Original Research Article

Factors affecting Nutritional Status of inpatient and outpatient treatments of severe acute malnutrition (SAM)

ABSTRACT:

The study was conducted at the Centre of Nutrition in Elobeid Specialized Paediatric Hospital, Elobied, Sheikan Locality, North Kordofan State, Sudan. It aimed at evaluating the effect of some factors on nutritional status of under-five children (6-59 months) inpatients and outpatients therapeutic treatment of severe acute malnutrition (SAM). Eighty children were randomly selected from population size of 180 children where 40 children were treated inpatient by therapeutic milk (F100 and F75) and the other 40 children were treated outpatient by therapeutic foods (ready to use therapeutic foods, RUTF). Data was collected using questionnaire and observations. The data was analysed via the statistical package for social sciences (SPSS) program version 16. The study results showed that 57.5% of inpatients' respondents and 75% of outpatients' ones were weaned before reaching 24 months. Concerning inpatients and outpatients respondents, the reasons for early weaning were mothers' new pregnancy (48%) and (80%), mothers' illness (30%) and (20%) besides mothers' milk refusal (22%) and (0%). The study findings reported that inpatients and outpatients respondents used for feeding cup (82.5%) and (65%) also bottle (17.5%) and (65%), respectively, 80% of either inpatients' or outpatients' respondents ate their meals by themselves. The study results reported that 35 and 5% of the inpatients' and outpatients' respondents did not eat eggs. Moreover, the reasons of omission of eating eggs by inpatients' and outpatients' respondents were 71.4 and 50%, respectively referred to social tradition plus 28.6 and 50%, respectively due to children refusal. Drinking of goats' milk preferred by 30 and 7.5% of inpatients and outpatients' respondents. Regarding inpatient and outpatient respondents', the study findings reported that 50 and 45% of them faced difficulties in the ability for food ingestion during their treatment, respectively. The reason behind that, was the lack of desire in eating food because of disease according to all respondents viewpoint. It can be concluded that the above studied factors could affect the nutritional status of the children divergently. The study recommended that raising mothers' awareness about malnutrition causes, providing training opportunities for most vulnerable families, increasing nutrition services and additional centres for inpatient treatment should be considered.

Keywords: Malnutrition, inpatient, outpatient, treatment, therapeutic milk, therapeutic foods.

Comment [DK1]: TERM WEANING IS NO LONGER USED NOW

1. INTRODUCTION

Malnutrition in children is the consequence of a range of factors that are often related to poor food quality, insufficient food intake, and severe and repeated infectious diseases, or frequently some combinations of the three. Growth assessment thus not only serves as a means for evaluating the health and nutritional status of children but also provides an indirect measurement of the quality of life of an entire population [1].

Food insecurity, or an inability to access enough food, is often cited as a cause of malnutrition. The FAO has outlined six factors that work together to predispose individuals to food for instance agricultural production of food, the preservation of food (including processing), the population in terms of child spacing and overall density, the prevalence of poverty, political ideologies, disease and infection epidemiology. Usually there is not one single cause of malnutrition, but various factors at both the individual and communal levels that contribute [2].

Malnutrition can lead to various secondary health conditions that impact morbidity and mortality. Deficiencies of vitamin A, found in a variety of green and leafy vegetables, can lead to blindness and increased rates of infection [3].

The best way to prevent malnutrition is to eat a nutrient diverse and balanced diet. Immunized and supplementary nutrients for children can also lower the burden of severe and moderate malnutrition [4].

For the first six months of life, exclusive breastfeeding is the best source of nutrition for infants under six months. It enhances infant and maternal health by providing essential antibodies, enzymes and easily digestible nutrients. Breastfed infants are less likely to suffer from infectious diseases, diarrhea and severe bacterial infections, reducing infant morbidity and death. Exclusive breastfeeding also contributes to women's health by lowering female fecundity and increasing birth intervals, possibly benefitting infants for years to come [5].

The early cessation of breastfeeding for cultural reasons or due to the mother's lack of production contributes to childhood malnutrition. Ceasing breastfeeding often limits an infant's intake of calories and of vital antibodies that support immune system functioning and prevent diarrheal disease [6].

The severity of chronic and acute malnutrition is diagnosed using anthropometric measures. Those with moderate acute malnutrition (MAM) or moderate chronic malnutrition (MCM) are 2–3 standard deviations below the population's weight for age and height for weight averages. Similarly, those who are severely acutely malnourished (SAM) or severely chronically malnourished (SCM) are at least 3 standard deviations below the population's growth averages [7.

According to WHO and UNICEF, Ready-to-Use Therapeutic Food (RUTF) is home-based treatment for severely malnourished children between six months and five years old malnourished children have a higher risk of death and illness. Moreover, WHO and UNICEF, [9], defined that F-100 and F-75 (also known as formula 100 and formula 75) are therapeutic milk products designed to treat severe malnutrition.

Ready to use therapeutic food (RUTF) are useful to treat severe malnutrition without complications in communities with limited access to appropriate local diets for nutritional rehabilitation [8].

1.1 Objectives of the study: The objective of this paper was to evaluate the effect of some factors on nutritional status of under-five children (6-59 months) inpatients and outpatients therapeutic treatment of severe acute malnutrition (SAM).

2. MATERIALS AND METHODS:

Comment [DK2]: HOW SAMPLE SIZE IS CALCULATED?
WHAT IS STUDY DESIGN?
COMMENT ON ETHICAL APPROVAL

2.1 Study area: The study was carried out in the Nutrition Centreat Elobied Specialized Pediatric Hospital, Elobied, Sheikan Locality, North Kordofan State. North Kordofan State located at latitude 12° 15 – 16° 32 N and longitude 27° – 32° E, the area of the state is 19480 km2, it is divided in to 13 localities and consisted of more than 35 administrative units, the total number of citizens is 2920992 according to 2008 census.

2.2 Sampling techniques: The study sample population composed of children under five years (6 to 59 months), 80 children has been randomly selected from population size of 180 children as study samples using the following equation according to Balal *et al*. [10].

$$N = \log (1 + (\propto 2 * n)/(\propto 2))$$

Where:

N= size of the sample

$\alpha = 0.01$

n = monthly target

Forty Children were treated inpatient by therapeutic milk (F100 and F75) and the other 40 children were treated outpatient by therapeutic foods (ready to use therapeutic foods, RUTF).

2.3 Inclusion criteria: children under five years (6-59 months) old.

2.4 Exclusion criteria: More than 5 years children and parental refusal to participate in the study.

2.5 Data Collection: The study data collection depended on primary and secondary data, the primary data was collected by questionnaire and observations. The secondary data was collected from the reports, books, journals and previous studies.

2.6 Data Analysis: The data were analysed using Statistical Package for Social Sciences (SPSS), software, version (16) (percentages). The percentages and means were calculated. The results were presented in tables and figures.

3. RESULTS AND DISCUSSION:

3.1 Localities of treated children: As shown in the Table (1), with regard to the children who treated from malnutrition at the hospital, it is clear that the inpatients belonged to different localities which were Sheikan (55%), Dalanaj (10%), Elfola (10%), Bara (7.5%), Sodary (5%), Errahad (2.5%), Ennuhud (2.5%), Gebaish (2.5%), Abokarshula (2.5%) and Lagawa (2.5%). Moreover, the outpatients were from two localities which are Shikan (95%) and Errahad (5%).

Table 1. Localities of inpatients and outpatients children

Inpatient (SC)			Outpatient (OTP)		
Locality	**Frequency**	**(%)**	**Locality**	**Frequency**	**(%)**
Sheikan	22	55.0	Shikan	38	95.0
Dalang	4	10.0			
Elfola	4	10.0			
Bara	3	7.5			
Rahad	1	2.5	Rahad	2	5.0
Sodary	2	5.0			
Elnhoud	1	2.5			
Gebaish	1	2.5			
Abokarshola	1	2.5			
Lagawa	1	2.5			
Total	**40**	**100.0**	**Total**	**40**	**100.0**

3.2 Sex of respondents: Table (2) showed that males and females were equal in inpatient respondents (50%). Concerning outpatient respondents, the females were 55% whereas for outpatient were 45%. This result was agreed with what reported by [11].

Table 2. Sex of respondents

Inpatient (SC)			Outpatient (OTP)		
Sex	**Frequency**	**(%)**	**Sex**	**Frequency**	**(%)**
Female	20	50.0	Female	22	55.0
Male	20	50.0	Male	18	45.0
Total	**40**	**100.0**	**Total**	**40**	**100.0**

3.3 Age of respondents: Table (3) showed the ages of the respondents, in the two treatments, the first category (6-18) months contained inpatient and outpatients' respondents 50 and 65%, respectively. In the second category (19-31) months, the inpatients and outpatients respondents were 40 and 27.5%, respectively. In the third category (32-43) months, include inpatients and outpatients respondents with percent 5 and 2.5%, respectively. In the last category (44-59) months, inpatient and outpatient respondents represented with 5 and 5%, respectively. The majority of mal-nourished children were found to be from the first category (6-18) months and this is could be attributed to the early weaning.

Table 3. Age of the Respondents'

Inpatient (SC)*			Outpatient (OTP)*		
Months	**Frequency**	**(%)**	**Months**	**Frequency**	**(%)**
6-18	20	50	6-18	26	65
19-31	16	40	19-31	11	27.5
32-43	2	5	32-43	1	2.5
44-59	2	5	44-59	2	5
Total	**40**	**100.0**	**Total**	**40**	**100.0**

3.4 Number of family members: Table (4) showed the number of family members, in case of inpatients respondents, the categories (1-3) (4-7) and (8-11) members of the respondents' families represented by the ratios 7.5, 70 and 22.5%, respectively. On the other hand, for outpatient respondents, these mentioned categories represented with ratios 65, 27.5, 2.5 and 5%, respectively. As the results indicated there were obvious findings that the mal-nutrition susceptibility was found to be more in the families with large number of members.

Table 4. Number of family members

Inpatient (SC)*			Outpatient (OTP)*		
Category	**Frequency**	**(%)**	**Category**	**Frequency**	**(%)**

1-3	3	7.5	1-3	2	5
4-7	28	70	4-7	26	65
8-11	9	22.5	8-11	12	30
Total	**40**	**100.0**	**Total**	**40**	**100.0**

3.5 Birth weight of respondents: For both inpatients' and outpatients' respondents, the study results revealed that all mothers were not familiar with the weight of the child at the birth time (Table, 5), this findings indicated the ineffectiveness of the role of midwives for the weight of the children at the moment of birth. Hence it is important for the mother to know the weight of her infant which helps her for the good nutritional and health management.

Table 5. Birth weight at delivery

Inpatient (SC)			Outpatient (OTP)		
Birth weight	**Frequency**	**(%)**	**Birth weight**	**Frequency**	**(%)**
I don't know	40	100	I don't know	40	100
I know	0	0	I know	0	0
Total	**40**	**100.0**	**Total**	**40**	**100.0**

3.6 Order of the child in the family: Table (6) showed the order of the child in the family, in case of inpatient respondents, were found to be (0, 85, and 15%) as a first child, (2-5) order, and (6-10) order, respectively. Whereas for out patients' respondents, they were (0, 75, and 25%) as a first child, (2-5) order, and (6-10) order, respectively. From these results it was clearly seen that most of the affected children ranked as (2-5) in order in their family in the both of inpatient (85%) and outpatient (75%) respondents. This could be attributed to the less attention of mother's towards them especially when a new pregnancy is assigned.

Table 6. Order of the child in the family

Inpatient (SC)*			Outpatient (OTP)*		
Order	**Frequency**	**(%)**	**Order**	**Frequency**	**(%)**
First child	0	0	First child	0	0
2-5	34	85	2-5	30	75
6-10	6	15	6-10	10	25
Total	**40**	**100.0**	**Total**	**40**	**100.0**

3.7 Weaning before 24 months age and the reasons: As shown in table (7), 57.5% of inpatient respondents were weaned before 24 months age whereas 42.5% continued breastfeeding till 24 months age. Regarding outpatient respondents, 75% of them were weaned before 24 months of age while 25% were continued breastfeeding till 24 months age. The reasons of weaning before 24 months age, regarding inpatients' respondents, might be attributed to several reasons, for instance, mother's new pregnancy (48%), mother's illness (30%) and refusing of taking mother's milk (22%). In case of outpatients' respondents, might be referred to mother's new pregnancy (80%) and mother's illness (20%). This shows the lack of awareness of mothers of the danger of sudden weaning of the infant and it is one of the causes of malnutrition among under the age of five. Early cessation of breastfeeding is one of the main causes of malnutrition problems among children of five years of old [6].

Comment [DK3]: TIMELY APPROPRIATE COMPLEMENTARY FEEDING IS STARTED AFTER 6 COMPLETED MONTHS. WHY BEFORE 24 MONTH IS TAKEN IN STUDY? SMALL TABLES CAN BE COMBINED IN ONE TABLE SHOWING DESCRIPTIVE ANALYSIS OF STUDY.
ASSOCIATION SOF VARIOUS RISK FACTORS WITH RESEARCH QUESTION TO BE CALCULATED.

Table 7. Weaning before 24 months age and the reasons

Inpatient (SC)			Outpatient (OTP)		
Weaning	**Frequency**	**(%)**	**Weaning**	**Frequency**	**(%)**
Yes	23	57.5	Yes	30	75
No	17	42.5	No	10	25
Total	**40**	**100.0**	**Total**	**40**	**100.0**
Reasons of weaning before 24 months age					
Reasons	**Frequency**	**(%)**	**Reasons**	**Frequency**	**(%)**
Pregnancy	11	48	Pregnancy	8	80
Illness	7	30	Illness	0	0
Refusing	5	22	Refusing	2	20
Total	**23**	**100.0**	**Total**	**10**	**100.0**

3.8 Ingestion of foods for the first time: Table (8) showed the ingestion of food for the first time. 37.5% of inpatients' respondents were serving a food for the first time when their ages between 1-3 months. Besides 62.5% of them ingested their first food when their ages between 4-6 months. Regarding outpatients' respondents, 10% of outpatients' respondents ingested food when their ages between (1-3) months and 90% of them ingested food when their ages between (4-6) months. From the nutritional point of view it was recommended that the starting of the first serving of food should be after 4 or 6 months of age.

3.9 Types of foods consumed by the respondents: Regarding inpatients' respondents, the most typeS of food eaten by them, for the first time, was fermented bread (*assida*) with meat porridge (*molahsharmot*) (47.5%) followed by starchy foods (22.5%) then milk (20%) and lentil (10%). In case of outpatients' respondents, the most consumed food was fermented bread (*assida*) with meat porridge (*molahsharmot*) (32.5%) followed by milk (27.5%) then lentil (22.5%) and starch foods (17.5%) (Table, 8). This indicates that some mothers have good awareness about food and nutrition because they are offering different types of foods to their children that consist of carbohydrates, proteins, lipids, minerals and vitamins. These lead to proper maintenance of the body cells and organs as well good growth that result in a better health and protection from disease.

Table (8) Ingestion of foods and their types for the first time

Inpatient (SC)*			Outpatient (OTP)*		
Months	**Frequency**	**(%)**	**Months**	**Frequency**	**(%)**
1-3	15	37.5	1-3	4	10
4-6	25	62.5	4-6	36	90
Total	**40**	**100.0**	**Total**	**40**	**100.0**
Type of foods consumed by infant first time					
Food type	**Frequency**	**(%)**	**Food type**	**Frequency**	**(%)**
Fermented bread	19	47.5	13	32.5	13
Milk	8	20.0	11	27.5	11
Lentil	4	10.0	9	22.5	9
Starch foods	9	22.5	7	17.5	7
Total	**40**	**100.0**	**40**	**100.0**	**40**

3.10 Types of feeding devices: As shown in table (9), in case of inpatients' respondents, the study findings showed that 82.5% of them used cups for feeding whereas 17.5% of them used bottles for feeding. Concerning outpatients' respondents, it is found that 65% of them used cups as a feeding device but 35% of them used bottles for feeding. These results indicated the knowledge of some mothers and their awareness about the risk of using bottle as feeding device as well as its contribution in contamination of microbes.

Table (9) Feeding's devices

Inpatient (SC)			Outpatient (OTP)		
Feeding device	**Frequency**	**(%)**	**Feeding device**	**Frequency**	**(%)**
Cup	23	82.5	Cup	26	65.0
Bottle	7	17.5	Bottle	14	35.0
Total	**40**	**100.0**	**Total**	**40**	**100.0**

3.11 First visits of mal-nourished children for the treatment: Based on the study results, the first visits of the inpatients' respondents to the cure centers were found to be after (1-2), (3-4) and (5-7) days after the feeling of the disease according to the opinion of 15, 70 and 15%, of respondents, respectively. On the other hand, the outpatient respondents visited the cure centers for the first time after (1-2), (3-4) days after the feeling of disease and (5-7) depending on what was reported by 55, 27.5 and 17.5% of the respondents (Table 10).

Table (10) First visit of mal-nourished children for the treatment

Inpatient (SC)*			Outpatient (OTP)*		
Days	**Frequency**	**(%)**	**Days**	**Frequency**	**(%)**
1-2	6	15	1-2	22	55

3-4	28	70	3-4	11	27.5
5-7	6	15	5-7	7	17.5
Total	**40**	**100.0**	**Total**	**40**	**100.0**

3.12 Home distance of respondents: The distance from the respondents' home to the treatment center is crucial to determine the availability of health services. In case of the inpatients' respondents in this study, 42.5% of respondents were live far away from the treatment center whereas 57.5% of them were live near the centers. Regarding the outpatient respondents, 20% of them were live far away from the center but 80% of them were live near the centers (Table, 11). These findings indicated the expansion of nutrition and health services, especially the centers that provide external treatment services hence there is an urgent need for the availability of the centers providing internal treatment services to reduce the concentration of treatment in cities and to reduce the burden of travel for families.

Table 11. Home distance of respondents

Inpatient (SC)			Outpatient (OTP)		
Faraway	**Frequency**	**(%)**	**Faraway**	**Frequency**	**(%)**
Yes	17	42.5	Yes	8	20.0
No	23	57.5	No	32	80.0
Total	**40**	**100.0**	**Total**	**40**	**100.0**

3.13 Types of foods taken by respondents: As shown in table (12), regarding the inpatients' and outpatients' respondents, all of them took liquid and solid foods during the treatment period, respectively. This result showed that the mothers are very knowledgeable about not introducing other foods with the prescribed milk in the internal treatment.

Table 12. Types of foods taken by respondents

Inpatient (SC)			Outpatient (OTP)		
Food type	**Frequency**	**(%)**	**Food type**	**Frequency**	**(%)**
Liquids	40	100	Liquids	0	0
Solids	0	0	Solids	40	100
Total	**40**	**100.00**	**Total**	**40**	**100.00**

3.14 Eating of respondents by themselves: The study findings revealed that 80% of the inpatient and outpatients' respondents used to eat their meals by themselves while 20% did not accomplish that (Table, 13). These results indicated that most of the respondents in both treatments depended on themselves when eating their meals; this may lead to malnutrition if they were not eating enough quantities of food. Moreover, eating alone may lead to some bad social habits like shyness, stinginess, and unsocial character. On the other hand, if they eat with the family member might lead to shortage of food quantities they take due to the competition with the different members of the family.

Table 13. Respondents eating by themselves

Inpatient (SC)			Outpatient (OTP)		
Eat by him self	**Frequency**	**(%)**	**Eat by him self**	**Frequency**	**(%)**
Yes	32	80.0	Yes	32	80.0
No	8	20.0	No	8	20.0
Total	**40**	**100.0**	**Total**	**40**	**100.0**

3.15 Eating eggs by respondents: As displayed in table (14), pertaining to inpatients' respondents, the study outcomes indicated that 65% of the respondents accustomed to eat eggs whereas 35% of them did not use to do that. Regarding the outpatients' respondents, most of them (95%) accustomed to eat eggs while 5% did not use to do that. These results reflected the food culture in cities is more applicable than in villages also some people think that eating eggs may cause some health problems. In case of respondents who did not eat eggs, for the inpatients and outpatients ones, the study findings revealed that 71.4 and 50% of them referred the reason for that was the social tradition. Whereas 28 and 50% of them said that the reason was children themselves who refused to eat eggs. To convince the respondents on eating eggs as one of most important food items which rich in food constituents, extension and awareness on food and nutrition is urgently needed.

Table 14. Eating eggs by the respondents and the reasons for not eating it

Inpatient (SC)			Outpatient (OTP)		
Eating eggs	**Frequency**	**(%)**	**Eating eggs**	**Frequency**	**(%)**
Yes	26	65.0	Yes	38	95.0
No	14	35.0	No	2	5.0
Total	**40**	**100.0**	**Total**	**40**	**100.0**
Reasons for not eating egg					
Inpatient (SC)			**Outpatient (OTP)**		
Reason	**Frequency**	**(%)**	**Reason**	**Frequency**	**(%)**
Tradition	10	71.4	Tradition	1	50
Refusing	4	28.6	Refusing	1	50
Total	**14**	**100.0**	**Total**	**2**	**100.0**

3.16 Drinking goats' milk by respondents: The study results (Table, 15), for inpatients' respondents, showed that 30% of them drank goats' milk. Concerning the outpatients' respondents, only 7.5% of them drank goats' milk. These findings showed that most of the mothers did not follow the traditional knowledge of the similarity of goat milk and mother milk or may be also due to limited raising of goats among the families especially in the cities.

Table 15. Drinking of goats' milk by respondents

Inpatient (SC)			Outpatient (OTP)		
Drinking	**Frequency**	**(%)**	**Drinking**	**Frequency**	**(%)**
Yes	12	30.0	Yes	3	7.5
No	28	70.0	No	37	92.5
Total	**40**	**100.0**	**Total**	**40**	**100.0**

3.17 Traditional methods of treatment: The study results for inpatients respondents indicated that 60% of them treated themselves by the tradition methods like burning (*kay*) and injury (*fasad*) whereas in case of outpatients' respondents, 80% of them treated by these traditional methods (Table 16). These results showed that traditional practices are still practiced for the treatment of some diseases according the parents' thought which may affect negatively the nutritional and health of the children. Moreover, it can make some psychological problems to the children. To stop these bad habits more awareness and health advice are needed.

Table 16. Traditional methods treatment for respondents

Inpatient (SC)			Outpatient (OTP)		
Treated	**Frequency**	**(%)**	**Treated**	**Frequency**	**(%)**
Yes	24	60.0	Yes	32	80.0
No	16	40.0	No	8	20.0
Total	**40**	**100.0**	**Total**	**40**	**100.0**

3.18 Difficulties in ability of food ingestion by the respondents: Regarding the inpatient respondents, the study findings reported that 50% of the respondents faced difficulties in the ability for food ingestion during their treatment. Nevertheless, for the outpatient respondents 45% of them faced the same difficulties among their treatment (Table, 17). The reason for the inability for food digestion was the lack of desire in eating food because of disease according the outlook of all inpatients and outpatients respondents (Table, 17). The disease is the major factor for loss of appetite which leads to health deterioration.

Table 17. Difficulties in ability for food ingestion by respondents and the reasons

Inpatient (SC)			Outpatient (OTP)		
Facing	**Frequency**	**(%)**	**Facing**	**Frequency**	**(%)**
Yes	20	50.0	Yes	18	45.0
No	20	50.0	No	22	55.0
Total	**40**	**100.0**	**Total**	**40**	**100.0**
Reasons for inability for food ingestion					
Inpatient (SC)			**Outpatient (OTP)**		
Reason	**Frequency**	**(%)**	**Reason**	**Frequency**	**(%)**
Disease	20	100	Disease	18	45.0

Others	0	50.0	Others	0	55.0
Total	**20**	**100.0**	**Total**	**18**	**100.0**

4. CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions: According to the findings of this paper it can be concluded that the total number of respondents (under five) was 80, half of them were inpatients and the others were outpatients. The inpatients' respondents came from different localities in big kordofan region while the outpatients' ones came from only two localities in north Kordofan state. Nearly the respondents of both treatments divided equally to males and female. More than half of the inpatients' and third quarter of outpatients' respondents were weaned early. The reasons of this early weaning were mothers' new pregnancy, mother illness and refusal of mothers' milk by child. The study findings reported that inpatients and outpatients respondents mostly used cup and in a lesser degree bottle for feeding. Eighty percent of either inpatients' or outpatients' respondents eat their meals by themselves. The study results reported that 35 and 5% of the inpatients' and outpatients' respondents did not eat eggs. Moreover, the reasons of omission of eating eggs by inpatients' and outpatients' respondents referred that to the social tradition and to refusal by children. Drinking of goats' milk was preferred by 30 and 7.5% of inpatients and outpatients' respondents. Regarding the difficulties in the ability for food ingestion during their treatment, half of inpatients' and outpatients' respondents, faced these difficulties. The reason for the inability for food digestion was the lack of desire in eating food because of disease according the outlook of all inpatients' and outpatients' respondents. It is worth to mention that the above studied factors could affect the nutritional status of the children in different manners.

4.2 Recommendations: The study recommended that raising mothers' awareness about the factors leading to malnutrition, providing training opportunities for the most vulnerable families, focusing efforts on increasing nutrition services and additional centers for inpatient treatment should be considered.

ETHICAL APROVAL AND CONSENT

This study got ethical approval from the Ministry of Health, North Kordofan State. In addition to the Centre of Nutrition at Elobeid Specialized Pediatric Hospital, Elobied, Sheikan Locality, North Kordofan State, Sudan. Before enrollment of the children in the study, the mothers have got informed consent about the study.

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