Assessment of Knowledge and Practice of Nurses towards
Management and Care of Malnourished under 5 years Children

A thesis Submitted in Partial fulfillment for the requirements of Master Degree
in Nursing Science (Pediatric Nursing)

By

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قال تعالى:

(وَقُلِ اعْمَلُواْ فَqsirَىِّ اللَّهُ عَمَلَكُمْ وَرَسُوْلُهُ وَالْمُؤْمِنِّنَّ وَسَتُرَدُّونَ إِلَى عَالِمِ الْغَيْبِ وَالشَّهَادَةِ فَيَنْبَنِكُم بِمَا كُنتُمْ تَعْمَلُونَ)

صدق الله العظيم
سورة التوبة أية (105)
Dedication

Words do not satisfy my feeling

To my dear parents, sisters and brother

To my dear husband and my sweet kids

To all colleagues and friends
Acknowledgement

My deep appreciation and thanks to my supervisor Dr. Muntasir Taha for his valuable and inspiring instructions, guidance and patience during supervision of this study.

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My thanks extend to my colleagues who were helpful and kind to participate by their data.

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Abstract

**Background:** Nutritional assessment is and will continue to be an essential part of the nursing role, as well as the level of knowledge and performance impacts outcome of management.

**Objectives:** This study aimed to assess knowledge & practice of nurses towards management and care of malnourished children under-five years with.

**Methods:** This is a descriptive cross-sectional hospital based-study conducted among nurses working at Mohammed Elamin Teaching Hospital for Paediatrics during the period from March to May 2015. The study population assessed through direct interview by using pre-designed questionnaire, obtained data was analyzed by using SPSS program, results presented as tables and figures.

**Results:** The most common age group was 30-39 years 26(51%), females represented 46(90.2%) versus 5(9.8%) males. Specialized training on malnutrition found received by 29(56.9%). Nurses who fully defined malnutrition were 7(13.7%), who provided good definition were 27(52.9%), mean of knowledge about causes of malnutrition was found to be 20%, length/height to classify malnutrition were answered correctly by 1only 36%. Mean of knowledge about complications of malnutrition was found to be very poor (15.7%), prevention from malnutrition was identified correctly by (47.1%). Mean of practice was (60.8%). Experience showed positive impact on identifying malnutrition (P value = 0.05), as well as organizing training in hospital (P value = 0.040).

**Conclusion:** Nurses showed poor degree of knowledge, versus proportionally higher degree of practice and this was assumed to affect performance of malnutrition management and mother counseling.
مساهمة الدراسة

خلفية: إن تقييم عملية التغذية ستظل من المهام الرئيسية التي يقع عبءها على الممرض وكما يعتمد نتائج الرعاية الصحية على مستوى المعرفة والأداء.

الأهداف: هدفت هذه الدراسة إلى تقييم معرفة وأداء الأمراض تجاه رعاية الأطفال في عمر أقل من 5 سنوات المصابين بسوء التغذية.

المنهجية: هذه دراسة وصفية مقطعية سريرية تم إجراؤها وسط الممرضين الذين يعملون في مستشفى محمد الأمين للأطفال بأمدرمان خلال الفترة من مارس إلى مايو 2015م. تم جمع البيانات باستخدام الحوار المباشر واستبيان معد مسبقاً ومن ثم تحليل البيانات عن طريق برنامج الحزمة الإحصائية للدراسات الاجتماعية وعرضت النتائج كجدول وأشكال.

النتائج: أظهرت الدراسة أن أكثر فئة عمرية في مجموعة الدراسة كانت 30-39 سنة حيث مثموا 26(51%)، وكان عدد الإناث 46(90%) بينما الذكور بلغوا 5(9.8%). وجد أن 29(9.56%) نتائج تدريب متخصص في معالجة سوء التغذية. الممرضين الذين قدموا تعريف كامِل لسوء التغذية بلغوا 7(4.71%) فيما تم 27(52.9%) تعرف غير مكتملة. بلغ متوسط المعرفة عن أسباب سوء التغذية 20%، تقسيم سوء التغذية اعتمادًا على نسب الطول والوزن ذكر صحيحاً بنسبة 36%. متوسط المعرفة بمضاعفات سوء التغذية طان ضعيف جداً حيث بلغ 15.7%، المعرفة بالوقاية من الإصابة بسوء التغذية لدى الأطفال كان بنسبة 47.4%. متوسط أداء الممرضين مجموعة الدراسة كان (60.8%). أظهرت الخبرة وتنظيم دورات تدريبية تأثيراً على المعرفة بسوء التغذية (القيمة الاحتمالية = 0.5) و(القيمة الاحتمالية = 0.04).

الخلاصة: أظهرت الممرضين مجموعة الدراسة معرفة ضعيفة تجاه مرض سوء التغذية بينما كان مستوى الأداء أعلى بنسبة الذي قد يؤثر على أداء الممرض تجاه معالجة المريض واستشارة الأمهات.
1.1 INTRODUCTION AND LITERATURE REVIEW

1.1 Introduction:

Malnutrition or malnourishment is a condition that results from eating a diet in which nutrients are either not enough or are too much such that the diet causes health problems.\textsuperscript{[1,2]}

It may involve calories, protein, carbohydrates, vitamins or minerals.\textsuperscript{[2]}

Not enough nutrients is called undernutrition while too much is called overnutrition the term malnutrition is commonly used to refer to undernutrition only malnutrition" in documents by the World Health Organization, UNICEF, Save the Children or other international non-governmental organizations (NGOs) usually is equated to under-nutrition. There were 925 million undernourished people in the world in 2010, an increase of 80 million since 1990.\textsuperscript{[2,3]} Another billion people are estimated to have a lack of vitamins and minerals.\textsuperscript{[5]} In 2013 protein-energy malnutrition was estimated to have resulted in 469,000 deaths down from 510,000 deaths in 1990.\textsuperscript{[6]} Other nutritional deficiencies, which include iodine deficiency and iron deficiency anemia, result in another 84,000 deaths.\textsuperscript{[7]} Undernutrition as of 2010 was the cause of 1.4\% of all disability adjusted life years.\textsuperscript{[5,8]}

About a third of deaths in children are believed to be due to undernutrition;
however, the deaths are rarely labelled as such.\textsuperscript{9} In 2010 it was estimated to have contributed to about 1.5 million deaths in women and children though some estimate the number may be greater than 3 million.\textsuperscript{11} An additional 165 million children have stunted growth from the disease.\textsuperscript{11} Undernutrition is more common in developing countries.\textsuperscript{10} Diverse studies have demonstrated that malnutrition increases the risks of infection and death\textsuperscript{11,12}. The most frequent causes of death in children under 5 years old are acute diarrhea and acute respiratory infection. Several studies have shown that malnutrition is frequently causally associated with these deaths\textsuperscript{13}. However, as malnutrition rarely appears as cause of death on death certificates, its impact is largely underestimated.

Incidence in United States: Fewer than 1\% of all children in the United States have chronic malnutrition. Incidence of malnutrition is less than 10\%, even in the highest risk group (children in shelters for the homeless). Some studies indicate that poor growth secondary to inadequate nutrition occurs in as many as 10\% of children in rural areas. Studies of hospitalized children suggest that as many as one fourth of patients had some form of acute PEM and 27\% had chronic PEM.

Global incidence: The World Health Organization estimates that by the year 2015, the prevalence of malnutrition will have decreased to 17.6\% globally, with 113.4 million children younger than 5 years affected as measured by low weight for age. The overwhelming majority of these
children, 112.8 million, will live in developing countries with 70% of these children in Asia, particularly the south central region, and 26% in Africa. An additional 165 million (29.0%) children will have stunted length/height secondary to poor nutrition.

Nurses who work with children and young people have an important role in identifying whether children are at risk of malnutrition and monitoring it. This position statement is aimed at all such nurses in GP practices, outpatient departments, hospitals, health centres and schools. Ensuring that children receive optimum nutrition is everybody’s business and nurses in contact with children are in a prime position to identify nutritional problems and take appropriate steps aimed at rectifying these[1].
1.2 Problem statement:

Malnutrition in Developing Countries is very prevalent with high mortality rate among children under 5 years old, and Sudan is of the countries that face continuous problems of malnutrition among children being increased and exaggerated by conflicts and economic deterioration.

Nurses’ performance on caring and management of malnutrition is highly depended on their knowledge. Accordingly, continuous assessment and evaluation of such issues can help providing better outcome.
1.3 Objectives:

General objectives:

To assess knowledge & practice of nurses to care children under five year with malnutrition

Specific objective

- To identify the knowledge of nurses about malnutrition in regard to definition, causes of malnutrition, classification of malnutrition and sign & symptom & complication.
- To assess the practice of nurses about malnutrition in regard to weighting the child, hand washing care of NG tube.
1.4 Literature review

Classification

Malnutrition is frequently classified on the basis of deficits of weight-for-age (w/a) or height-for-age\textsuperscript{[15,16]}. In this system, children are classified into three groups according to malnutrition severity based on their weight compared to the weight average for their age. First degree or mild cases of malnutrition include children whose weights are 76–90% of the average weight. Children with second degree or moderate cases have weights between 61–75% of the average, and children with third degree or severe malnutrition weigh 60% or less than their peers\textsuperscript{[15]}. With time, the so-called “Gómez classification” has been used widely both to classify individual children for clinical referral and to assess malnutrition in communities\textsuperscript{[17]}. The stratification of malnutrition as mild, moderate or severe has helped to systematize clinical observations and has allowed for the comparison of findings between different researchers\textsuperscript{[18]}. Moreover, the risk of death is directly correlated with the degree of malnutrition\textsuperscript{[19]}. In developing countries, about 3.5% of children under the age of 5 years suffer from severe malnutrition. Although mild and moderate types of childhood malnutrition are even more prevalent, their significance in childhood morbidity and mortality is less well recognized\textsuperscript{[3]}. The term "severe malnutrition" or "severe undernutrition" is often used to
refer specifically to PEM. PEM is often associated with micronutrient deficiency.[20,21] Two forms of PEM are kwashiorkor and marasmus, and they commonly coexist.[22]

**Kwashiorkor**

Kwashiorkor (‘displaced child’) is mainly caused by inadequate protein intake resulting in a low concentration of amino acids.[21] The main symptoms are edema, wasting, liver enlargement, hypoalbuminaemia, steatosis, and possibly depigmentation of skin and hair.[21] Kwashiorkor is identified by swelling of the extremities and belly, which is deceiving of actual nutritional status.[23]

**Marasmus**

Marasmus (‘to waste away’) is caused by an inadequate intake of protein and energy. The main symptoms are severe wasting, leaving little or no edema, minimal subcutaneous fat, severe muscle wasting, and non-normal serum albumin levels. Marasmus can result from a sustained diet of inadequate energy and protein, and the metabolism adapts to prolong survival.[22] It is traditionally seen in famine, significant food restriction, or more severe cases of anorexia.[24] Conditions are characterized by extreme wasting of the muscles and a gaunt expression.[23]
Causes:
Inadequate food intake, infections, psychosocial deprivation, the environment (lack of sanitation and hygiene), social inequality and perhaps genetics contribute to childhood malnutrition

Risk factors

In children

- Young age (<5 years) - most vulnerable are premature babies and infants at time of weaning
- Children with co-existing chronic illnesses or developmental delay
- Neglect by care-givers
- Poverty and its complex relationships with:
  - Political and economic situation
  - Education
  - Sanitation
  - Seasonal and climatic conditions
  - Food production and security
  - Cultural and religious traditions
  - Prevalence of infectious diseases
  - Availability and effectiveness of nutrition programmes and health services.\cite{24}

Signs and symptoms

Measures

There are three commonly used measures for detecting malnutrition in children:

- stunting (extremely low height for age),
• underweight (extremely low weight for age), and
• wasting (extremely low weight for height).\textsuperscript{[25]}

These measures of malnutrition are interrelated, but studies for the World Bank found that only 9 percent of children exhibit stunting, underweight, and wasting.\textsuperscript{[25]}

Children with severe acute malnutrition are very thin, but they often also have swollen hands and feet, making the internal problems more evident to health workers.\textsuperscript{[25]}

**WHO criteria for identifying children with severe malnutrition:**

- Bipedal oedema
- Visible severe wasting
- Weight for height more than 3 standard deviations below the median of international reference population

**Protein energy malnutrition:**

- Poor weight gain
- Slowed linear growth

Behavioural changes - irritability, apathy, anxiety, attention deficit. Classically apathetic and quiet when lying in their bed but cry when picked up, with a typical monotonous bleat or loud groan.

**Three clinical syndromes (note, mixed pictures may occur):**

**Marasmus:**

Obvious loss of weight with gross reduction in muscle mass especially
from limb girdles. Subcutaneous fat virtually absent.

- Thin, atrophic skin lies in folds.
- Pinched face has appearance of old man or monkey.
- Alopecia and brittle hair.
- Sometimes, appearance of lanugo hair.

**Kwashiorkor:**

Usually occurs in children aged 1-2 years with changing hair colour to red, grey or blonde. Moon facies, swollen abdomen (pot belly), hepatomegaly and pitting oedema.

Dry, dark skin which splits where stretched over pressure areas to reveal pale areas.

**Other clinical features may include:** [26]

- Fever related to systemic infection (especially Gram-negative coliforms such as *Escherichia coli* and *Klebsiella pneumoniae*)
- Respiratory distress
- Heart failure
- Electrolyte abnormalities (hypophosphataemia, hypokalaemia, hypoglycaemia)
- Marked anorexia
- Anaemia
- Profuse diarrhoea
- Shock
Malnutrition is diagnosed by anthropometric measurements and physical examination. Correlation of malnutrition and growth retardation allows assessment of the individual nutritional state, which is usually measured as body mass index (BMI). BMIs are given as weight-for-height\textsuperscript{[27]}. PCM is defined by measurements that fall below 2 standard deviations under the normal weight-for-age (underweight), height-for-age (stunting) and weight-for-height (wasting)\textsuperscript{[28]}. Wasting indicates recent weight loss, whereas stunting usually results from being chronically underweight. Of all children under 5 years of age in developing countries, about 31% are underweight, 38% have stunted growth and 9% show wasting\textsuperscript{[29]}. Underweight, stunting, and wasting forms PEM each represent different histories of nutritional deficits. Occurring primarily in the first 2–3 years of life, linear growth retardation (stunting) is frequently associated with repeated exposure to adverse economic conditions, poor sanitation, and the interactive effects of poor energy and nutrient intake and infection. Low weight-for-age indicates a history of poor health or nutritional deficiencies, including recurrent illness and/or starvation. In contrast, low weight-for-height is an indicator of wasting or thinness and is generally associated with recent illness, weight loss or a failure to gain weight\textsuperscript{[30]}.  

\textbf{Diagnosis.} \textsuperscript{[24]}
**Assessment**

Screening should assess BMI and percentage of unintentional weight loss, and consider the timescale of reduced nutritional intake and likelihood of this continuing in the future. Several screening tools exist to aid this assessment, including:

The 'Malnutrition Universal Screening Tool' (MUST), which was developed by the Malnutrition Advisory Group, a standing committee of BAPEN; it has been reviewed regularly since its launch in 2003.[31]

The Mini Nutritional Assessment short-form (MNA-SF), which is a practical tool for identification of nutritional status.[32,33]

**Nutritional support should be considered for those:**

- With a BMI <18.5.
- With unintentional weight loss of >10% over the previous 3-6 months.
- With a BMI <20 and unintentional weight loss of >5% over the previous 3-6 months.
- Who have eaten little or nothing for >5 days and who are unlikely not to for the following 5 days or longer.
- Who have poor absorption, high nutrient losses or increased nutritional needs.
Differential diagnosis

Elderly failure-to-thrive (weight loss >5% of baseline, decreased appetite, poor nutrition, inactivity) - consider in addition to malnutrition.[34]

Impaired physical function (for example, infection, malignancy, renal or heart failure)

- Depression
- Dementia

Severe malnutrition - may all co-exist:

- Dehydration
- Severe infection
- Hypoglycaemia
- Anaemia

Anthropometric assessment:[26]

Height and weight (height and weight for age and weight for height are sensitive markers in childhood and a z score, comparing an individual child to a healthy reference population, can be derived, expressed in units of standard deviations from the mean of the reference population):

Moderate malnutrition is defined as a weight for height z score between 2 and 3 standard deviations below the mean.

Severe malnutrition is defined as the weight for height z scores more than 3 standard deviations below the mean. BMI (used mainly in adults)

Mid upper arm diameter (overdiagnoses among younger children, under
diagnoses among older children): An upper arm circumference <110 mm is also used to define severe malnutrition in children.

Asian prospective studies have found that an upper arm circumference of <110 mm was the best single anthropometric predictor of death from malnutrition within 6 months.

**Skin folds**

For the investigation of malnourished children in developing countries, WHO recommends:

- Blood glucose
- FBC and film
- Urine MC & S
- Stool OC & P
- Serum albumin
- HIV test
- U&Es

**Additional tests to assess nutritional status may include:**

- Iron studies, folate, B12
- Pre-albumin, transferrin, retinol-binding protein (better short-term indicators of protein status than albumin alone)
- TFTs
- Coeliac serology
- Calcium, phosphate, zinc
- Vitamin levels - if deficiency is suspected
• Most accurate evidence of malnutrition in an elderly patient is hypocholesterolaemia and hypoalbuminaemia.[34]

**Malnutrition treatment and management.**[35]

In mild-to-moderate cases of malnutrition, initial assessment and nutritional intervention may be done in the outpatient setting. A patient with malnutrition may require hospitalization based on the severity and instability of the clinical situation. Hospitalization of patients with suspected malnutrition secondary to neglect allows observation of the interactions between parent/caregiver and child and documentation of actual intake and feeding difficulties. It may also be warranted in cases where dehydration and acidosis complicate the clinical picture. In moderate-to-severe cases of malnutrition, enteral supplementation via tube feedings may be necessary manual provides practical guidelines for the management of patients with severe malnutrition.1 It seeks to promote the best available therapy so as to reduce the risk of death, shorten the length of time spent in hospital, and facilitate rehabilitation and full recovery. Emphasis is given here to the management of severely malnourished children; Severe malnutrition is both a medical and a social disorder. That is, the medical problems of the child result, in part, from the social problems of the home in which the child lives. Malnutrition is the end result of chronic nutritional and, frequently, emotional deprivation by carers who, because of poor understanding, poverty or family problems,
are unable to provide the child with the nutrition and care he or she requires.

Successful management of the severely malnourished child requires that both medical and social problems be recognized and corrected. If the illness is viewed as being only a medical disorder, the child is likely to relapse when he or she returns home, and other.\textsuperscript{35}

**Children in the family will remain at risk of developing the same problem.**

![Table 1. Time-frame for the management of a child with severe malnutrition](image)

Management of the child with severe malnutrition is divided into three phases. These are: Initial treatment: life-threatening problems are identified and treated in a hospital or a residential care facility, specific
deficiencies are corrected, metabolic abnormalities are reversed and feeding is begun.

Rehabilitation: intensive feeding is given to recover most of the lost weight, emotional and physical stimulation are increased, the mother or care giver is trained to continue care at home, and preparations are made for discharge of the child.

Follow-up: after discharge, the child and the child’s family are followed to prevent relapse and assure the continued physical, mental and emotional development of the child.

A typical time-frame for the management of a child with severe malnutrition is shown in Table 1. Successful management of the severely malnourished child does not require sophisticated facilities and equipment or highly qualified personnel. It does, however, require that each child be treated with proper care and affection, and that each phase of treatment be carried out properly by appropriately trained and dedicated health workers. When this is done, the risk of death can be substantially reduced and the opportunity for full recovery greatly improved.[36]

**Initial treatment**

*Principles of management*

Children with severe malnutrition are often seriously ill when they first present for treatment. Wasting, anorexia and infections are common. Wherever possible, severely malnourished children should be referred to
hospital. Successful initial management requires frequent, careful clinical
evaluation and anticipation of common problems so they can be prevented,
or recognized and treated at an early stage. The physiology of
malnourished children is seriously abnormal; how this affects their
management is summarized. [37]

Recently admitted children should be kept in a special area where they can
be constantly monitored. Because they are very susceptible to infection,
they should, if possible, be isolated from other patients. The child should
not be kept near a window or in a draught, and windows should be closed at
night. The child should be properly covered with clothes, including a hat,
and blankets. Washing should be kept to a minimum and, if necessary,
done during the day. When the child is washed he or she must be dried
immediately and properly. The room temperature should be kept at 25–30
°C (77– 86 °F). This will seem uncomfortably warm for active, fully
clothed staff, but is necessary for small, immobile children who easily
become hypothermic. [37]

Intravenous infusions should be avoided except when essential, as for
severe dehydration or septic shock. Intramuscular injections should be
given with care in the buttock, using the smallest possible gauge needle
and volume of fluid.

Initial treatment begins with admission to hospital and lasts until the
child’s condition is stable and his or her appetite has returned, which is
usually after 2–7 days. If the initial phase takes longer than 10 days, the child is failing to respond and additional measures are required.[37]

The principal tasks during initial treatment are:

- To treat or prevent hypoglycaemia and hypothermia.
- To treat or prevent dehydration and restore electrolyte balance.
- To treat incipient or developed septic shock, if present.
- To start to feed the child.
- To treat infection.
- To identify and treat any other problems, including vitamin deficiency, severe Anaemia and heart failure. These tasks are described in detail below.[38]

4.2 Hypoglycaemia

All severely malnourished children are at risk of developing hypoglycaemia (blood glucose <54 mg/dl or <3 mmol/l), which is an important cause of death during the first 2 days of treatment. Hypoglycaemia may be caused by a serious systemic infection or can occur when a malnourished child has not been fed for 4–6 hours, as often happens during travel to hospital. To prevent hypoglycaemia the child should be fed at least every 2 or 3 hours day and night.

8 Management of severe malnutrition: a manual for physicians and other
Senior health workers. Signs of hypoglycaemia include low body temperature (<36.5 °C), lethargy, limpness and loss of consciousness. Sweating and pallor do not usually occur in malnourished children with hypoglycaemia. Often, the only sign before death is drowsiness.

If hypoglycaemia is suspected, treatment should be given immediately without laboratory confirmation; it can do no harm, even if the diagnosis is incorrect. If the patient is conscious or can be roused and is able to drink, give 50 ml of 10% glucose or sucrose, or give F-75 diet by mouth (see section 4.5), whichever is available most quickly. If only 50% glucose solution is available, dilute one part to four parts of sterile water. Stay with the child until he or she is fully alert.

If the child is losing consciousness, cannot be aroused or has convulsions, give 5 ml/kg of body weight of sterile 10% glucose intravenously (IV), followed by 50 ml of 10% glucose or sucrose by nasogastric (NG) tube. If IV glucose cannot be given immediately, give the NG dose first. When the child regains consciousness, immediately begin giving F-75 diet or glucose in water (60 g/l). Continue frequent oral or NG feeding with F-75 diet to prevent a recurrence.

All malnourished children with suspected hypoglycaemia should also be treated with broad-spectrum antimicrobials for serious systemic infection.\[38\]
**Hypothermia**

Infants under 12 months, and those with marasmus, large areas of damaged skin or serious infections are highly susceptible to hypothermia. If the rectal temperature is below 35.5 °C (95.9 °F) or the underarm temperature is below 35.0 °C (95.0 °F), the child should be warmed. Either use the “kangaroo technique” by placing the child on the mother’s bare chest or abdomen (skin-to-skin) and covering both of them, or clothe the child well (including the head), cover with a warmed blanket and place an incandescent lamp over, but not touching, the child’s body. Fluorescent lamps are of no use and hotwater bottles are dangerous.

The rectal temperature must be measured every 30 minutes during rewarming with a lamp, as the child may rapidly become hyperthermic. The underarm temperature is not a reliable guide to body temperature during rewarming. All hypothermic children must also be treated for hypoglycaemia and for serious systemic infection.\[^{39}\]

**Dehydration and septic shock**

Dehydration and septic shock are difficult to differentiate in a child with severe malnutrition. Signs of hypovolaemia are seen in both conditions, and progressively worsen if treatment is not given. Dehydration progresses from “some” to “severe”, reflecting 5–10% and >10% weight loss, respectively, whereas septic shock progresses from “incipient” to “developed”, as blood flow to the vital organs decreases. Moreover, in
many cases of septic shock there is a history of diarrhoea and some degree of dehydration, giving a mixed clinical picture.\textsuperscript{[40]}

Many of the signs that are normally used to assess dehydration are unreliable in a child with severe malnutrition, making it difficult or impossible to detect dehydration reliably or determine its severity. Moreover, many signs of dehydration are also seen in septic shock. This has two results:

- Dehydration tends to be over diagnosed and its severity overestimated; and
- It is often necessary to treat the child for both dehydration and septic shock.\textsuperscript{[40]}

**Initial treatment**

(a) Signs of dehydration and/or septic shock that are reliable in a child with severe malnutrition include: History of diarrhoea. A child with dehydration should have a history of watery diarrhoea. Small mucoid stools are commonly seen in severe malnutrition, but do not cause dehydration. A child with signs of dehydration, but without watery diarrhoea, should be treated as having septic shock.

Thirst. Drinking eagerly is a reliable sign of “some” dehydration. In infants this may be expressed as restlessness. Thirst is not a symptom of septic shock.

Hypothermia. When present, this is a sign of serious infection, including
septic shock. It is not a sign of dehydration “Sunken eyes”. These are a helpful sign of dehydration, but only when the mother says the sunken appearance is recent.

Weak or absent radial pulse. This is a sign of shock, from either severe dehydration or sepsis. As hypovolaemia develops, the pulse rate increases and the pulse becomes weaker. If the pulse in the carotid, femoral or brachial artery is weak, the child is at risk of dying and must be treated urgently.

Cold hands and feet. This is a sign of both severe dehydration and septic shock. It should be assessed with the back of the hand.

Urine flow. Urine flow diminishes as dehydration or septic shock worsens. In severe dehydration or fully developed septic shock, no urine is formed.\(^{[40]}\)

(b) Signs of dehydration that are not reliable include:

Mental state. A severely malnourished child is usually apathetic when left alone and irritable when handled. As dehydration worsens, the child progressively loses consciousness. Hypoglycaemia, hypothermia and septic shock also cause reduced consciousness.

Mouth, tongue and tears. The salivary and lacrimal glands are atrophied in severe malnutrition, so the child usually has a dry mouth and absent tears. Breathing through the mouth also makes the mouth dry.

Skin elasticity. The loss of supporting tissues and absence of subcutaneous
fat make the skin thin and loose. It flattens very slowly when pinched, or may not flatten at all.

Oedema, if present, may mask diminished elasticity of the skin. The clinical features of dehydration and septic shock are compared in Table 5.

(c) Additional signs of septic shock: Incipient septic shock. The child is usually limp, apathetic and profoundly anorexic, but is neither thirsty nor restless. Developed septic shock. The superficial veins, such as the external jugular and scalp veins, are dilated rather than constricted. The veins in the lungs may also become engorged, making the lungs stiffer than normal. For this reason the child may groan, grunt, have a shallow cough and appear to have difficulty breathing. As shock worsens, kidney, liver, intestinal or cardiac failure may occur. There may be vomiting of blood mixed with stomach contents (coffee-ground vomit), blood in the stool, and abdominal distension with “abdominal splash”; intestinal fluid may be visible on X-ray. When a child reaches this stage, survival is unlikely.[38,40]

**Treatment of dehydration**

Whenever possible, a dehydrated child with severe malnutrition should be rehydrated:
Oral rehydration salts (ORS) solution for severely malnourished children

Because severely malnourished children are deficient in potassium and have abnormally high levels of sodium, the oral rehydration salts (ORS) solution should contain less sodium and more potassium than the standard WHO-recommended solution. Magnesium, zinc and copper should also be given to correct deficiencies of these minerals. The composition of the recommended ORS solution for severely malnourished children (ReSoMal).

ReSoMal is available commercially. However, ReSoMal can also be made by diluting one packet of the standard WHO-recommended ORS in 2 litres of water, instead of 1 litre, and adding 50 g of sucrose (25 g/l) and 40 ml (20 ml/l) of mineral mix solution1.[41]

Amount of ReSoMal to give

Between 70 and 100 ml of ReSoMal per kg of body weight is usually enough to restore normal hydration. Give this amount over 12 hours, starting with 5 ml/kg every 30 minutes for the first 2 hours orally or by NG tube, and then 5–10 ml/kg per hour. This rate is slower than for children who are not severely malnourished. Reassess the child at least every hour. The exact amount to give should be determined by how much the child will drink, the amount of ongoing losses in the stool, and whether the child is vomiting and has any signs of overhydration, especially signs of heart
failure. ReSoMal should be stopped if:

The respiratory and pulse rates increase; the jugular veins become engorged; or there is increasing oedema (e.g. puffy eyelids). Rehydration is completed when the child is no longer thirsty, urine is passed and any other signs of dehydration have disappeared. Fluids given to maintain hydration should.\(^{[42]}\)

**Dietary treatment**

Children who do not require other emergency treatment, especially for hypothermia, dehydration or septic shock, should immediately be given a formula diet. They should also continue to be breastfed.\(^{[43]}\)

**Initial treatment**

Formula diets for severely malnourished children. Almost all severely malnourished children have infections, impaired liver and intestinal function, and problems related to imbalance of electrolytes when first admitted to hospital. Because of these problems, they are unable to tolerate the usual amounts of dietary protein, fat and sodium. It is important, therefore, to begin feeding these children with a diet that is low in these nutrients, and high in carbohydrate. The daily nutrient requirements of severely malnourished children are given in Appendix 5.

Two formula diets, F-75 and F-100, are used for severely malnourished children. F-75 (75 kcal or 315 kJ/100 ml), is used during the initial phase of treatment, while F-100 (100 kcal or 420 kJ/100 ml) is used during the
rehabilitation phase, after the appetite has returned. These formulas can easily be prepared from the basic ingredients: dried skimmed milk, sugar, cereal flour, oil, mineral mix and vitamin mix. They are also commercially available as powder formulations that are mixed with water.\[44\]

The mineral mix supplies potassium, magnesium and other essential minerals; it must be added to the diet. The potassium deficit, present in all malnourished children, adversely affects cardiac function and gastric emptying. Magnesium is essential for potassium to enter cells and be retained. The mineral mix does not contain iron as this is withheld during the initial phase.\[44\]

**Feeding on admission**

To avoid overloading the intestine, liver and kidneys, it is essential that food be given frequently and in small amounts. Children who are unwilling to eat should be fed by NG tube (do not use IV feeding). Children who can eat should be given the diet every 2, 3 or 4 hours, day and night. If vomiting occurs, both the amount given at each feed and the interval between feeds should be reduced. The F-75 diet should be given to all children during the initial phase of treatment.

The child should be given at least 80 kcal/h or 336 kJ/kg, but no more than 100 kcal/h or 420 kJ/kg per day. If less than 80 kcal/h or 336 kJ/kg per day are given, the tissues will continue to be broken down and the child will deteriorate. If more than 100 kcal/h or 420 kJ/kg per day are given, the
child may develop a serious metabolic imbalance.

For example, if a child weighing 7.0 kg is given the F-75 diet every 2 hours, each feed should be 75 ml. During the initial phase of treatment, maintain the volume of F-75 feed at 130 ml/kg per day, but gradually decrease the frequency of feeding and increase the volume of each feed until you are giving the child feeds 4-hourly (6 feeds per day).

Nearly all malnourished children have poor appetites when first admitted to hospital. Patience and coaxing are needed to encourage the child to complete each feed. The child should be fed from a cup and spoon; feeding bottles should never be used, even for very young infants, as they are an important source of infection. Children who are very weak may be fed using a dropper or a syringe. While being fed, the child should always be held securely in a sitting position on the attendant’s or mother’s lap. Children should never be left alone in bed to feed themselves.[44]

**Nasogastric feeding**

Despite coaxing and patience, many children will not take sufficient diet by mouth during the first few days of treatment. Common reasons include a very poor appetite, weakness and painful stomatitis. Such children should be fed using a NG tube. However, NG feeding should end as soon as possible. At each feed, the child should first be offered the diet orally. After the child has taken as much as he or she wants, the remainder should be given by NG tube. The NG tube should be removed when the child is
taking three-quarters of the day’s diet orally, or takes two consecutive feeds fully by mouth. If over the next 24 hours the child fails to take 80 kcal/kg or 336 kJ/kg, the tube should be reinserted. If the child develops abdominal distension during NG feeding, give 2 ml of a 50% solution of magnesium sulfate IM.\textsuperscript{[45]}

The NG tube should always be aspirated before fluids are administered. It should also be properly fixed so that it cannot move to the lungs during feeding. NG feeding should be done by experienced staff. \textsuperscript{[45]}

**Feeding after the appetite improves**

If the child’s appetite improves, treatment has been successful. The initial phase of treatment ends when the child becomes hungry. This indicates that infections are coming under control, the liver is able to metabolize the diet, and other metabolic abnormalities are improving. The child is now ready to begin the rehabilitation phase. This usually occurs after 2–7 days. Some children with complications may take longer, whereas others are hungry from the start and can be transferred quickly to F-100.\textsuperscript{[46]}

Nevertheless, the transition should be gradual to avoid the risk of heart failure which can occur if children suddenly consume large amounts of feed. Replace the F-75 diet with an equal amount of F-100 for 2 days before increasing the volume offered at each feed. It is important to note that it is the child’s appetite and general condition that determine the phase of treatment and *not* the length of time since admission.\textsuperscript{[46]}
Infections

**Bacterial infections** Nearly all severely malnourished children have bacterial infections when first admitted to hospital.\[^{46}\]

**First-line treatment**

Children with no apparent signs of infection and no complications should be given cotrimoxazole (25 mg of sulfamethoxazole 5 mg of trimethoprim/kg) orally twice daily for 5 days.

Children with complications (septic shock, hypoglycaemia, hypothermia, skin infections, respiratory or urinary tract infections, or who appear lethargic or sickly) should be given: Ampicillin, 50mg/kg IM or IV every 6 hours for 2 days, followed by amoxicillin, 15mg/kg orally every 8 hours for 5 days (if amoxicillin is unavailable, give ampicillin, 25mg/kg orally every 6 hours) and gentamicin, 7.5 mg/kg IM or IV once daily for 7 days.\[^{47}\]

**Second-line treatment**

If the child fails to improve within 48 hours, *add* chloramphenicol, 25mg/kg IM or IV every 8 hours (or every 6 hours if meningitis is suspected) for 5 days. Further details of antimicrobial treatment are given in Appendix 6. The duration of treatment depends on the response and nutritional status of the child. Antimicrobials should be continued for at least 5 days. If anorexia still persists after 5 days of treatment, give the child another 5-day course. If anorexia still persists after 10 days of
treatment, reassess the child fully. Examine the child for specific infections and potentially resistant organisms, and check that vitamin and mineral supplements have been correctly given. If specific infections are detected for which additional treatment is needed, for example dysentery, candidiasis, malaria or intestinal helminthiasis, this should also be given. Tuberculosis is common, but antituberculosis drugs should be given only when tuberculosis is diagnosed. Some institutions routinely give malnourished children metronidazole, 7.5 mg/kg every 8 hours for 7 days, in addition to broad-spectrum antimicrobials. However, the efficacy of this treatment has not been established by clinical trials.

4.7 Vitamin deficiencies

**Vitamin A deficiency**

Severely malnourished children are at high risk of developing blindness due to vitamin. A deficiency for this reason a large dose of vitamin A should be given routinely to all malnourished children on day 1, unless there is definitive evidence that a dose has been given during the past month. The dose is as follows: 1 50 000 International Units (IU) orally for infants 6 months of age, 100 000 IU orally for infants 6–12 months of age and 200 000 IU orally for children 12 months of age. If there are any clinical signs of vitamin. A deficiency (e.g. night blindness, conjunctival xerosis with Bitot’s spots, corneal xerosis or ulceration, or keratomalacia), a large dose should be given on the first 2 days, followed by a third dose at
least 2 weeks later. Oral treatment is preferred, except at the beginning in children with severe anorexia, oedematous malnutrition or septic shock, who should be given IM treatment. For oral treatment, oil-based preparations are the international standard (or reference preparation) of vitamin A has been discontinued. However, the international units for vitamin A are still used extensively, particularly in the labeling of capsules and injectable preparations.[49]

**Very severe anaemia**

If the haemoglobin concentration is less than 40 g/l or the packed-cell volume is less than 12%, the child has very severe anaemia, which can cause heart failure. Children with very severe anaemia need a blood transfusion. Give 10 ml of packed red cells or whole blood per kg of body weight slowly over 3 hours. Where testing for HIV and viral hepatitis B is not possible, transfusion should be given only when the haemoglobin concentration falls below 30 g/l (or packed-cell volume below 10%), or when there are signs of life-threatening heart failure. Do not give iron during the initial phase of treatment, as it can have toxic effects and may reduce resistance to infection.[49]

**Congestive heart failure**

This is usually a complication of over-hydration (especially when an IV infusion or standard ORS solution is given), very severe anaemia, blood or plasma transfusion, or giving a diet with a high sodium content. The first
sign of heart failure is fast breathing (50 breaths per minute or more if the child is aged 2 months up to 12 months; 40 breaths per minute or more if the child is aged 12 months up to 5 years). Later signs are respiratory distress, a rapid pulse, engorgement of the jugular vein, cold hands and feet, and cyanosis of the fingertips and under the tongue. Heart failure must be differentiated.\[49\]

**Initial treatment**

From respiratory infection and septic shock, which usually occur within 48 hours of admission, whereas heart failure usually occurs somewhat later. When heart failure is caused by fluid overload, the following measures should be taken:

1. Stop all oral intake and IV fluids; the treatment of heart failure takes precedence over feeding the child. No fluid should be given until the heart failure is improved, even if this takes 24–48 hours.

2. Give a diuretic IV. The most appropriate choice is furosemide (1 mg/kg).

3. Do not give digitalis unless the diagnosis of heart failure is unequivocal (jugular venous pressure is elevated) and the plasma potassium level is normal. In that case, 5g/kg of body weight of digoxin may be given IV as a single dose, or orally, if the IV preparation is not available.\[48\]

**Dermatosis of kwashiorkor**

This is characterized by hypo- or hyperpigmentation, shedding of the skin
in scales or sheets, and ulceration of the skin of the perineum, groin, limbs, behind the ears and armpits. There may be widespread weeping skin lesions which easily become infected.

Spontaneous resolution occurs as nutrition improves. Atrophy of the skin in the perineum leads to severe diaper dermatitis, especially if the child has diarrhoea. The diaper area should be left uncovered. If the diaper area becomes colonized with *Candida* spp., it should be treated with nystatin ointment or cream (100000 IU (1 g)) twice daily for 2 weeks and the child should be given oral nystatin (100 000 IU four times daily). In other affected areas, application of zinc and castor oil ointment, petroleum jelly or paraffin gauze dressings helps to relieve pain and prevent infection. The zinc supplement contained in the mineral mix is particularly important in these children, as they are usually severely deficient. \[49\]

Bathe the affected areas in 1% potassium permanganate solution for 10–15 minutes daily. This dries the lesions, helps to prevent loss of serum, and inhibits infection.

Polyvidone iodine, 10% ointment, can also be used. It should be used sparingly, however, if the lesions are extensive, as there is significant systemic absorption.

All children with kwashiorkor-related dermatosis should receive systemic antibiotics.

1. There is no reported experience in malnourished children of
angiotensin-converting enzyme inhibitors or other drugs used to treat congestive heart failure.

2. Diuretics should never be used to reduce oedema in malnourished children.

Rehabilitation

Principles of management

The principal tasks during the rehabilitation phase are:

- To encourage the child to eat as much as possible.
- To re-initiate and/or encourage breastfeeding as necessary.
- To stimulate emotional and physical development.
- To prepare the mother or carer to continue to look after the child after discharge.

The child should remain in hospital for the first part of the rehabilitation phase. When all the criteria in the box below have been met (usually 2–3 weeks after admission), the child can be transferred to a nutrition rehabilitation centre.[49]

Criteria for transfer to a nutrition rehabilitation centre

- Eating well
- Mental state has improved: smiles, responds to stimuli, interested in surroundings
- Sits, crawls, stands or walks (depending on age)
- Normal temperature (36.5–37.5°C)
- No vomiting or diarrhoea
• No oedema
• Gaining weight: ≥5 g/kg of body weight per day for 3 successive days

**Nutritional rehabilitation**

The most important determinant of the rate of recovery is the amount of energy consumed. However, at the start of the rehabilitation phase, the child is still deficient in protein and various micronutrients, including potassium, magnesium, iron and zinc. These must also be given in increased amounts. Infants under 24 months can be fed exclusively on liquid or semi-liquid formulas. It is usually appropriate to introduce solid foods for older children.\(^{49}\)

**Folic acid and iron**

Nearly all severely malnourished children have anaemia and should be given supplementary folic acid and iron. They should also continue to receive the vitamin and mineral mixes in their food throughout rehabilitation. Iron should *never* be given during the initial phase of treatment, but must be given during the rehabilitation phase. It should only be given orally, *never* by injection.

**Assessing progress**

The child should be weighed daily. It is useful to mark the point that is equivalent to 1 SD (90%) of the median NCHS/WHO reference values for weight-for-height, which is the target weight for discharge. The usual
weight gain is about 10–15 g/kg per day. A child who does not gain at least 5 g/kg per day for 3 consecutive days is failing to respond to treatment with high-energy feeding, most severely malnourished children reach their target weight for discharge after 2–4 weeks.\textsuperscript{[49]}

**Emotional and physical stimulation**

Severely malnourished children have delayed mental and behavioural development, which, if not treated, can become the most serious long-term result of malnutrition.

Emotional and physical stimulation through play programmes that start during rehabilitation and continue after discharge can substantially reduce the risk of permanent mental retardation and emotional impairment.\textsuperscript{[43]}

**Follow-up**

Although much improved at the time of discharge, the child usually remains stunted and mental development is delayed. Management of these conditions and preventing the recurrence of severe malnutrition requires sustained improvement in feeding of the child and in other parenting skills.

Planned follow-up of the child at regular intervals after discharge is essential. This should include an efficient strategy for tracing children who fail to attend follow-up appointments. Such children are at increased risk of recurrence of malnutrition or of developing other serious illnesses.\textsuperscript{[43]}

As the risk of relapse is greatest soon after discharge, the child should be seen after 1 week, 2 weeks, 1 month, 3 months and 6 months. Provided the
child’s weight-for-height is no less than 1SD (90%) of the median NCHS/WHO reference values, progress is considered satisfactory. If a problem is found, visits should be more frequent until it is resolved. After 6 months, visits should be twice yearly until the child is at least 3 years old. Children with frequent problems should remain under supervision longer. The mother should know the location and regular opening hours of the nearest nutrition clinic and be encouraged to bring her child without an appointment if the child is ill or a previous appointment was missed.

At each visit the mother should be asked about the child’s recent health, feeding practices and play activities. The child should be examined, weighed and measured, and the results recorded. Any needed vaccine should be given. Training of the mother should focus on areas that need to be strengthened, especially feeding practices, and mental and physical stimulation of the child. Attention should also be given to feeding practices for other children in the family, and for pregnant or lactating women, as these are likely to be inadequate. If vitamins or medicines are needed, they should be provided.  

Teaching parents how to prevent malnutrition from recurring

All parents should know how to prevent malnutrition from recurring. Before the child is discharged, ensure that the parents or carers understand the causes of malnutrition and how to prevent its recurrence, including correct feeding and continuing to stimulate the child’s mental and
emotional development. They must also know how to treat, or obtain treatment for, diarrhoea and other infections, and understand the importance of regular (every 6 months) treatment for intestinal parasites. The parents have much to learn; teaching them should not be left until a few days before the child is discharged.\textsuperscript{[44]}

The mother (or carer) should spend as much time as possible at the nutrition rehabilitation centre with her child. This may be facilitated by providing the mother with money for transportation and meals. The mother, in turn, should help prepare her child’s food, and feed and look after her child. A rotation of mothers may also be organized to help with general activities on the ward, including play, cooking, feeding, bathing and changing the children, under supervision. This will enable each mother to learn how to care for her child at home; she will also feel that she is contributing to the work of the centre. Teaching of mothers should include regular sessions at which important parenting skills are demonstrated and practised. Each mother should be taught the play activities that are appropriate for her child, so that she and others in the family can continue to make toys and play with the child after discharge.\textsuperscript{[44]}

The staff must be friendly and treat the mothers as partners in the care of the children. A mother should never be scolded, blamed for her child’s problems, humiliated or made to feel unwelcome. Moreover, helping, teaching, counselling and befriending the mother are an essential part of
the long-term treatment of the child.

**Complications**

- The consequences of malnutrition include: \[4\]
  - Impaired immune response and increased risk of infection
  - Reduced muscle strength
  - Impaired wound healing
  - Impaired psycho-social function, including poor cognition and increased dependency
  - Impaired recovery from illness and surgery
  - Poorer health outcomes
  - Poor quality of life \[17\]

**Prognosis**

Severe malnutrition in children carries a case fatality rate of 5-60\%. Fatality rates for kwashiorkor are higher than those for marasmus. \[5\]

**Prevention in childhood**

Good prenatal nutrition - importance of pre-conceptual and antenatal care.

Promotion of breast-feeding. Health promotion/education - regular age-appropriate nutritional advice and counselling during childhood.

Specific programmes addressing micronutrient supplementation/fortification (eg, vitamin D, iodine) according to population needs.

Improvement of hygiene and sanitation to reduce infectious disease and parasitic load. Global political and economic commitment to achieving UN millennium development goals - specifically: the reduction of levels of extreme poverty and hunger to half 1990 levels by 2015. \[45,46\]
Nursing assessment

Nutritional assessment is and will continue to be an essential part of the nursing role and as nurses we have a professional duty to develop our knowledge and skills in this area.

It is vital that patients who require additional nutritional support be identified quickly in order that the appropriate referrals can be made and nutritional support provided. In the busy healthcare environment the importance of nutritional assessment cannot be underestimated and must not be forgotten. The second article in this two-part series will look at more specific nutritional assessment tests. [46]

Assessment tools

There is a range of assessment tools available. These include anthropometric measurements, biochemical analyses and specific nurse-administered screening tools, as well as physical assessment and dietary history (see part two of this series). Only a few of these tools have a place in routine nursing practice. [46]

Anthropometric measurements

These are measurements of the human body, starting from simple estimates of weight loss, through to ideal body weight, BMI and body composition. Care must be taken when assessing weight loss using normal weight-for-height assessments as they do not take into account factors such as height loss in old age (Barasi, 2003). In addition, there is a
tendency to associate weight gain with fat gain. This may lead to false assumptions about body fat in an individual. For example, those engaging in weight training may gain weight as a result of increased muscle mass.[48]

Weight loss

It can be useful to estimate how much weight an individual has unintentionally lost over a period of time because unintentional weight loss is often a feature of serious illness and may be linked to malnutrition.

A weight loss of 5-10% over three to six months is an early indication of risk of undernutrition, while a weight loss of more than 10% indicates a clinically significant risk and the need for nutritional support (Bowling, 2004). Weight loss of more than 20% is considered severe and may require long-term nutritional support (Ward and Rollins, 1999).[48]

Ideal body weight

The ideal body weight is a measure of weight in relation to height (Worthington, 2004) and can be calculated using the formula: Women: 45.5kg (100lb) for the first 1.52m (5ft) of height plus 2.3kg (5lb) for every additional inch.

Men: 48kg (106lb) for the first 1.52m (5ft) of height plus 2.5kg (6lb) for every additional inch. Body weight should be within 10% of the ideal body weight (Moore, 2005). This method can be used to judge over- or under-nutrition (Worthington, 2004) or to set targets for weight gain or loss. [48]
BMI

BMI is a useful reliable measure of the appropriateness of weight for height, which is simple to carry out and is well-correlated with body-fat percentage (Shetty, 2003). However, it is used differently in children and adults - in adults it is a height-weight ratio while in children age-related growth and body fat gain must be taken into consideration (Worthington, 2004). BMI should decline before the age of five and then increase through childhood into adolescence until adulthood is reached. Its use is limited in older adults as it does not account for loss of height and loss of muscle mass. [48]

The World Health Organization (WHO) classifies patients into several categories according to their BMI. BMI can also be used to assess possible malnutrition. A BMI of less than 16 indicates grade 3 malnutrition, 16-16.9 indicates grade 2 malnutrition, while a BMI of 17-18.4 indicates grade 1 malnutrition (Barasi, 2003).

It should be remembered that while BMI will be high in an obese person, this may mask recent unintentional weight loss that may be associated with illness (Ward and Rollins, 1999). BMI is therefore not a diagnostic tool and other data and information must be considered when assessing nutritional status. [48]

All patients should have the following information recorded as part of their nursing or medical assessment on admission to hospital (NHSQIS, 2003):
- Height and weight; Eating and drinking likes and dislikes; Food allergies and medical dietary requirements (for example gluten-free diet for those with coeliac disease); Cultural/ethnic/religious requirements (halal for Muslims or kosher for Jews); Social/environmental mealtime requirements (such as minimising care-giving activities at mealtimes); Physical difficulties with eating and drinking (such as tremor).
- Need for equipment to help with eating and drinking. [48]

This basic information will help nurses to recognise and respond to some of the many issues (such as surroundings, portion size and suitable dietary availability) that can be a cause of PEM in some hospital patients.

Those who are at risk of malnutrition will require more detailed questioning to assess the nature of their risk. The assessment of a patient’s nutritional status should include a general observation of the person, looking for signs of malnutrition, such as the appearance of hair and skin. In a malnourished person hair is likely to be dull, brittle and dry, and there may be signs of hair loss. The skin may be pale, dry and rough, and any wounds will take longer to heal. Nurses should also look for signs of weight loss such as thin appearance and a lack of subcutaneous fat. [48]

The individual’s recent medical and dietary history should also be noted. Dietary history can be used to devise a nutritional treatment plan and recent medical history combined with a dietary history may point to illnesses or conditions that can increase the risk of malnutrition. For
example, a patient may report loss of appetite, nausea and vomiting, change in bowel habit, weight loss or tiredness, all of which could be indications of an underlying condition\textsuperscript{[47-49]}

\textbf{Nursing care plan:}

\textbf{Nursing Diagnosis:}

\textbf{Altered nutrition: less than body requirements}

\textbf{Related to:}

1. decreased oral intake associated with:
   A. anorexia resulting from decreased activity, depression and social isolation, the effect of negative nitrogen balance, and early satiety that occurs with decreased gastrointestinal motility
   B. difficulty feeding self as a result of impaired or limited physical mobility;

2. increased nutritional needs associated with an imbalance in the rate of catabolism and anabolism (in the immobilized person, catabolic processes occur at a faster rate than anabolic processes).

\textbf{Desired Outcome:}

The client will maintain an adequate nutritional status as evidenced by:

1. Weight within normal range for client

2. Normal BUN and serum albumin, Hct, Hb, and lymphocyte levels
3. No further decline in strength and activity tolerance healthy oral mucous membrane.

**Nursing Actions and Selected Purposes/Rationales**

1. Assess for and report signs and symptoms of malnutrition:
   A. weight below client's usual weight or below normal for client's age, height, and body frame
   B. abnormal BUN and low serum albumin, Hct, Hb, and lymphocyte levels
   C. weakness and fatigue
   D. sore, inflamed oral mucous membrane
   E. Pale conjunctiva.


3. Implement measures *to maintain an adequate nutritional status*:
   A. perform actions *to improve oral intake*:
      I. obtain a dietary consult if necessary to assist client in selecting foods/fluids that meet nutritional needs, are appealing, and adhere to personal and cultural preferences
      II. encourage a rest period before meals *to minimize fatigue*
      III. maintain a clean environment and relaxed, pleasant atmosphere
IV. provide oral hygiene before meals *(removes unpleasant tastes, which often improves the taste of foods/fluids)*

V. serve frequent, small meals rather than large ones if client is weak, fatigues easily, and/or has a poor appetite

VI. implement measures to prevent gastrointestinal distention (e.g. perform actions to prevent constipation, administer prescribed gastrointestinal stimulants) *in order to prevent feeling of fullness and early satiety*

VII. encourage significant others to bring in client's favorite foods unless contraindicated and eat with him/her *to make eating more of a familiar social experience*

VIII. encourage significant others to be present to assist client with meals if needed

IX. allow adequate time for meals; reheat foods/fluids if necessary

X. limit fluid intake with meals (unless the fluid has high nutritional value) *to reduce early satiety and subsequent decreased food intake*

XI. enable client to feed self if possible; if client needs to be fed, offer foods/fluids in the order he/she prefers

XII. increase activity as allowed *(activity usually promotes a sense of well-being, which can improve appetite)*

B. ensure that meals are well balanced and high in essential nutrients; offer high-protein, high-calorie dietary supplements if indicated

C. administer vitamins and minerals if ordered.

4. Perform a calorie count if ordered. Report information to dietitian and physician.
5. Consult physician about an alternative method of providing nutrition (e.g. parenteral nutrition, tube feedings) if client does not consume enough food or fluids to meet nutritional needs.

**Nursing care plan:**

Nursing Intervention for Imbalanced Nutrition Less than Body Requirements\(^{[50]}\)

1. Determine daily calorie needs are realistic and adequate. Consultation on nutrition expert.
2. Weigh the body weight every day, monitor the results of laboratory examination.
3. Explain the importance of adequate nutrition.
4. Teach individuals to use flavorings to help improve the taste and smell of food (lemon, mint, clove, cinnamon, rosemary)
5. Give encouragement of individuals to eat with others (food served in the family room or group)
6. Plan maintenance procedures have an unpleasant or painful not done before eating.
7. Give a fun, relaxed atmosphere (not visible potty, do not busy)
8. Adjust the treatment plan to reduce or eliminate odors that cause wanted to vomit or procedure performed near the time of eating.
9. Teach or assist individuals to rest before eating.
10. Teach individuals to avoid the smell of fried food-eating, coffee-cooked if possible.
11. Maintain oral hygiene before and after chewing.
12. Offer to eat small portions but frequently to reduce feelings of tension in the stomach (six times per day with little food)
13. Set to get the nutrients protein / high calorie, which is presented to individuals when they want to eat. (Eg, if the chemotherapy is done early morning and serve meals in the evening before eating).
14. Instruct individuals who experience decreased appetite for:
   o Eating dry foods waking.
   o Eating salty foods if there are no restrictions.
   o Avoid foods that are too sweet, fattening, greasy.
   o Try to drink clear, warm.
   o Sip through a straw.
   o Eat whenever tolerated.
   o Eat small meals low in fat and eat more often.
15. Try commercial supplements are available in many forms (powder, pudding, liquid)
16. If individuals experiencing eating disorders (Townsend, 1994)
   o Set goals with the client's input, doctors and nutritionists.
   o Talk about the benefits of compliance and the consequences of disobedience.
- If the input of food that must be rejected, remind the doctor.
- Sitting accompany individuals during the meal, limit the time to eat up to 30 minutes.
- Observe at least 1 hour before. Accompany client when to the bathroom.
- Weigh the client body when he woke up and after the first micturition.
- Give encouragement to repair, but do not focus the conversation on food or way of eating.
- Along the improvement of individual, explore issues of self-image, weigh again, and watched over.

17. For individuals who are hyperactive

- Provide food and beverages that are high in protein, high calorie.
- Offer more frequent smaller meals. Avoid foods that contain no calories (eg, soda)
- Take a stroll along individual when given little food\(^{50}\).
2. METHODOLOGY

Study design:
This is a descriptive cross-sectional hospital based study.

Study area:
It was carried out in pediatric ward at Mohammed Elamin Teaching Hospital. The hospital is located in Omdurman City, serves patients come from center and peripheries of Omdurman, it is a specialized hospital contain many different departments of paediatric clinics.

Study period:
The study was conducted during the period from March to May 2015.

Population & sample:
All nurses who worked in pediatric ward at the hospital.

Sample Size:
Full coverage, due to limited population number. Accordingly paricipants were (51).

Tools & data collection:
Data was collected by means a questionnaire and check list.

Data analysis:
The data was analyzed by using computer software program: (Statistical Package for Social Science; SPSS).
Ethical consideration:

Ethical clearance:

- Approval from university of Ribat –post graduate studies was taken.
- Approval from matron of nursing at Ribat was taken.
- Verbal consent was taken from nurses who work in pediatric word.
3. RESULTS

This is a descriptive cross-sectional study conducted at pediatric ward at Mohammed Alamen Hamed Teaching Hospital Omdurman Military Hospital and aimed to assess knowledge & practice of nurses to care children under-five years with malnutrition.

A) Participants’ data:

Figure (1): Age distribution showed that, 26(51%) had age of 30-39 years, 16(31.4%) had age of 20-29 years, 8(15.7%) had age of 40-49 years, while there was one participant had age more than 50 years.

Figure (2): Gender distribution showed that, 46(90%) were females versus 5(9.8%) males, with female to male ratio of 9.2: 1.

Figure (3): Marital status showed that, 29(56.9%) of nurses were married and 22(43.1%) unmarried.

Figure (4): In regard to qualifications, 24(47.1%) of nurses in the study had diploma, 23(45.1%) had bachelor degree, 3(5.9%) had master degree and one nurse had PhD.

Figure (5): Experience distribution showed that, 21(41.2%) had one year experience, 22(43.1%) had experience of more than 3 years, 4 (7.8%) had experience of 2 years and the same percentage regarding nurses with
experience of 3 years.

**Figure (6):** Specialized trained on malnutrition found received by 29(56.9%), among which 29(56.9%) received the training in Sudan and 3(5.9%) had training outside Sudan.

**Figure (7):** Among participants who reported to receive specialized training on malnutrition, 29(56.9%) reported that they had the training in Sudan, and 3(5.9%) outside Sudan.

**Figure (8):** When participants inquired whether knowledge of training courses provided in hospitals are updated or not, 23(45.1%) answered positively, while 28(54.9%) said that, hospitals courses mostly do not provide updated knowledge.

**Figure (9):** Nurses who fully defined malnutrition were 7(13.7%), who provide good definition were 27(52.9%), while there were 17(33.3%) who provided poor definition.

**Figure (10):** In regard to cause of malnutrition, 24(47.1%) of nurses said it is caused by early weaning, 14(27.5%) reported inadequate feeding and 5(9.8%) reported diarrheal disease.

**Table (1):** When nurses inquired about complications of malnutrition, sepsis was reported by 19(37.3%), heart failure by 14(27.5%), renal failure by 11(21.6%), heart failure + renal failure by 2(3.9%), sepsis + heart failure by one nurse (2) and the sample percentage regarding sepsis + renal failure.
**Table (2):** Prevention of malnutrition was reported to be through educating the mother about method of preparing the child meal by 36(70.6%) of nurses, while 12(23.5%) said through starting supplementary food after six months.

**Practice:**

**Table (3):** The nurses were assessed in some criteria of practice relevant to malnutrition, and it included weight the child daily, hand washing before providing the food and care of nasogastric tube. Weighting the child daily was reported to be done by 35(68.6%) of nurses in the study area, hand washing found done by 35(68.6%) and care and monitoring the NG tube found done by 23(45.1%).

**Table (4):** Correlation between qualifications of nursing and definition of malnutrition was found insignificant (P value = 0.323).

**Table (5):** Correlation between qualifications of nursing and care of NG tube was found significant (P value = 0.019).

**Table (6):** Correlation between gender and definition of malnutrition was found insignificant (P value = 0.402).

**Table (7):** Correlation between gender and care of NG tube was found insignificant (P value = 0.809).

**Table (8):** Correlation between experience of nursing and definition of malnutrition was found significant (P value = 0.05).

**Table (9):** Correlation between experience nurses and care of NG tube was
found insignificant (P value = 0.752).

**Table (10):** Correlation between receiving training courses and care of NG tube was found insignificant (P value = 0.275).

**Table (11):** Correlation between place of training courses and definition of malnutrition was found significant (P value = 0.093).

**Table (12):** Correlation between believing that knowledge of courses are updated and care of NG tube was found significant (P value = 0.04).
Figure (1): Age distribution among nurses assessed about malnutrition
Figure (2): Sex distribution of nurses assessed about malnutrition
Figure (3): Distribution of nurses assessed about malnutrition according to marital status.
Figure (4): Distribution of nurses assessed about malnutrition according to qualification
Figure (5): Distribution of nurses assessed about malnutrition according to experience
Figure (6): Receiving specialized training on malnutrition among nurses of the study
Figure (7): Place of receiving specialized training on malnutrition among nurses of the study
B) Knowledge:

Figure (8): Updating of hospital courses
**Figure (9):** Definition of malnutrition

*Scoring of malnutrition definition:*

- **Excellent:** Diet in which nutrients are either not enough or are too much such that the diet causes health problems
- **Good:** Health problem caused by diet intake
- **Poor:** Taking diet with sufficient nutrients.
Figure (10): Knowledge about the cause of malnutrition
Table (1): Knowledge about the classification of malnutrition

<table>
<thead>
<tr>
<th>Classification of malnutrition according to severity:</th>
<th>Frequency</th>
<th>Percent</th>
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</thead>
<tbody>
<tr>
<td>Yes</td>
<td>18</td>
<td>36%</td>
</tr>
<tr>
<td>No</td>
<td>32</td>
<td>64%</td>
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<tr>
<td>Total</td>
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</table>

Knowledge about kwashiorkor and marasmus

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
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</thead>
<tbody>
<tr>
<td>Yes</td>
<td>23</td>
<td>46%</td>
</tr>
<tr>
<td>No</td>
<td>27</td>
<td>54%</td>
</tr>
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<td>Total</td>
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</table>
Table (2): Knowledge about complication of malnutrition

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<thead>
<tr>
<th>Complication of MN</th>
<th>Frequency</th>
<th>Percent</th>
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</thead>
<tbody>
<tr>
<td>Sepsis</td>
<td>19</td>
<td>37.3</td>
</tr>
<tr>
<td>Heart failure</td>
<td>14</td>
<td>27.5</td>
</tr>
<tr>
<td>Renal failure</td>
<td>11</td>
<td>21.6</td>
</tr>
<tr>
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<td>2.0</td>
</tr>
<tr>
<td>Sepsis and Renal failure</td>
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<td>2.0</td>
</tr>
<tr>
<td>Heart failure and renal failure</td>
<td>2</td>
<td>3.9</td>
</tr>
<tr>
<td>All are true</td>
<td>3</td>
<td>5.9</td>
</tr>
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<td><strong>100.0</strong></td>
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**Table (3):** Knowledge about how to prevent MN:

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<th>How to prevent MN</th>
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<th>Percent</th>
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<tbody>
<tr>
<td>Start supplementary food after six months</td>
<td>12</td>
<td>23.5</td>
</tr>
<tr>
<td>Education of the mother how to prepare meal to her child</td>
<td>36</td>
<td>70.6</td>
</tr>
<tr>
<td>Total</td>
<td>51</td>
<td>100.0</td>
</tr>
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</table>
C) Practice:

Table (4): Practice of weighting the child daily, hand washing before providing food and care of NG tube

<table>
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<th>Weight the child daily</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Done</td>
<td>35</td>
<td>68.6</td>
</tr>
<tr>
<td>Not done</td>
<td>16</td>
<td>31.4</td>
</tr>
<tr>
<td>Total</td>
<td>51</td>
<td>100</td>
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</table>

<table>
<thead>
<tr>
<th>Hand washing</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Done</td>
<td>35</td>
<td>68.6</td>
</tr>
<tr>
<td>Not done</td>
<td>16</td>
<td>31.4</td>
</tr>
<tr>
<td>Total</td>
<td>51</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Care of NGT</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Done</td>
<td>23</td>
<td>45.1</td>
</tr>
<tr>
<td>Not done</td>
<td>28</td>
<td>54.9</td>
</tr>
<tr>
<td>Total</td>
<td>51</td>
<td>100.0</td>
</tr>
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</table>
D) Correlations:

Table (5): Level of nursing education * What is malnutrition

<table>
<thead>
<tr>
<th>Level education</th>
<th>C.L.What.is.MN</th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Excellent</td>
<td>Good</td>
<td>Poor</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>Diploma</td>
<td>2 (3.9%)</td>
<td>17 (33.3%)</td>
<td>5 (9.8%)</td>
<td>24 (47.1%)</td>
<td></td>
</tr>
<tr>
<td>Bachelor</td>
<td>5 (9.8%)</td>
<td>10 (19.6%)</td>
<td>8 (15.7%)</td>
<td>23 (45.1%)</td>
<td></td>
</tr>
<tr>
<td>Master</td>
<td>0 (0.0%)</td>
<td>1 (2.0%)</td>
<td>2 (3.9%)</td>
<td>3 (5.9%)</td>
<td></td>
</tr>
<tr>
<td>PhD</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>1 (2.0%)</td>
<td>1 (2.0%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>7 (13.7%)</td>
<td>28 (54.9%)</td>
<td>16 (31.4%)</td>
<td>51 (100.0%)</td>
<td></td>
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PV = 0.323
Table (6): Correlation between level of nursing education and Care of NGT

<table>
<thead>
<tr>
<th>q1 Level of education</th>
<th>C.L.Cre.of.NGT</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Done</td>
<td>Not done</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>Diploma</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>6</td>
<td>18</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>% of Total</td>
<td>11.8%</td>
<td>35.3%</td>
<td>47.1%</td>
<td></td>
</tr>
<tr>
<td>Bachelor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>13</td>
<td>10</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>% of Total</td>
<td>25.5%</td>
<td>19.6%</td>
<td>45.1%</td>
<td></td>
</tr>
<tr>
<td>Master</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Count</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>% of Total</td>
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<td>.0%</td>
<td>5.9%</td>
<td></td>
</tr>
<tr>
<td>PhD</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
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<td></td>
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<tr>
<td>% of Total</td>
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<td>.0%</td>
<td>2.0%</td>
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</tr>
<tr>
<td>Total</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
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<td>51</td>
<td></td>
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<tr>
<td>% of Total</td>
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<td>54.9%</td>
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PV = .019
Table (6): Correlation between sex and malnutrition definition

<table>
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<th>B.Sex</th>
<th>What.is.malnutrition</th>
<th>Count</th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Excellent</td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>0</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>% within B.Sex</td>
<td>.0%</td>
<td>80.0%</td>
<td>20.0%</td>
<td>100.0%</td>
<td></td>
</tr>
<tr>
<td>% within What.is.malnutrition</td>
<td>.0%</td>
<td>14.8%</td>
<td>5.9%</td>
<td>9.8%</td>
<td></td>
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<td>16</td>
<td>46</td>
</tr>
<tr>
<td>% within B.Sex</td>
<td>15.2%</td>
<td>50.0%</td>
<td>34.8%</td>
<td>100.0%</td>
<td></td>
</tr>
<tr>
<td>% within What.is.malnutrition</td>
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<td>94.1%</td>
<td>90.2%</td>
<td></td>
</tr>
<tr>
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<td></td>
<td>7</td>
<td>27</td>
<td>17</td>
<td>51</td>
</tr>
<tr>
<td>% within B.Sex</td>
<td>13.7%</td>
<td>52.9%</td>
<td>33.3%</td>
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<td></td>
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<tr>
<td>% within What.is.malnutrition</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
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PV = .402
Table (7): Correlation between sex and care of NGT

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<tr>
<th>B.Sex</th>
<th>Count</th>
<th>Care.of.NGT</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>Male</td>
<td></td>
<td>2</td>
<td>3</td>
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<td>60.0%</td>
</tr>
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<td></td>
<td>% within Care.of.NGT</td>
<td>8.7%</td>
<td>10.7%</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>21</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>% within B.Sex</td>
<td>45.7%</td>
<td>54.3%</td>
</tr>
<tr>
<td></td>
<td>% within Care.of.NGT</td>
<td>91.3%</td>
<td>89.3%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>23</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>% within B.Sex</td>
<td>45.1%</td>
<td>54.9%</td>
</tr>
<tr>
<td></td>
<td>% within Care.of.NGT</td>
<td>100.0%</td>
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</tr>
</tbody>
</table>

PV= 0.809
### Table (8): Correlation between experience and definition of malnutrition

<table>
<thead>
<tr>
<th>q2Year.work.in.Malnutrition</th>
<th>C.L.What.is.MN</th>
<th>Excellent</th>
<th>Good</th>
<th>Poor</th>
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<tbody>
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<td>15.7%</td>
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PV = .05
Table (9): Correlation between experience and Care of NGT

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PV=.752
Table (10): Correlation between receiving specialized training care of NGT

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PV= 0.275
Table (11): Correlation between place of receiving and malnutrition definition

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PV = .093
### Table (12): Correlation between training and care of NGT

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<td><strong>Total</strong></td>
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PV = 0.040
4.1 Discussion

Each year, an estimated 500,000 Sudanese children suffer from severe acute malnutrition. Yet lifesaving interventions reach less than 15 per cent of that number[UNICEF][51]. Accordingly, community participation is very effective and necessary to manage and reduce malnutrition among children.

The current study aimed to assess knowledge & practice of nurses to care children under-five years with malnutrition. The study inquired some criteria of knowledge, practice and personal data of nurses to provide an outlines of the situation in this issue.

The most frequent age group of nurses in the study was 30-39 years who represented by more than half of participants (52%). This might indicate that, most nurses in the study expected to have considerable years of experience in field of nursing in general, on the other hand, their experience in field of malnutrition care among children found mostly for more than 3 years (43.1%) and they had variation in experience from 3 years up to teen years (one participant had more than 20 years of experience). In regard to marriage, more than half of the studied groups were married (56.9%). The study in Malawi among nurses who provide care for malnourished children showed that, nurses experience ranged between 2-30 years[52].
Distribution of participants according to qualification revealed that, they were either qualified with diploma degree (47.1%) or bachelor degree (45.1%), while few of them found to have master or PhD degree (5.9% and 2% respectively).

Nurses who received specialized training on malnutrition were less than half of participants (54.9%), and it was mostly in Sudan (90.6%). Abroad training is known to be cost-effective but it obtains updated knowledge and experience. Therefore, more than half of nurses in the study (54.9%) believe that, local training provided by hospitals not always provide an updating knowledge. The positive outcome of training about malnutrition was reported by previous studies, as mentioned by Puoane T1 and colleagues mentioning that, Experience in this province has shown that in-service training changes attitudes to malnutrition and treatment practices, as well as saving lives. The financial status impacts organizing training programs, and this was reported by WHO guidelines for severe malnutrition in 2007[54].

Accurate definition of malnutrition by nurses in the study was reported by few of them (13.7%) and they defined it as deficiency of calories in addition to protein, while most of them (52.9%) reported that, malnutrition is protein deficiency, while a considerable percentage (33.3%) showed poor knowledge mentioning inaccurate definition (shortage in nutrition).
Knowing the accurate definition of any disorder is the first big step towards the right diagnosis and management.

Mean of knowledge about causes of malnutrition was found to be 20%. Most nurses knew early weaning as a cause of malnutrition (47.1%), followed by those who knew inadequate feeding (27.5%), diarrheal diseases (9.8%), while those who knew wall mentioned causes were represented by 15.7%.

The study of Yalcin N and colleagues among nurses showed poor knowledge towards causes of malnutrition which was 22.2%. The NHS conducted a study by Wong SS to assess knowledge about malnutrition among physician, nurses and dietitian and they reported a similar findings of poor knowledge showing that 35.7% of nurses could identify malnutrition causes.

Nurses were inquired about classification of malnutrition according to severity by multiple choice question providing percentage of reduction in height to weight ratio, they showed unsatisfying degree of knowledge; only 36% knew the right percentages of sever, mild and moderate malnutrition. On the other hand, knowledge about kwashiorkor and marasmus was mentioned correctly by 46% of nurses. With slight difference a similar study by Yalcin N, et al showed moderate knowledge of nurses towards classification of malnutrition where 52% had the correct answer.

Mean of knowledge about complications of malnutrition was found to be
very poor (15.7%), they mostly knew sepsis (37.3%), followed by heart failure (27.5%) and renal failure (21.6%), but only 5.9% knew all the complications. This agrees with percentage of knowledge about complication of malnutrition (17.2%)[56].

In regard to prevention from malnutrition, they showed moderate degree of knowledge (47.1%); and most of them (70.6%) reported that prevention should be through educating mothers about preparing meals to their children, and few percentage knew that, supplementary food should be started after six months of age (23.5%). This is compatible with Yalcin N and colleagues results which found that prevention of malnutrition was identified by 52.3% of nurses[56].

Mean of practice among nurses included assessment of weighting the child daily, monitoring hand washing before providing food and taking care of NG tube and it was found better when compared to their knowledge (60.8%); two thirds found weight the child, and the same percentage found wash their hands before providing food, while less percentage of practice found regarding taking care of NG tubes (45.1%).

High score of practice versus low score of knowledge is not consistent with most of previous studies which shows better knowledge compared to practice, and this was justified in literature as that, the most common cause for insufficient nutritional practice is lack of nutritional knowledge[57].

Experience in the current study found to have positive impact on
identifying malnutrition (P value = 0.05), as well as organizing training in hospital reflected positively on practice and specifically on taking care of NG tube (P value = 0.040).

The effect of training was found to have positive effect as reported by Schönherr S and colleagues who revealed that, there is a significant differences in percentage of correct answers between registered nurses and nurse aides, nursing staff with training in nutrition and without\cite{57}. 
4.2 Conclusion

The study concluded that, nurses in the study showed higher degree of practice when compared to knowledge which was found poor, and this was assumed to affect performance of malnutrition management and mothers’ counseling.

Malnutrition definition was mentioned correctly by most of participants, among whom few reported the accurate definition, but they showed poor knowledge about causes, classification, complications and they showed moderate knowledge about methods of preventing malnutrition.

They showed higher degree of practice compared to knowledge in the aspect of weighting the child daily, hand hygiene and caring of NG tube.

Experience found to have positive impact on identifying malnutrition, as well as organizing training in hospital reflected positively on some criteria of practice.
4.3 Recommendations

- A continuous extensive training program should be organized and executed by the health policy makers to train nurses and continue reporting monitoring and evaluation of their performance.

- Abroad training and post-graduate studies will help raising the level of performance.

- Specialization of Mohammed Elamin Hospital as a paediatric hospital necessitates supplying it with facilities and funds that help qualifying the nurses in management children health problems.

- Further studies should be conducted in this issue covering a wide angle of the topic as well as covering large participants of nurses.
REFERENCES


16. Treatment and care towards the end of life: good practice in decision making; General Medical Council, May 2010.


Geneva 27, Switzerland).


53. Puoane T, Sanders D, Ashworth A, Ngumbela M. Training nurses to save lives of


56. Wong SS, Derry F., Grimble G.K., Forbes A. An audit to assess knowledge about malnutrition amongst staff working in the UK spinal cord injuries centres; NHS: Buckinghamshire Hospital, 2010: 2-4.

Appendix

Questionnaire about
Nurse's Knowledge and Practice in Malnutrition Children

Socio demographic data:

(A) Age
(B) Sex a. Male b. Female
Marital status:- a. Married b. Unmarried

1-Level of nursing education:-
a- Diploma b- Bachelor c- Master d- PhD

2-How many years did you work in mal nutrition ward t:-
a- One year. b- 2 year. c- 3 years. D- > 3 yrs

3- Did you receive any training course in mal nutrition ward:-
a. Yes b. No

4- Where did you receive these courses:-
a- In Sudan b- Outside Sudan

5- If the hospital prepares continuous training course for the Nursing staff so that to update themselves:-
a. Yes b. No

6- What is mal nutrition?
a- Excellent b- good c - poor

7- Do you know Kwashiorkor and marasmus according to severity?
a. Yes b. No

8- Do you know classifications of malnutrition according to severity?
a. Yes b. No

9-Are you weight the child daily:-
a. Yes b. No

10-do you wash your hand before and after feeding?
Yes No

11-did you do the care of NGT o
Yes No
12-the cause of malnutrition
   a- early weaning □  b- inadequate feeding □  c- diarrheal disease □

13- Complications of malnutrition are:-
   a sepsis □  b- heart failure □
   c- renal failure □  d. sepsis & heart failure □
   e. sepsis and renal failure □  f./ Heart Failure & Renal Failure □

14- how to prevent malnutrition:-
   a- Start supplementary food in six month □
   b. education of the mother how to prepare meal to her child □
   c. both a and b are correct □