13 - 24	52	15.4
	25 - 36	50	14.8
	37 - 60	42	12.5
	Total	337	100.0
Pregnancy duration	Complete	313	92.9
	Not complete	24	7.1
	Total	337	100.0
Vaccination history	Yes	288	85.5
	No	49	14.5
	Total	337	100.0
Types of vaccination	All vaccines	165	49.0
	Partial	122	36.2
	(Other)	50	14.8
	Total	337	100.0
Baby brothers	Have	269	79.8
	Haven't	68	20.2
	Total	337	100.0
Old brother interval	1 y	43	12.8
	2 y	107	31.8
	(Other)	187	55.5
	Total	337	100.0
Small brother interval	1 y	35	10.4
	2 y	33	9.8
	(Other)	269	79.8
	Total	337	100.0
Baby feed	Breast feeding	113	33.5
	Eating	111	32.9
	Both	113	33.5
	Total	337	100.0
No. of breast feeding Per day	1-2	12	3.6
	3-4	80	23.7
	5-6	115	34.1
	Not fit	130	38.6
	Total	337	100.0
Duration of breast feeding	5 min	126	37.4
	10 min	48	14.2
	15 min	27	8.0
	(Other)	136	40.4
	Total	337	100.0

Table 4.4 showed that more than one third 105 (31.2%) of child aged < 6 months and 26.1% aged between 7-12 months. The vast majority of mothers complete the pregnancy duration 92.9%. More than 85% (85.5%) of the child were vaccinated with 49% for all vaccination and 36.2% with partial vaccination. A number of 269 (79.8%) of child have brothers 79.8%. More than one third 31.8% of the child old brother interval was 2 years; 12.8% was one years and 55.5% was other. While 10.4% of child with small brother interval 1 years; 9.8% was 2 years and 79.8% was other. More than one third 33.5% of the child was not breast feed.

Table 4.5 Child Supplementary feeding and weaning at Bashair teaching hospital, Khartoum state 2018 (n=337)

	Response	Frequency	%
Supplementary feeding	<6 month	93	27.6
	after 6 month	86	25.5
	8-12 month	20	5.9
	After 1 year	14	4.2
	(Other)	124	36.8
	Total	337	100.0
No. of meals	2 meals	62	18.4
	3 meals	112	33.2
	4 meals	54	16.0
	(Other)	109	32.3
	Total	337	100.0
Child weaned	Yes	147	43.6
	No	190	56.4
	Total	337	100.0
Time of weaning	Not breast feeding	14	4.2
	After 6 month	9	2.7
	After 1 years	51	15.1
	After 2 years	59	17.5
	(Other)	204	60.5
	Total	337	100.0
Cause of weaning	Baby disease	15	4.5
	Mother disease	18	5.3
	Mother pregnancy	39	11.6
	Refuse breast	6	1.8
	Old age	47	13.9
	(Other)	212	62.9
	Total	337	100.0
Duration of weaning	Sudden	68	20.2
	Gradual	65	19.3
	(Other)	204	60.5
	Total	337	100.0
Hereditary disease	Yes	136	40.4
	No	201	59.6
	Total	337	100.0
Kind of inherited disease	DM	68	20.2
	Bp	50	14.8
	(Other)	219	65.0
	Total	337	100.0
Near history	Whooping cough	7	2.1
	Measles	11	3.3
	Diphtheria	6	1.8
	Diarrhea	150	44.5
	TB	5	1.5
	Other	158	46.9
	Total	337	100.0

Table 4.5 showed that 32.9% were eating and 33.5% were both. A number of 115 (34.1%) of the child were breast feed 5-6 times with 37.4% for 5 minutes and 14.2% for 10 minutes. A number of 93 (27.6%) of Childs were supplementary feeding at < 6 months and 25.5% after 6months. More than one third of Childs (33.2%) have 3 meals. A number of 147 (43.6%) were weaned. Time of weaning among Childs after 6 months 2.7%; after 1 year was 15.1% and 17.5% after 2 years. Most of causes of weaning were baby disease (4.5%); mother disease (5.3%); mother pregnancy (11.6%); refuse breast (1.8%), old age (13.9%) and other reasons (62.9%). Moreover, 20.2% of Childs their duration of weaning was sudden; 19.3% were gradual and 60.5% were other. More than 40% (40.2%) of the respondents have heredity diseases; among them 20.2% were diabetic; 14.8% were hypertensive and 65% have other inherited diseases. A number of 7 (2.1%) have near history of whooping cough; 3.3% have measles; diphtheria; 44.5% have diarrhea; 1.5% have TB and 46.9% have other diseases.

Table 4.6: Children Healthcare Status and Services in Bashair teaching hospital, Khartoum state 2018 (n=337)

Variable	Response	Frequency	%
Mood before sick	Nervous	53	15.7
	Inhibited	54	16.0
	Moody	90	26.7
	Cry	82	24.3
	Other	58	17.2
	Total	337	100.0
Repeating of disease	Once	147	43.6
	Twice	97	28.8
	3 times	59	17.5
	4 times	34	10.1
	Total	337	100.0
Taking weight of baby	Yes	238	70.6
	No	99	29.4
	Total	337	100.0
Checking the height	Yes	132	39.2
	No	205	60.8
	Total	337	100.0
Learn about additional feeding	Yes	147	43.6
	No	190	56.4
	Total	337	100.0

Table 4.6 showed that Near one third 90 (26.7%) of the Childs their mood before sick were moody; nervous (15.7%); inhibited (16%); cry (24.3%) and other (17.2%). More than 43% of the Childs (43.6%) were once repeating the disease; twice (28.8%); 3 times (17.5%) and 10.1% were 4 times. The majority of Childs (70.6%) weight was taken in addition to height (39.2%). More than 43% (43.2%) of mothers were learned about additional feeding.

Table 4.7: Family Habits and Home Environment at Bashair Teaching Hospital, Khartoum State 2018 (n=337)

Variable	Response	Frequency	%
Prohibited foods in family	Yes	155	46.0
	No	182	54.0
	Total	337	100.0
Types of food	Egg	257	76.3
	camel meat	10	3.0
	cow meat	20	5.9
	Lamp meat	2	.6
	Other	48	14.2
	Total	337	100.0
Reasons of prevent some foods	logical reasons	22	6.5
	Believe	241	71.5
	Other	74	22.0
	Total	337	100.0
Having bath at home	Traditional	226	67.1
	Modified	43	12.8
	septic tank	34	10.1
	Other	34	10.1
	Total	337	100.0
Ways of food storage at home	Refrigerator	129	38.3
	Mashlaeeb	35	10.4
	Hala	173	51.3
	Total	337	100.0

Table 4.7 showed that 155(46.0%) were exhibited foods in family. Regarding types of food taken by respondents, eggs was representing 76.3%; camel meat (3%); cow meat (5.9%); lamp meat (0.6%) and other food was (14.2%). The most reasons of prevent some foods was believed (71.5%) logical reasons (6.5%); and others reasons was 22%. More than two thirds of the respondents having traditional bath at home (67.1%); 12.8% have modified bath at home; 10.1% having septic tank at home 10.1% and 10.1% having other types of bath at home. A number of 129 (38.3%) of the respondents used refrigerator to store food at home; 10.4% used Mashleeb and 173 (51.3%) used hala (other methods).

Table 4.8: Association between child and nutritional status at Bashair teaching hospital, Khartoum state 2018 (n=337)

Variables	Response	Healthy	Malnutrition	Total	χ^2	P-value
Enough breast feeding	> 40 min	139 (100%)	0 (0.0%)	139 (100%)	52.2	.000**
	< 40 min	100 (68.5%)	46 (31.5%)	146 (100%)		
	Total	239 (83.9%)	46 (16.1%)	285 (100%)		
Child age (years)	< 1 y	159 (82.8%)	33 (17.2%)	192 (100%)	31.2	.000**
	1 – 2	49 (57.6%)	36 (42.4%)	85 (100%)		
	3 – 4	31 (51.7%)	29 (48.3%)	60 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337 (100%)		
Child gender	Male	117 (70.1%)	122 (71.8%)	239 (70.9%)	.11	.411
	Female	50 (29.9%)	48 (28.2%)	98 (29.1%)		

Table 4.8 showed displayed those Childs who breast feed for less than 40 minutes were highly significantly malnourished 31.5% compared to those who breast feed more than 40 minutes, $P < 0.05$. Malnourished was significantly greater among Childs aged 3-4 years 48.3% compared to other ages; $p < 0.05$.

Table 4.9 Association between socio-demographic characteristics and child nutritional status at Bashair teaching hospital, Khartoum State 2018 (n=337)

Variables	Response	Healthy	Malnutrition	Total	χ^2	P-value
	Total	167 (100%)	170 (100%)	337 (100%)		
Mother education	Illiterate	93 (65.5%)	49 (34.5%)	142 (100%)	4.1	.396
	Primary education	86 (76.1%)	27 (23.9%)	113 (100%)		
	Secondary education	42 (72.4%)	16 (27.6%)	58 (100%)		
	University education	17 (93.7%)	6 (26.1%)	23 (100%)		
	Post graduate	1 (100%)	0 (0.0%)	1 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337 (100%)		
Mother social status	Married	214 (75.1%)	71 (24.9%)	285 (100%)	15.9	.001**
	Divorce	19 (57.5%)	23 (69.7%)	33 (100%)		
	Other	6 (66.7%)	3 (33.3%)	9 (100%)		
	Total	239 (71.1%)	97 (28.9%)	336 (100%)		
Mother work	Employee	21 (72.4%)	8 (27.6%)	29 (100%)	5.7	.126
	Not work	171 (74.3%)	59 (25.7%)	230 (100%)		
	Business	39 (60.9%)	25 (39.1%)	64 (100%)		
	Other	8 (57.1%)	6 (42.9%)	14 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337 (100%)		

****P-value significant at less than .05 levels**

Table 4.9 showed That is association between mother social status and Childs nutritional status. Malnourished were significantly more prevalent among Childs of divorce mothers (69.7%) compared to married women (24.9%), $p < 0.05$.

Table 4.10 Association between Mothers and fathers economic, - and child nutritional status at Bashair teaching hospital, Khartoum State 2018 (n=337)

Variables	Response	Healthy	Malnutrition	Total	χ^2	P-value
Mother economic status	Low	38 (60.3%)	25 (39.7%)	63 (100%)	8.7	0.034**
	Medium	45 (69.2%)	20 (30.8%)	65(100%)		
	Good	6 (50%)	6 (50%)	12 (100%)		
	Not fit	150 (76.1%)	47 (23.9%)	197 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337 (100%)		
Father education	Illiterate	72 (71.3%)	29 (28.7%)	101 (100%)	.7	.945
	Primary education	82 (72.6%)	31 (27.4%)	113 (100%)		
	Secondary education	52 (68.4%)	24 (31.6%)	76 (100%)		
	University education	30 (71.4%)	12 (28.6%)	42(100%)		
	Post graduate	3 (60%)	2 (40%)	5 (100%)		
	Total	239 (70.6%)	98 (29.1%)	337 (100%)		
Father work	Employee	38 (77.6%)	11 (22.4%)	49 (100%)	6.2	.055
	Worker	189 (71.6%)	75 (28.4%)	264 (100%)		
	Other	12 (50%)	12 (50%)	24 (100%)		
	Total	239 (70.9%)	98 (100%)	337(100%)		
Father economic status	Low	108 (64.7%)	59 (35.3%)	167 (100%)	9.3	.026**
	Medium	107 (79.9%)	27 (20.1%)	134 (100%)		
	Good	17(70.8%)	7 (29.2%)	24 (100%)		
	Not fit	7 (58.3%)	5 (41.7%)	12 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337 (100%)		

****P-value significant at less than .05 levels**

Table 4.10 showed those Childs whose mother with good income were significantly having great malnourished compared to mother with low income (39.7%); p=.034. Childs whose fathers having low income (35.3%) were significantly greater malnourished (35.3%) compared to high income and medium income.

Table 4.11 Association between mother and child health information and child nutritional status at Bashair teaching hospital, Khartoum state 2018 (n=337)

Variables	Response	Healthy	Malnutrition	Total	χ^2	P-value
Pregnancy duration	Complete	218 (69.6%)	95 (30.4%)	313(100%)	3.4	.046**
	Not complete	21 (87.5%)	3 (12.5%)	24 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337 (100%)		
Vaccination history	Vaccinated	195 (67.7%)	93 (32.3%)	288 (100%)	9.9	.002**
	Not vaccinated	44 (89.8%)	5 (10.2%)	49 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337 (100%)		
Types of vaccine	All vaccine	98 (59.4%)	67 (40.6%)	165 (100%)	23.0	.000**
	Partial	96 (78.7%)	26 (21.3%)	122 (100%)		
	Other	45 (90%)	5 (10%)	50 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337(100%)		
Baby brother	Yes	187 (69.5%)	82 (30.5%)	269 (100%)	1.3	.164
	No	52 (76.5%)	16 (23.5%)	68 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337 (100%)		
Old brother interval	I year	22 (51.2%)	21 (48.8%)	43 (100%)	21.3	.000**
	2 year	66 (61.7%)	41 (38.3%)	107(100%)		
	(Other)	151 (80.7%)	36 (19.3%)	187 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337(100%)		
Small brother interval	I year	22 (62.9%)	13 (37.1%)	35 (100%)	13.7	.001**
	2 year	15 (45.5%)	18 (54.5%)	33(100%)		
	(Other)	202 (75.1%)	67 (24.9%)	269 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337(100%)		
Baby feed	Breast feeding	97 (85.8%)	16 (14.2%)	113(100%)	25.9	.000**
	Eating	61 (55%)	50 (45%)	111 (100%)		
	Both	81 (71.7%)	32 (28.3%)	113(100%)		
	Total	239 (70.9%)	98 (29.1%)	337(100%)		

Variables	Response	Healthy	Malnutrition	Total	χ^2	P-value
No. of breast feeding	1-2	8 (66.7%)	4(33.3%)	12 (100%)	25.4	.000**
	3-4	58 (72.5%)	22 (27.5%)	80 (100%)		
	5-6	99 (86.1%)	16 (13.9%)	115(100%)		
	Not fit	74 (56.9%)	56 (43.1%)	130 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337(100%)		
Duration of breast feeding	5 minutes	90 (71.4%)	36 (28.6%)	126 (100%)	30.5	.000**
	10 minutes	47 (97.9%)	1 (2.1%)	48 (100%)		
	15 minutes	23 (85.2%)	4 (14.8%)	27 (100%0		
	Other	79 (58.1%)	57 (41.9%)	136 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337 (100%)		
Supplementary feeding	<6 month	60 (64.5%)	33 (35.5%)	93 (100%)	28.8	.000**
	After 6 month	57 (66.3%)	29(33.7%)	86 (100%)		
	8-12 month	9 (45%)	11(55%)	20(100%)		
	After 1 year	6 (42.9%)	8 (57.1%)	14(100%)		
	Other	107 (86.3%)	17 (13.7%)	124 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337 (100%)		
No. of meals	2 meals	15 (24.2%)	47 (75.8%)	62 (100%)	90.6	.000**
	3 meals	81 (72.3%)	31 (27.7%)	112 (100%)		
	4 meals	43 (79.6%)	11 (20.4%)	54 (100%)		
	Other	100 (91.7%)	9 (8.3%)	109 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337 (100%)		
Child weaning	Yes	92 (62.6%)	55 (37.4%)	147 (100%)	8.8	.003**
	No	147 (77.4%)	43 (22.6%)	190 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337 (100%)		
Time of weaning	Not breast feed	6 (42.9%)	8(57.1%)	14(100%)	24.7	.000**
	After 6 months	6(66.7%)	3(33.3%)	9(100%)		
	After 1 years	25(49%)	26(51%)	51(100%)		
	After 2 years	40(67.8%)	19(32.2%)	59(100%)		
	Other	162(79.4%)	42(20.6%)	204(100%)		
	Total	239(70.9%)	98(29.1%)	337(100%)		
Cause of weaning	Baby disease	8 (53.3%)	7 (46.7%)	15 (100%)	34.9	.000**
	Mother disease	8 (44.4%)	10 (55.6%)	18(100%)		
	Mother pregnancy	24 (61.5%)	15 (38.5%)	39(100%)		
	Refuse breast	1 (16.7%)	5 (83.3%)	6 (100%)		
	Old age	26 (55.3%)	21 (44.7%)	47 (100%)		
	Other	172 (81.1%)	40 (18.9%)	212(100%)		
	Total	239 (70.9%)	98 (29.1%)	337 (100%)		

Variables	Response	Healthy	Malnutrition	Total	χ^2	P-value
Duration of weaning	Sudden	35 (51.5%)	33 (48.5%)	68 (100%)	19.5	.000**
	Gradual	43 (66.2%)	22 (33.8%)	65 (100%)		
	Other	161 (78.9%)	43 (21.1%)	204 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337 (100%)		
Hereditry disease	Yes	90 (66.2%)	46 (33.8%)	136 (100%)	2.5	0.73
	No	149 (74.1%)	52 (25.9%)	201 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337 (100%)		
Kind of inherited disease	DM	39 (57.4%)	29 (42.6%)	68 (100%)	7.8	.021**
	BP	36 (72%)	14 (28%)	50 (100%)		
	Other	164 (74.9%)	55 (25.1%)	219 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337(100%)		
Near disease history of:	Whooping cough	4 (57.1%)	3 (42.9%)	7 (100%)	8.2	.147
	Measles	8 (72.7%)	3 (27.3%)	11(100%)		
	Diphtheria	3 (50%)	3 (50%)	6(100%)		
	Diarrhea	98 (65.3%)	52 (34.7%)	150 (100%)		
	TB	3 (60%)	2 (40%)	5 (100%)		
	Other	123 (77.8%)	35 (22.2%)	158(100%)		
	Total	239 (70.9%)	98 (29.1%)	337 (100%)		
Mood before sick	Nervous	28 (52.8%)	25 (47.2%)	53 (100%)	16.4	.003**
	Inhibited	34 (63%)	20 (37%)	54(100%)		
	Moody	68 (75.6%)	22 (24.4%)	90 (100%)		
	Cry	60 (73.2%)	22 (26.8%)	82 (100%)		
	Other	49 (84.5%)	9 (15.5%)	58 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337 (100%)		
Repeating of diseases infection	Once	114 (77.6%)	33 (22.4%)	147 (100%)	7.4	.06
	Twice	60 (61.9%)	37 (38.1%)	97 (100%)		
	3 times	40 (67.8%)	19 (32.2%)	59 (100%)		
	4 times	25 (73.5%)	9 (26.5%)	34 (100%)		
	Total	239	98 (29.1%)	337 (100%)		

		(70.9%)				
Taking weight of baby	Yes	184 (77.3%)	54 (22.7%)	238 (100%)	16.0	.000**
	No	55 (55.6%)	44 (44.4%)	99 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337 (100%)		
Checking the height	Yes	101 (76.5%)	31 (23.5%)	132 (100%)	3.3	.07
	No	138 (67.3%)	67 (32.7%)	205 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337(100%)		
Learn about supplementary feeding	Yes	111 (75.5%)	128 (67.7%)	239 (100%)	2.1	.074
	No	36 (24.5%)	61 (32.3%)	98 (100%)		
	Total	147 (43.6%)	189 (56.4%)	337 (100%)		

Table 4.11 showed Malnourished was significantly prevalent among Childs whose mother complete pregnancy duration 30.4% compared to Childs who belong to mothers not complete pregnancy duration 12.5%, $p < 0.05$. Also, the study revealed that Childs who were vaccinated were significantly more malnourished 32.3% versus 10.2% of not vaccinated Childs. Moreover, the malnourished was significantly more occurred among Childs having all vaccination 40.6% compared to those who having partial vaccination 10.2%. Childs who having brother interval of 1 year were significantly more malnourished compared to other intervals, $p < 0.05$. Childs who having old brother's interval of 1 year 48.8% were significantly more malnourished, $p < 0.0$ compared to other intervals. Also, Childs who having small brother interval for 2 years were significantly more malnourished 54.5% compared to other intervals. Malnutrition was significantly less prevalent among breast feed Childs 14.2% in comparison to Childs who feed by eating 45% and both 28.3%. Childs who breast feeding 5-6 times were less malnourished 13.9% compared to those who breast feed 1-2 times 33.3%. Those who breast feed for 15 minutes were significantly healthier 85.2% compared to those who feed for 5 minutes

71.4%, $p < 0.05$. Childs who starting supplementary feeding after 1 year were significantly more malnourished 57.1% compared to other periods. Children who having 2 meals were significantly more malnourished 75.8% compared to those who having more than 2 meals, $p < 0.05$. Malnourished was significantly more prevalent among weaned Childs 37.4% compared to not weaned Childs 22.6%, $p < 0.05$. Malnourished was significantly more occurred among not breast feed Childs 57.1% compared to those who started breast feeding after 6 months 33.3%; after 1 year 51% and after 2 years 32.2%. Malnourished was significantly more prevalent among Childs who refuse breast feeding 83.3% compared to other reasons, $p < 0.05$.

Childs who exposed to sudden weaning were significantly more malnourished 48.5% compared to the Childs with gradual weaning 33.8%, $p < 0.05$. Childs who having heredity disease were significantly more malnourished 33.8% compared to those who have-not 25.9%, $p < 0.05$.

Childs who having diabetic mellitus were significantly greater malnourished 42.6% compared to hypertensive Childs 28% and Childs with other inherited diseases 25.1%, $p < 0.05$. Childs with nervous mood before sick were significantly more malnourished compared to other moods, $p < 0.05$. Childs whose weight not taken was significantly more malnourished 44.4%.

Table 4.12: Association between child nutritional status and Family Environment at Bashair teaching hospital, Khartoum state 2018 (n=337)

Variables	Response	Healthy	Malnutrition	Total	χ^2	P-value
Prohibited foods in family	Yes	94 (60.6%)	61 (39.4%)	155 (100%)	14.6	.000**
	No	145 (79.7%)	37 (20.3%)	182 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337 (100%)		
Types of food	Egg	9 (18.8%)	39 (81.3%)	48 (100%)	109.9	.000**
	Camel meat	3 (30%)	7 (70%)	10 (100%)		
	Cow meat	7 (35%)	13 (65%)	20 (100%)		
	Lamb meat	1 (50%)	1 (50%)	2 (100%)		
	Other	219 (85.2%)	38 (14.8%)	257 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337 (100%)		
Reasons for prevent some foods	Logical reasons	11 (50%)	11 (50%)	22 (100%)	25.7	.000**
	Belief	38 (51.4%)	36 (48.6%)	74 (100%)		
	Other	190 (78.8%)	51 (21.2%)	241 (100%)		
	239 (100%)	98 (29.1%)	337 (100%)	337 (100%)		
Having bath at home	Traditional	159 (70.4%)	67 (29.6%)	226 (100%)	.91	.824
	Modified	29 (67.4%)	14 (32.6%)	43 (100%)		
	Septic tank	26 (76.5%)	8 (23.5%)	34 (100%)		
	Other	25 (73.5%)	9 (26.5%)	34 (100%)		
	Total	239 (70.9%)	98 (29.1%)	337 (100%)		
Ways of food storage at home	Refrigerator	98 (76%)	31 (24%)	129 (100%)	2.7	.263
	Mashleeb	23 (65.7%)	12 (34.3%)	35 (100%)		
	Other	118 (68.2%)	55 (31.8%)	173 (100%)		
	Total	239(100%)	98 (29.1%)	337(100%)		

Table 4.12 showed Childs who facing prohibition foods in family were significantly more malnourished 39.4%, $p < 0.05$. Childs whose foods was prevent eggs were significantly more malnourished (81.3%) compared to other types of food, $p < 0.05$. Childs with logical reasons for prevent some food were significantly more malnourished (50%) compared to belief 48.6% and other 21.2%, $p < 0.05$.

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1. Discussion

The major global health problem faced by the developing countries today is malnutrition (50). The causes of malnutrition are multi-factorial, with dietary and environmental factors contributing to the risks of malnutrition in children (51). In the present study, among the total of 337 families studied, 50.4% were females and 49.6% were males. Similarly, Dabone *et al.* found that the percentage of girls (52.4%) was slightly higher than that of boys 47.6%, and in Garhwal Himalayas the percentage of girls was 7% more than that of boys. In contrast, Gobostwang reported that the percentage of boys was 51% higher than that of girls 49%.

The present study showed that illiteracy was prevalent among mothers 42.1%. However, in terms of socio-demographic characteristics of mothers of the under five malnourished children at Bashair Hospital. There were statistically significant $P < 0.05$ difference were found towards mother social status and parents economic. The illiteracy of mothers was considered a substantial risk factor in the present study. The findings of this study are in line with Yousef, Ahmed (52) and Washi *et al.* (53) who found that the higher educational level of the mothers, the better preparation and estimation of malnutrition in their children. Low level of mother's education was associated with high relative risk and high etiologic for malnutrition (54). From socio-economic view, the study revealed that most of parents having medium and low income. This may affect earning of families for having food for their children or food-insufficient and Food insufficiency is clearly related to poverty. WHO/EMRO (55) stated a rise in income almost results in rise in food expenditure. Many studies conducted by Case, Fertig and Paxson (56) investigate how the relationship between parental SES and UK child health varies as children get older - they find that the relationship between parental SES and child health gets steeper as children get older – i.e. the health differences across SES gets larger as children age. However it is not clear in this, and other, work whether the direction of

causality is clearly established. In the Case *et al.* (56) work, for example, it is not clear whether this is due to low SES children having more adverse health shocks, or more serious ones, or whether such households do not cope as well with these shocks. The present study revealed that the majority of children had baby brother and the oldest interval between brothers was 2 years and the small brother interval was more than 2 years. This can be explained that food supply did not meet rapid rate of growth; this study agrees with Case *et al.* (56) who found that the majority of children with malnutrition 94% their age ranged from 6 to less than 15 months and illustrated that 33.3% of children in the age group ranged from 6 to 24 months exposed to under nutrition. While children aged 2-5 years were 20.0 % and 25.8 % of them were found in history of malnutrition in other sibling.

The study showed that there was significant difference between enough breast feeding and malnourished Childs. Also there was association between baby feed and malnourished child, $p < 0.05$.

The association between duration of breast feeding and nutritional status was studied in a population-based sample of 802 children aged 12 to 35.9 months in Southern Brazil during 1982. The prevalence of malnutrition (low weight for age, length for age, and weight for length) was smallest in those children breastfed for 3 to 6 months, but after this age nutritional status appeared to be worse in those breastfed longer (57). Kumar *et al.* (58) undertook a study to evaluate breastfeeding and weaning practices in relation to nutritional status of infants. They found that higher prevalence of malnutrition among older children 6-12 months may be related to prolong exclusive breastfeeding. Breast milk alone is not sufficient to satisfy the nutritional needs to sustain optimal growth beyond 4-6 months. Also the study showed that there was association between number of meals and malnourished Childs. Those who eat 2 meals were significantly higher malnourished. This may be returned to the low income of families. Moreover, the study indicated association between pregnancy duration

and malnourished children. Malnourished was prevalent among children whose mothers complete pregnancy duration. This may be poor care of pregnant women may lead to malnutrition in their children, the message is that men who care for their wives or partners are safeguarding the health of their children as well as that of the women (59). Also the study showed that there was association between vaccination and types of vaccination and malnourished children, $p < 0.05$. This finding indicated that child vaccination was also the other statistically associated variable with childhood acute malnutrition. Children who ever vaccinated were less likely to be malnourished compared with their counterparts. This finding is supported by the findings of other similar studies (60). This can be justified as vaccinated children are less likely to be frequently infected with vaccine preventable diseases such as diarrhea and respiratory infections, which are known in depleting nutrients from the body (60).

The study showed that there was association between supplementary feeding and malnourished children. Malnourished was significantly higher among children supplement after 1 year. This finding matched to the WHO guidelines which recommends that infants start receiving complementary foods at 6 months of age in addition to breast milk, initially 2-3 times a day between 6-8 months, increasing to 3-4 times daily between 9-11 months and 12-24 months with additional nutritious snacks offered 1-2 times per day, as desired. However, inappropriate feeding practices are often a greater determinant of inadequate intakes than the availability of foods in the households (61).

In addition, the study proved that there was association between child weaning and time of weaning and malnourished children. Malnourished was significantly found greater among weaned Childs. The finding in line with other studies that showed insufficient dietary intake may refer to poor breastfeeding practices, early weaning, delayed introduction of complementary foods and insufficient protein in the diet. The inadequate intake can also be linked to neglect and abuse.

The study showed that there was association between malnutrition and duration of weaning, $p < 0.05$.

Those children who were exposed to sudden weaning were higher malnourished. The World Health Organization recommends a gradual weaning period from 6 months to 2 years (22). This allows for the child to still receive the benefits from breastfeeding, while also consuming the necessary nutrients from the complementary foods. Foods should be prepared adequately containing the required nutrients as well as appropriately with a suitable texture and temperature (22). Without the knowledge of proper weaning practices as well as a perception of the child's hunger needs, malnutrition and illness may ensue. The weaning period is therefore a vulnerable time when the child should be attentively cared for and observed so as to maintain health (22).

On the other hand, the study proved that there was association between malnutrition and infection with inherited diseases, $p < 0.05$. Children who were diabetic were higher malnourished. Previous studies have shown that diabetic patients are at a higher risk of malnutrition than non-diabetic patients (64).

Association was found between mood of child before sick and malnutrition, $p < 0.05$. Those children who were in nervous mood were higher malnourished, $p < 0.05$. This may be because

Carbohydrates significantly affect mood and behavior. Eating a meal high in carbohydrates triggers release of a hormone called insulin in the body. Insulin helps let blood sugar into cells where it can be used for energy, but insulin also has other effects in the body. As insulin levels rise, more tryptophan enters the brain. Tryptophan is an amino acid, or a building block of protein, that affects levels of neurotransmitters in the brain. As more tryptophan enters the brain, more of the neurotransmitter serotonin is produced. Higher serotonin levels in the brain enhance mood and have a sedating effect, promoting sleepiness. This effect is partly responsible for the drowsiness some people experience after a large meal.

The study indicated that, there was association between checking weight of baby and malnourished, $p < 0.05$. The children whose weight was taken were less malnourished. This may be due to the care of children families which were keener for their children health. Also, an association was found between prohibited food in family and malnourished children, $p < 0.5$. Malnutrition was significantly higher among children of prohibited foods in family. In addition an association was found between malnutrition and types of food. Malnutrition was less likely prevalent among children who not eat eggs. A compared study found that supplementing young children living in rural Uganda with two-eggs per day, five days per week over six months resulted in a significant increase in height and weight compared to 0 eggs and 1 egg per day, which did not differ. These findings are supported by data from studies conducted in Kenya (65) and Guinea-Bissau (66), which found that supplementation with animal-source foods (e.g. meat and dairy) improved parameters of growth such as MUAC (66) and weight-for-age z score(66) in children.

5.2 Conclusion:

From this study it can be concluded that;

Several risk factors were found to be associated with PEM including:

- ☒ Mother status social, economic, education level and pregnancy duration.
- ☒ Vaccination history and types;
- ☒ Old and small brother interval;
- ☒ baby feed; duration of breast feeding; supplementary feeding; number of meals; child weaning; time of weaning; cause of weaning;
- ☒ kind of inherited diseases; mood before sick ; checking the weight of baby;
- ☒ prohibited foods in family; types of food and reasons for prevent some foods.
- ☒ Health education of mothers about proper feeding practices, breast feeding, feeding, additional and adult food to prevent PEM.
- ☒ Also increasing mother's awareness related to risk factors of PEM and how to manage the different infections among their children and encourage vaccination at the appropriate time.

5.3 Recommendations:

In light of the findings of this study, the following recommendations are offered:

1. For MOH: Assessment and treatment of acute malnutrition through continuous nutrition surveillance and early warning information systems followed by response.
2. For Hospital: Health Workers (HWs) and Community Health Volunteers should strengthen giving participatory nutrition education to create awareness and to develop behavior change communication for better feeding and caring practices among the community.
3. For Community: Health education should be reinforced at child welfare clinics, health facilities and, at community level to improve parents' knowledge of the recommended infant and child feeding practices.
4. For Government and NGOs: low income family should be supported with certain plan, objective and standards.
5. For IUA: Similar research should be conducted on a large sample of under-five children to detect the effects of some of the factors that could not be observed by the current study.

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ANNEXES

Annexes:

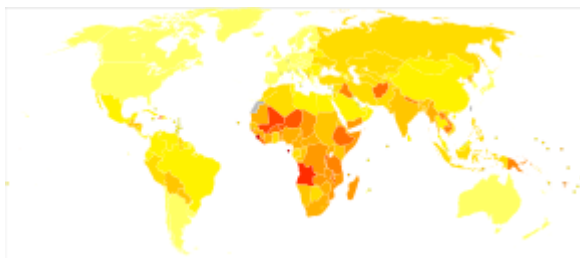
1- Map

2- Images

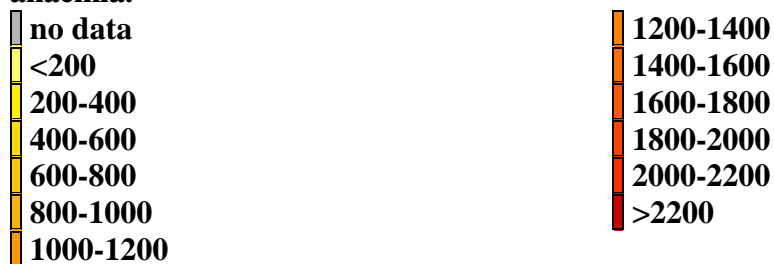
3-Questionnair.

Annexes (1)

Percentage of population affected by undernutrition by country



Disability-adjusted life year for nutritional deficiencies per 100,000 inhabitants in 2004. Nutritional deficiencies included: protein-energy malnutrition, iodine deficiency, vitamin A deficiency, and iron deficiency anaemia.^[117]



The figures provided in this section on epidemiology all refer to *undernutrition* even if the term malnutrition is used which, by definition, could also apply to too much nutrition.

Annexes (2)

Child in the US with signs of **Kwashiorkor**, a dietary protein deficiency



y



Malnourished children in Niger, during the famine.

Annexes

International University of Africa
Faculty of Medicine
Deanship of Postgraduate Studies, Research and Publication

The Risk Factors Contributing To Protein-Energy Malnutrition Among Children Under Five Years Old At Bashair Teaching Hospital Khartoum Sudan 2018.

Zuhail Mhgoob Ebrahim Mohammed

1 Questionnaire in English

No	Variables	questions	answer
1	Age	<ol style="list-style-type: none">1. Less than one Year2. From Year to 3 years3. From 3 years to 5 years	
2	Gender	<ol style="list-style-type: none">1. Male2. female	
3	Mother's educational level	<ol style="list-style-type: none">1. Illiterate2. primary3. Secondary4. University5. postgraduate	
4	Social status	<ol style="list-style-type: none">1. Married2. Divorced3. widow4. Others	
5	the work	<ol style="list-style-type: none">1. employee2. No Working3. Business Free4. Others	
6	Monthly income level	<ol style="list-style-type: none">1. low2. medium3. height	
7	Educational level of the father	<ol style="list-style-type: none">1. Illiterate2. primary3. Secondary4. University5. postgraduate	
8	Parent work	<ol style="list-style-type: none">1. Employee2. Business Free3. Others	
9	Monthly income	<ol style="list-style-type: none">1. low2. medium3. height	

Child Patient:

	No	Variables	questions	answer
	10	Gender	1. Male 2. female	
	11	Age	1. Less than 6 months 2. From 7 to 12 Months 3. From 13 to 24 months 4. From 25 to 36 months 5. From 37 to 60 months	
Pregnancy and spring immunization	12	Pregnancy duration	1. complete. 2. 7 months.	
	13	Has the patient received immunization?	1. Yes 2. No	
	14	Type of immunization	1. Full. 2. partial. 3. Other.	
	15	Is the patient brothers	1. Yes 2. No	
	16	If there is: bigger than you	1. One year 2. Two years 3. Others	
	17	Smaller than you	1. One year 2. Two years 3. Others	
Feeding and weaning	18	Child Feeding Device	1. Breast feeding 2. the food 3. together	
	19	Number of feeds per day	1. (1-2) 2. (3-4) 3. (5-6) 4. Others	
	20	Duration of feeding	1. (5 minutes) 2. (10 minutes) 3. (15 minutes) 4. Others	
	21	When did the additional feeding begin?	1.after six Month 2. befor six Months 3.(8-12 months) 4. one Year 5. Others	
	22	Number of meals per child	1. Meals 2. three Meals 3. four Meals 4. Others	
	23	Have you weaned the child?	1. Yes 2. No	
	24	When was his weaning?	1. after Months From Birth. 2. One year.	

		<ol style="list-style-type: none"> 3. Two years. 4. Others 	
25	The cause of weaning	<ol style="list-style-type: none"> 1. Illness Child 2. Illness the mother 3. Pregnancy the mother 4. Refusal Breast feeding 5. Child had become Great 6. Others 	
26	Weaning type	<ol style="list-style-type: none"> 1. Sudden 2. gradually 3. Others 	
Hereditary disease			
27	Are there hereditary diseases in the family?	<ol style="list-style-type: none"> 1. Yes 2. No 	
28	Type of genetic disease	<ol style="list-style-type: none"> 1. DM 2. Hypertension 3. Others 	
29	Did your child get sick before his last illness?	<ol style="list-style-type: none"> 1. Cough Dickey 2. Measles 3. Diphtheria 4. Diarrhea 5. Other 	
30	The general condition of the child before illness	<ol style="list-style-type: none"> 1. Neural 2. idle 3. Temperamental 4. Cry continuously 5. Others 	
31	Have you ever had a disease?	<ol style="list-style-type: none"> 1. Once 2. Twice 3. (3 times) 4. (4 times) 	
Feeding and measurements			
32	When you go to the clinic for any reason, does the baby's weight is measured?	<ol style="list-style-type: none"> 1. Yes 2. No 	
33	Is its length measured	<ol style="list-style-type: none"> 1. Yes 2. No 	
34	Are you advised how to feed more	<ol style="list-style-type: none"> 1. Yes 2. No 	
35	Are there foods as to how to feed extra	<ol style="list-style-type: none"> 1. Yes 2. No 	
36	What foods do you give him/her	<ol style="list-style-type: none"> 1. eggs 2. meat Camel 3. meat Cow 4. meat Sheep 5. Others 	

	37	Why some foods are blocked	<ol style="list-style-type: none"> 1. Reasons Morbidity 2. Beliefs 3. Others 	
Sanitary	38	Is there a toilet in the house?	<ol style="list-style-type: none"> 1. traditional 2. improve latrine 3. saptic tanke 4. Others 	
	39	Ways to store food at home	<ol style="list-style-type: none"> 1. Fridge 2. Maslaeeb 3. Others 	

نموذج الموافقة المستنيرة :

1/ الاسم : زحل محجوب ابراهيم محمد

سوف اقوم لك بشرح البحث :

2/ عنوان الدراسة : هو دراسة عوامل الخطورة التي تسهم في سوء التغذية (نقص الطاقة والبروتين)

لدي الاطفال اقل من 5 سنوات بمستشفى بشائر بولاية الخرطوم 2018

3/ سوف اقوم باخذ معلومات من الامهات

4/ سوف يكون هنالك وصف تفصيلي لاجراءات البحث التجريبي للامهات

5/ وصف المخاطر المتوقعة من البحث (ان وجدت)

6/ وصف الاجراءات البديلة او العلاج المناسب للمشارك

7/ تاكيد سرية المعلومات والوثائق الخاصة بالمشارك

8 / المشاركة في البحث طوعية وان رفض المشاركة في البحث لا تفقدك حقك في اية فوائد من البحث

9/ من حقك الانسحاب من البحث في اي وقت والتوقيع علي طلب الانسحاب

10/ سوف يتم توضيح المخاطر المحتملة للمبحوث والغير مرئية الان للعقار او الاجراء الذي سيستخدم

في البحث

11/ توضيح للمشارك انه وفي ظروف معينة يمكن للباحث ايقاف المشارك من البحث دون اخذ موافقته

12/ توضيح للمشارك الفوائد التي سوف تجني من استمراره في المشاركة في البحث

13/ توضيح للمشارك العدد التقريبي للمشاركين معه في البحث

14/ توضيح للمشارك بالتعويض او الرعاية الصحية الذي سيتلقاها في حالة حدوث ازي من اجراء هذا

البحث

15/يمكن ان يتم الاتصال هنا 0914722095 لاي اسفسارات عن :

*البحث

*المشاركين في البحث

*حقوق المشاركين في البحث

بسم الله الرحمن الرحيم

جامعة افريقيا العالمية

كلية الطب كلية الدراسات العليا

تقييم أسباب سوء التغذية وسط الأطفال اقل من خمس سنوات

بمستشفى بشائر التعليمي ولاية الخرطوم 2018 م

أنا زحل محجوب بصدد إجراء البحث التكميلي ماجستير الصحة العامة، وسأقوم بجمع البيانات لتقييم أسباب سوء التغذية وسط الأطفال الأقل من خمس سنوات بمستشفى بشائر التعليمي ولن أستخدمها لأي غرض آخر. الرجاء مشكورين الإجابة على هذه الأسئلة بدقة وشفافية.
البيانات الأساسية للوالدين:

الرقم	المتغيرات	الأسئلة	الإجابة
1	العمر	1. أقل من سنة 2. من سنة إلى سنتين 3. من 3 سنة إلى 4 سنوات	
2	الجنس	1. ذكر 2. أنثى	
3	المستوى التعليمي للأم	1. أمي 2. الأساس 3. الثانوي 4. جامعي 5. فوق الجامعي	
4	الحالة الاجتماعية	1. متزوجة 2. مطلقة 3. أرملة 4. أخرى	
5	العمل	1. موظفة 2. لا تعمل 3. أعمال حرة 4. أخرى	
6	مستوى الدخل الشهري	1. متدني 2. وسط 3. جيد 4. لا ينطبق	
7	المستوى التعليمي للوالد	1. أمي 2. الأساس 3. الثانوي 4. جامعي 5. فوق الجامعي	
8	عمل الوالد	1. موظف عامل 2. عامل 3. أخرى	
9	الدخل الشهري	1. متدني 2. وسط 3. جيد 4. لا ينطبق	

الطفل المريض:

الإجابة	الأسئلة	المتغيرات	الرقم
	1. ذكر 2. أنثى	الجنس	10
	1. أقل من 6 شهور 2. من 7 إلى 12 شهر 3. من 13 إلى 24 شهر 4. من 25 إلى 36 شهر 5. من 37 إلى 59 شهر	العمر	11
	1. مكتمل. 2. غير مكتمل	مدة الحمل به	12
	1. نعم 2. لا	هل تلقى المريض تحصين	13
	1. كامل. 2. جزئي. 3. أخرى.	نوع التحصين	14
	1. نعم 2. لا	هل للمريض أخوان	15
	1. عام 2. عامان 3. أخرى	إذا كان يوجد: أكبر منه بكم	16
	1. عام 2. عامان 3. أخرى	أصغر منه بكم	17
	1. رضاعة 2. الطعام 3. الاثنان معا	وسيلة تغذية الطفل	18
	1. (2-1) 2. (4-3) 3. (6-5) 4. لاينطبق	عدد الرضعات في اليوم	19
	1. (5 دقائق) 2. (10 دقائق) 3. (15 دقيقة) 4. أخرى	مدة الرضعة	20
	1. أقل من ستة أشهر 2. بعد ستة اشهر 3. (8-12) شهر 4. بعد سنة 5. أخرى	متى بدأت التغذية الإضافية	21
	1. وجبتين 2. ثلاث وجبات 3. أربعة وجبات 4. أخرى	عدد الوجبات للطفل	22
	1. نعم 2. لا	هل تم فطام الطفل	23
	1. لم يرضع 2. بعد ستة شهور من مولده. 3. بعد عام. 4. بعد عامين. 5. أخرى	متى تم فطامه	24
	1. مرض الطفل 2. مرض الأم 3. حمل الأم	سبب الفطام	25

	4. رفض الرضاعة 5. الطفل أصبح كبيراً 6. أخرى		
26	1. فجائياً 2. تدريجياً 3. أخرى	نوع الفطام	
27	1. نعم 2. لا	هل هناك أمراض وراثية في الأسرة	
28	1. سكري 2. ضغط 3. أخرى حدد	نوع المرض الوراثي	
29	1. سعال ديكي 2. حصبة 3. دفتريا 4. إسهال 5. سل 6. أخرى	هل أصيب طفلك قبل مرضه الأخير بأي مرض	
30	1. عصبي 2. خامل 3. مزاجي 4. يبكي باستمرار 5. أخرى	الحالة العامة للطفل قبل مرضه	
31	1. مرة 2. مرتين 3. (3 مرات) 4. (4 مرات)	هل تكررت الإصابة بأي مرض	
32	1. نعم 2. لا	عند زهابك للعيادات لأي سبب هل يتم وزن الطفل	
33	1. نعم 2. لا	هل يتم قياس طولك	
34	1. نعم 2. لا	هل يتم نصحك عن كيفية التغذية الإضافية	
35	1. نعم 2. لا	هل هناك كأطعمة عن كيفية التغذية الإضافية	
36	1. بيض 2. لحم الإبل 3. لحم البقر 4. لحم الضأن 5. أخرى	ما هي الأطعمة	
37	1. أسباب مرضية 2. معتقدات 3. أخرى	لماذا منعت الأطعمة	
38	1. تقليدي 2. معدل 3. سايفون 4. أخرى	هل يوجد مرضاض بالمنزل	<input type="checkbox"/> لا <input type="checkbox"/> نعم
39	1. الثلج 2. مشلعب 3. أخرى	طرق حفظ الطعام بالمنزل	