

## Original Research Article

# Protein Energy Malnutrition Among Children Less Than Five Years and the Clinical Management Protocol at Mohammed Elameen Hamid Hospital for Children - Sudan- 2019

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**Abstract:** According to the world health organization 49% of the 10.4 million deaths occurring in children less than 5 years in developing countries are associated with protein Energy Malnutrition (PEM). The aims of this study to assess protein energy malnutrition among children less 5 years and identify the clinical management protocol treatment for the affected children at Mohammed Elameen Hamid. **Methods and Material:** This study targeting PEM children and health professionals at the hospital. Fifty (50) all professionals were interview (working staff) in malnourished children wards at Mohammed Elameen Hamid Hospital for Children. 140 children less than 5 years admitted to the hospital with PEM during the collection of data convincingly selected. The tool used to collected data in the study was questionnaire. **Result:** 80% of the health professionals are female. (50%) of the professional's respondent confirm that the major causes of malnutrition were parent's awareness, economic status and culture. (90%) of the professionals respondent agree that national and international treatment protocols have been applying at the hospital. (90%) were sure that undergo enough treatment and flow up for malnutrition child at the hospitals. (56%) agree about the number of children with malnutrition admitted to the hospitals in the past five years increases year after year. 66% of the professionals were revealed that suitable treatment for children with malnutrition are includes drugs, balance diet, and ORS (oral dehydration solutions). 43.6% of children their age 12-24 month, 58% are male, 80% of them weaned gradually, 92.1 % take 3-4 meals/day, 58.6 % of them are marasmic, 55.0% have deficiency Anemia's, Pneumonia, Acute Bronchitis before get malnourished. Fathers and mothers education level was basic education (44.3%) and (46.4) respectively. **Conclusion:** Hospital has been use national and international treatment protocols. Affected children admitted to hospital increase year after year. Level of education of fathers and mothers, illness and diseases before PEM and inadequate intake of food and the economic situation are the main factors to caused PEM.

**Keywords:** Professional, health, Malnutrition, Protocol, nutrition, Sudan.

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## 1. INTRODUCTION

Malnutrition (under nutrition) is one of major public health problem in the world; about 841 million people suffered from hunger, 20% were in developing countries [1].

Malnutrition is the most common pathological condition resulting from deficiency or excess of necessary nutrients. Malnutrition is a significant cause of morbidity and mortality in children worldwide. For instance, malnutrition is the causes of approximately 60% deaths of children in the developing countries [2].

Malnutrition impairs body function, normal growth, cognitive development, reproductive, physical work capacity and it negatively predispose to disease. Generally, malnutrition impairs performance, health and survival of human. Inadequate dietary intake of protein resulted in the form of malnutrition called Protein Energy Malnutrition (PEM). The PEM is a major health problem in developing countries and a major risk factor of morbidity and mortality of children.

Acute malnutrition results from sudden reductions in food intake or diet quality and is often combined with pathological causes. Acute malnutrition

has been defined in various ways and has been referred to by various names with partially overlapping definitions, including protein-energy malnutrition, wasting, kwashiorkor, and marasmus. Acute malnutrition, or wasting, is defined using anthropometric cutoffs and clinical signs. The currently accepted definitions, set out by the WHO, are as follows:

- *Moderate acute malnutrition (MAM)*, defined as weight-for-height<sup>1</sup> z-score (WHZ) between -2 and -3 or mid-upper arm circumference (MUAC) between 115 millimeters and <125 millimeters [3].
- *Severe acute malnutrition (SAM)*, defined as WHZ < -3 or MUAC < 115 millimeters, or the presence of bilateral pitting edema, or both [4].
- *Global acute malnutrition (GAM)* refers to MAM and SAM together; it is used as a measurement of nutritional status at a population level and as an indicator of the severity of an emergency situation [5].

Marasmus and kwashiorkor are common terms historically used to differentiate between types of SAM. Marasmus refers to children who are very thin for their height (that is, they meet the WHZ or MUAC cutoff) but do not have bilateral pitting edema; kwashiorkor refers to edematous malnutrition.

Two million children under age five in Sudan suffer from acute malnutrition resulting in average global acute malnutrition (GAM) rate of 16.3%, which is above the 15% threshold that constitutes a critical emergency [6].

Sudan has the highest rate of acute malnutrition in Africa. A national survey conducted in 2013 revealed that 128 of the total 184 Sudan's localities have stunting (chronic malnutrition) rate classified as high as above 30% [7].

The clinical management of severely malnourished children can be rapidly assessed to highlight areas for improvement. Involving staff in the assessment process has led to their active involvement in improving the management of malnourished children admitted to the hospitals [8]. A review of treatment practices worldwide found that many health services use discredited practices and that staffs are unfamiliar with modern, effective guidelines for the management of severe malnutrition. 'Inappropriate practices associated with high mortality include overuse of intravenous (IV) fluids for rehydration, inadequate feeding leading to hypoglycemia and hypothermia, untreated infections, and failure to correct electrolyte and micronutrient deficiencies. (WHO) guidelines for management of severe malnutrition substantially increased rates of recovery.' These experiences suggest that evaluation of clinical practice is important [4].

### Role of Health Team Professionals

The health care team comprises all the health care professionals that work with a given patient or patients and their families toward the common goal of patient health. These include medical part of team (physician, nurse, dietitian, physical therapist, and pharmacist).

- a) *The physician*: generally the person with most broad based knowledge related to patient health care is the medical doctor (MD); otherwise refer to as the physician. The physician knows the patient medical history and has general understanding of the relationship between diseases states and other health concerns.
- b) *The nurse*: the nurse generally has the most contact with the individual patients and their families the nurse can provide other members the health care team. With good insight into patient needs because of this in depth patients contact. Ongoing assessment and monitoring of patient eating habits and health status are important roles of the nurse.
- c) *The physical therapist*: assisting in promoting mobility and physical movement to control pain is part of the role of the physical therapist (PT). A physical therapist may be involved with helping a person enhance capabilities that have been impaired due to illness or trauma. The PT may promote exercise that is appropriate for individual to promote weight loss on increase muscle strength.
- d) *The pathologist*: the professional to consult when assessing the seemingly simple act of swallowing is the speech the pathologist. Swallowing series of interrelated steps can be seriously impaired due to stroke or other neurological damage.
- e) *The pharmacist*: the registered pharmacist is responsible for preparing the nutritional solutions that the physician orders these solutions are administered through veins or enteral routes.
- f) *The registered dietitian*: the registered dietitian or RD is the health care professional best qualified to interpret the science of how foods is used by the body in health and disease states and to evaluate how changes in the diet can improve the patient health status.
- g) *The nutritionist*: is educator, as well as a counselor, who usually works in a health setting and who typically has an at least a bachelor's degree in nutrition. The legal credential certified or licensed nutritionist is used in some states to help indicate qualified nutritionists [4, 9, 10].

### The WHO's 10-Step Program for Inpatient Treatment

WHO reviews and update the guidelines on the management of severe malnutrition [3]. The 10 steps are divided into three phases; children's emotional and sensorial development should be stimulated throughout all phases:

- *Initial treatment:* Hypoglycemia, hypothermia, dehydration, infections, and electrolyte imbalances are corrected, as are micronutrient deficiencies with the exception of iron deficiency.
- *Rehabilitation:* Electrolyte imbalances and micronutrient deficiencies continue to be corrected, and iron is added. Feeding is increased to stimulate catch-up growth, and children are prepared for discharge.
- *Follow-up:* Increased feeding is continued to recover lost weight [11, 12].

#### **Treatment of malnutrition at the hospital**

- The team of physicians and health care providers who manage malnutrition patients includes a gastroenterologist who specializes in treating digestive conditions, a dietician, a nutrition nurse, a psychologist and a social worker.
- Nasogastric tube feeding, PEG feeding and intravenous infusion or parenteral nutrition may be done in the hospital for moderate to severely malnourished patients who are unable to take food via the mouth.
- High protein and calorie diet to meet the requirements for the malnutrition child.

All this steps consider as protocol to treatment of malnutrition [14-16].

#### **1.1. The magnitude of the problem**

A National survey conducted in 2013 revealed that 128 of the total 184 Sudan's localities have stunting (chronic malnutrition) rate classified as high as above 30% [7].

Two million children under age five in Sudan suffer from acute malnutrition resulting in average global acute malnutrition (GAM) rate of 16.3%, which is above the 15% threshold that constitutes a critical emergency [6].

National Nutrition Policy in Sudan estimated that close to 522.000 ages less than five yrs children suffer from sever acute malnutrition [17].

#### **1.2. Justification**

The nutrition situation in Sudan is characterized by persistently high levels of acute malnutrition and stunting. Both trends have continued since record keeping in 1987. In absolute terms the nutritional situation of children is worsening and underscores the urgent need for close monitoring whilst implementing the interventions for the prevention and treatment for malnutrition [18].

Sudan has made no progress towards achieving the target for stunting, with 38.2% of children less than 5 years of age affected, which is higher than the average for the Africa region (29.1%) [19].

The management of severe protein energy malnutrition has effective impact on the case. Such topic is of great importance to be focused on identification of malnutrition and the management protocol to treat the cases. Less than 5years of is most vulnerable group in the community.

#### **1.3. General objective**

To assess of the Protein Energy Malnutrition among children less than five years at Mohammed Elameen Hamid hospital for Children in Omdurman locality, Sudan, 2019.

#### **1.4. Specific objectives**

- To identify protein Energy Malnutrition among children less than five years at Mohammed Elameen Hamid hospital for Children in Omdurman locality, Sudan, 2019
- To determine the factors associated with PEM among children less than five years at Mohammed Elameen Hamid hospital for Children in Omdurman locality, Sudan, 2019
- To identify the management protocol implement to PEM children less than five years at Mohammed Elameen Hamid hospital for Children in Omdurman locality, Sudan, 2019

## **2. METHODOLOGY**

#### **2.1. Study Design**

A hospital based descriptive study was conducted at Mohammed Elameen Hamid hospital for Children in Omdurman locality, Sudan, 2019.

#### **2.2. Study area**

The hospital was established in 1986 by the man of righteousness and charity, Mohammed al-Ameen Hamed and offers it to government (Ministry of Health Khartoum Sate). The building represented the whole hospital with 90 beds but in line with the development and keeping up with the requirements of the right Childhood in the mid-1990s Ministry of health was approved to build another building inside the hospital area.

The hospital contains laboratory - x-ray - blood bank – pharmacy and office for the medical directors. The hospital receives cases transferred from the accident department. 14 wards in addition to the isolation ward. and have more than 225 beds (long stay) provide all medical services free of charge in the "wards" and the private suite has 6 private rooms and 6 double rooms. The hospital receives about 400-600

cases a day and the patient is initially examined, diagnosed and referred to the wards or be discharge.

### 2.3. Study Population

All health professional work in the malnutrition wards and malnourished children admitted to Mohammed Al Ameen Hamid hospital for children during the collection of date.

### 2.4. Sample size selection

50 health profession team and 140 malnourished children admitted to Mohammed Al Ameen Hamid hospital for children during the collection of date time. Sample size was selected by using a convenience sampling, the entire professional health worker and all children admitted to the hospital with PEM.

### 2.5. Ethical Consideration

Ethical clearance was obtained from College of Public and Environmental Health /University of Bahri and Ministry of Health-Sudan. The objective of the study was explained to participants, privacy and confidentiality of collected information was ensured at all level.

## RESULTS

### Health Professional

**Table-1: Gender Characteristics of the professional worker N=50**

Characteristics	Frequency	%
<b>Gender</b>		
Male	10	20%
Female	40	80%
Total	50	100%
<b>Age</b>		
18-25	19	38%
26-45	28	56%
46-65	3	6%
Total	50	100%
<b>Occupation</b>		
Doctor	24	48%
Nutritionist	7	14%
Nurse	19	38%
Total	50	100%

Table No. (1) Shows gender characteristic. 80% were female. 56% of the age characteristics are 25-45 years. Occupational analyses show that 48% are doctors.

**Table-2: Causes Malnutrition according to professionals N=50**

Respond	Frequency	Percent
Parents awareness	15	30%
Economic	9	18%
Culture	1	2%
Awareness +economic +culture	25	50%
Total	50	100%

Table No. (2) Shows major the causes Malnutrition. 50% the study group said that parent awareness with balance diet and economic and cultural situation are the main causes of malnutrition.

**Table-3: Malnutrition caused by inadequate food intake for the child N=50**

Respond	Frequency	%
Agree	26	52%
Strong agree	20	40%
Disagree	3	6%
Strong disagree	1	2%
Total	50	100%

Table No (3) shows the opinion of the respondents about the inadequate food intakes can cause of malnutrition. 52% of the health professionals agreed that malnutrition caused by low intakes of food than the equipments.

**Table-4: Apply of National and International protocol N=50**

Respond	Frequency	%
Agree	45	90%
Disagree	5	10%
Total	50	100%

Table No (4) shows the national and international treatment protocols apply in the hospital to children with malnutrition. 90% of respondent professionals agreed that international treatment protocols applied. This means good treatment and flow up are enough in the hospital.

**Table-5: State of malnourished children that treated at the hospital in the past five years N=50**

Respond	Frequency	%
Increase yearly	28	56%
Decrease yearly	10	20%
Moderate increase	11	22%
Randomly	1	2%
Total	50	100%

Table No 5. Shows the state of children treated at the hospital in the past five years. 56% of the professionals agree that the number of children with

malnutrition admit to hospital in the past five years increase year after year.

**Table-6: Problems faced the health professionals in the hospital No=50**

Respond	Frequency	%
mother	9	18%
father	2	4%
Both of them	34	68%
None of them	5	10%
Total	50	100%

Table No 6 Represents the problems faced the health professionals in the hospitals. 68% the

professionals said that the problems faced them in clinical management mainly from parents.

**Table-7: Suitable treatment for the children's with malnutrition in hospital N=50**

Respond	Frequency	%
Balance diet and liquid	17	34%
Balance diet , liquid+ Drug	33	66%
Drug only	0	0%
ORS (oral dehydration solutions)	0	0%
Total	50	100%

Table No 7. Shows suitable treatment for the children's with malnutrition at the hospitals. 66% mention the suitable treatment that uses in hospitals are

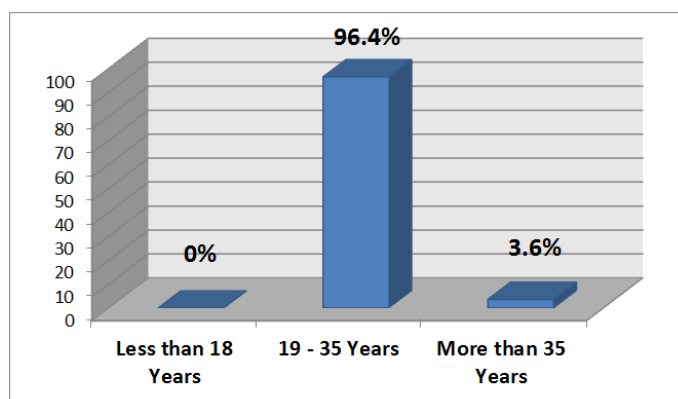
balance diet, liquid supply ORS (oral dehydration solutions) and dugs.

**Table-8: Health professional recommendations to the parents N=50**

Recommendation for treatment	Frequency	%
Balance diet	20	40%
Hygiene	1	2%
Children care	12	24%
Periodic diagnose	1	2%
Health awareness	9	18%
Breastfeeding	2	4%
other	5	10%
Total	50	100%

Table No. 8. Show the health professional recommendation to the parent. 40% advised balance diet as best way to avoid malnutrition.

### Children and Caregivers Results



**Fig-1: Shows Mother's ages. 96.4% of mother's ages were (19 – 35 years).**

**Table-9: Mother's and Father's Education level: N = 140**

Education level of mother	Frequency	Percent
Illiterate	30	21.4
Basic	65	46.4
Secondary	35	25.0
University	10	7.1
Total	140	100.0
Education level of Father		
Illiterate	18	12.9
Basic	62	44.3
Secondary	51	36.4
University	9	6.4
Total	140	100.0

Table No (9) Shows Mother's and Father's Education level. 46.4% of the mothers and 44.3% of the father's education level was basic school.

**Table-10: Mothers and Fathers Occupation N = 140**

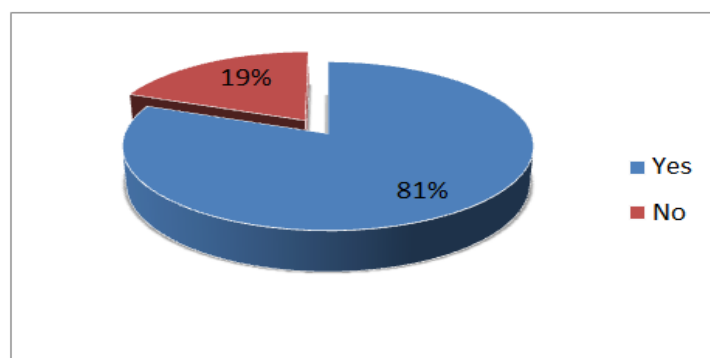
Occupation of mother	Frequency	Percent
Labor	8	5.7
Employee	8	5.7
Free work	17	12.1
Housewife	107	76.4
Total	140	100.0
Occupation of fathers		
Employee	15	10.7
Free work	67	40.2
Trade	6	5.0
Labor	52	37.1
Total	140	100.0

Table No (10) Represents mothers and fathers Occupation. 76.4% of mother's are housewives and 40.2% of father's free work (day by day work at the market).

**Table-11: Family income: N = 140**

Income/Month	Frequency	%
Less than 10.000	5	3.6
10.000-20.000	90	64.3
21.000-30.000	34	24.3
More than 30.000	11	7.8
Total	140	100.0

Table No (11): Shows the family income. 64.3% of the participants their income was (10.000- 20.000 SDG), According to MOF-Sudan is low income.

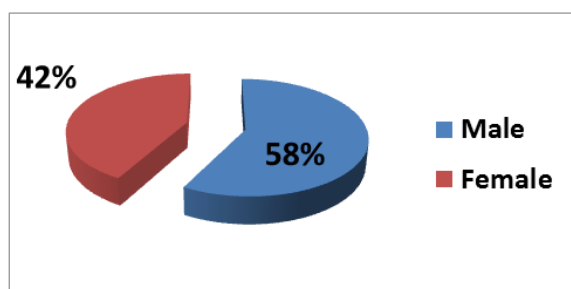


**Fig-2: Shows the knowledge of mothers about malnutrition. 81% of the mothers have knowledge about malnutrition.**

**Table-12: Child ages: N = 140**

Age	Frequency	Percent
6 month	4	2.9
6 - 12 month	45	32.1
12 - 24 month	61	43.6
24 - 36 month	20	14.3
36 - 48 month	10	7.1
Total	140	100.0

Table No (12) Shows malnourished children ages. 43.6% of the malnourished children their age were (12 – 24) month.

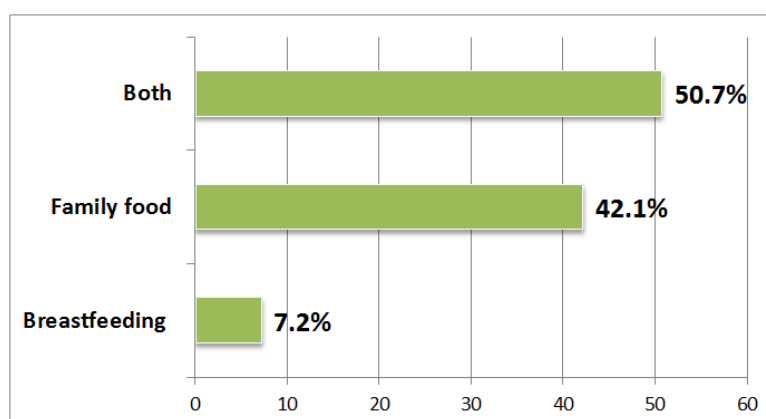


**Fig-3: Explains children gender characteristics. 58% of children gender was male**

**Table-13: Medical diagnosis of children: N = 140**

Diagnosis	Frequency	Percent
Under weight	16	11.4
Kwashiorkor	22	15.7
Marasmus	82	58.6
Marasmus-kwashi	20	14.3
Total	140	100.0

Table No (13): Shows that medical diagnosis of children 42.9% was marasmic.



**Fig-4: Shows the child food items. 50.7% were taken both family food and breastfeeding**

**Table-14: Children diseases before malnutrition: N = 140**

Acquired infections	Frequency	Percent
Malaria	25	17.9
Diarrhea diseases	38	27.1
TB	0	0.0
Other diseases	77	55.0
Total	140	100.0

Table No (14): Shows that children acquired diseases before they had got malnutrition. 55.0% have other diseases like Deficiency Anemia's, Pneumonia, Acute Bronchitis.

**Table-15: Number of children in the family: N = 140**

Options	Frequency	Percent
1 – 3	73	52.1
4 – 6	64	45.7
7 – 10	2	1.4
11	1	0.7
Total	140	100.0

Table No (15): Shows the number of children in the family. 52.1% of the families have 1-3 children.

**Table-16: Children weaning: N = 140**

Weaning status	Frequency	Percent
Gradually	112	80.0
Suddenly	28	20.0
Total	140	100.0

Table No (16): Shows the children weaning. 80% of children were weaned gradually.

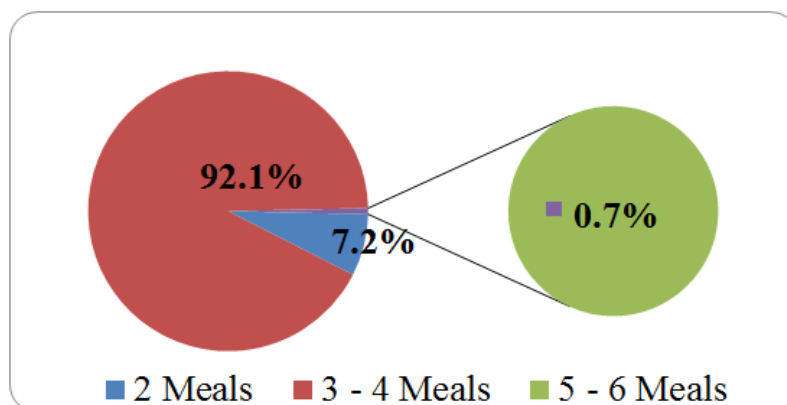


**Table-17: Starting of supplementary feeding: N = 140**

Starts	Frequency	Percent
After 4 month	32	22.9
6 - 8 month	103	73.6
9 - 12 month	5	3.6
Total	140	100.0

Table No (17): Shows that the starting supplementary feeding for the study group. 73.6% of

the study group starts supplementary feeding at age between (6 – 8) months.



**Fig-5: Explains the number of meals per day. 92.1% were eating (3 – 4 meals) per day**

## DISCUSSION

80% of the health professional works were female. 56% of the age characteristics are 25-45 years. Occupational analyses show that 48% are doctors (Table 1). In Sudan culture the occupation of nutritionist and nursing is suitable for female, This which explain why most of the professional worker are female.

50% the study group said that parent awareness with balance diet and economic and cultural situation are the main causes of malnutrition (Table 2). 52% of the health professionals agreed that malnutrition caused by low intakes of food than the equipments (Table 3). This result agrees with [20, 21] that the immediate causes of PEM include inadequate dietary intake and illness.

90% of respondent professionals agreed that international treatment protocols applied. This means good treatment and flow up are enough in the hospital (Table 4). This finding agrees with guidelines for management of severe malnutrition which substantially increased rates of recovery. Guidelines for the Inpatient Treatment of Severely Malnourished Children is apply [4, 12-14].

56% of the professionals agree that the number of children with malnutrition admit to hospital in the past five years increase year after year (Table 5). This result agrees with [16] report about the acute

malnutrition treated in the period (2015-2019) was increased yearly in Sudan.

68% of the professionals said that the problems faced them in clinical management mainly from parents (Table 6). The parents are not followed the treatment prescription.

66% of the professionals mention the suitable treatment that uses in hospitals are balance diet, liquid supply ORS (oral dehydration solutions) and dugs (Table 7). This result is agree with [14] inpatient Management of Severe Acute Malnutrition.

40% of the professionals advised parents to provide the children with balance diet to avoid malnutrition (Table 8). 96.4% of mother's ages were between (19 – 35) years, (Figure No 1) mothers are very young have no experience.

81% of the mothers have knowledge about malnutrition Figure No (2). Mother knowledge play vital role in children's intake to improve nutrition status [22] mentioned "unless mothers' economic status improves simultaneously with nutrition knowledge, they may not be able to practice what they know.

Fathers and mothers education level was basic education (44.3%) and (46.4) respectively (Table 9). This result agree with the statement mentioned by [6] low level of education and poor access to health services are among the major factors that contribute to high levels of malnutrition.



76.4% of mothers are housewives and 40.2% of the fathers were work in the market as free work. (Table10). This result means that most of the malnourished children depended on the father economically. Malnutrition was higher among families who have lower income. There is strong relation between the family income and malnutrition according the statement mentioned by [20] malnutrition is related to political, social, economic and environmental factors. Poor socioeconomic position was associated with chronic malnutrition since it inhibits purchase of nutritious foods such as milk, meat, poultry, and fruits 64.3% of the participants their income was (10000-15000 SDG)/ month, (Table11), which was consider as low income according to the classification of income in Sudan. Even after the improving employee's service conditions by amending allowances according to salaries of the year 2013 the participant's income still low [23]. About 8% of children belonged to low socioeconomic classes with poor hygienic and sanitary conditions are malnourished, and according the statement mentioned by [20] malnutrition is related to political, social, economic and environmental factors.

Children ages between (12-24) month was more affected with malnutrition (43.6%) than the other age groups, (Table 12). Malnutrition may occur at any age according the statement mentioned by [12].

A higher proportion of malnutrition in males (58%) than the females (figure No 3), this findings revealed a clear gender differences between genders. Study in rural areas of Eastern Kordofan and Darfur (Sudan) about environmental, socioeconomic and educational status show there are no clear gender differences [24].

According to medical diagnosis compared to other types of diseases among all children. The results from the study showed the distribution of malnutrition; Marasmus is higher, representing (42.9%) of all cases, while kwashiorkor (15.7%), Marasmic Kwash (14.3%), and underweight (11.4%).of the cases (Table13). Marasmus occur at any age particularly in early infancy according the statement mentioned by [12] (55%) of malnutrition children acquired infections before they had got malnutrition included diseases like Deficiency Anemia's, diarrhea, Pneumonia, Acute Bronchitis (Table 14). This result agrees with the statement mentioned by [25] Diarrhea and other infections can cause malnutrition through decreased nutrient absorption, decreased intake of food, increased metabolic requirements, and direct nutrient loss.

Malnutrition was higher among those have (1-3) child (52.1%). (Table 15) There is no relation as the statement mentioned by [6]. But indirectly the relation between number of children and malnutrition is the lack

of adequate nutrition and poor diets and food system and also the income of father as [21] mention "the underlying causes include: inadequate excess to food in the household, insufficient health services and healthy-full-environment".

(80.0%) of Malnutrition children were weaned gradually, (Table 16) this result disagree with [13] who mention the mothers have no knowledge about adequate weaning practices, which are all regarded as major leading factors of malnutrition among under five years of age children.

50.7% malnourished children take family food and breastfeeding (Figure 4). according the statement mentioned by [3] the quantity, type and choice of food items may not be ideal for the adequate growth of the child, and also child feeding practices especially lack of exclusive breastfeeding, poor hygiene, sanitation and caring practices. So introduction of timely, adequate and balanced weaning food is perhaps one of the most important single and direct remedial measures to combat infant's malnutrition. The family diets low in nutritional value, poverty, inadequate water supply, low sanitation and lack of mother's knowledge about adequate weaning practices are main factors for malnutrition [26].

Table 17 and Figure 5 are shows 73.6% of the malnourished children starting supplementary feeding between (6 – 8) month, and 92.1% consumed 3-4 meals/day. This finding confirms statement mentioned by [3] that the quantity and quality of these meals may not meet nutritional requirement. The quantity, type and choice of food items may not be ideal for the adequate growth of the child, and also child feeding practices especially lack of exclusive breastfeeding, poor hygiene, sanitation and caring practices contributed to malnutrition.

### 3. CONCLUSIONS

Hospital has been use national and international treatment protocols. All health professionals have being working continuously while affected children admitted to hospitals increase year after year. Low nutritional value diet, low income, poverty, lack of mother's knowledge, and infectious disease are main factors for malnutrition.

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