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Comparative analysis of different factors involved in Hospital Admission Criteria of Malnourished children in River Nile State Hospitals, Sudan

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Abstract

    This is a nutritional hospital - based study. The study was conducted on 220 children (110 males and 110 females), among whom were 40 children at the age between (0-6 months), 60 children at the age between (7-12 months), 60 children between (13-18 months) and 60 children at the age between (19-23 months) respectively. The study samples were selected from Sudan- River Nile State's Major Hospitals (Aldamer, Atbara and Shendi) to assess the effect of therapeutic nutritional formulae on malnourished children under two in River Nile State Hospitals. Primary data was collected using a questionnaire which was filled by children mothers and secondary data was collected from different books, journals, internet and other related research reports. The primary data was analyzed using Statistical Package for Social Science (SPSS).

    The majority of fathers (71.4%) and mothers (64.1%) were illiterate, followed by (12.7%) of fathers and (21.4%) of mothers who had only primary level of education. While 12.3% of mothers and 8.6% of fathers had secondary level of education and only 2.3% of mothers and 7.3% of fathers who had university level of education.

    These results indicated that the prevalence of low levels of education among the parents could have affected the introduction of complementary feeding and diversity of food that should be introduced

to their children. Most families were of low socioeconomic status (86.4% earning <1000 SDG per month), (13.6% earning 1000-2000 SDG per month), and were living in areas with poor environmental and sanitation conditions. The percentage families who had children less than five years were (49.1%) in families who had two children and (42.3%) in families who had two to three children and (8.6%) in families who had more than three children. Those families might face many difficulties to care about such number. 60.5% of the mother said there had no previous hospital admissions for malnutrition. 39.5% of the mothers stated that their children were admitted due to malnutrition.

In this study (55.9%) of the families had no background knowledge about malnutrition. They had mentioned different signs and symptoms such as wasting of the child's body (31.8%) and loss of appetite (12.3%). The main reasons behind hospital admission were diarrhea (72.3%) followed by low food intake (19.5%) and (8.2%) due to vomiting respectively. (76.4%) of respondents were taking other foods than therapeutic milk and 23.6% of the children didn't pass appetite test.

Food taboos were not highly prevalent among the attitudes of the respondents; the majority of them (87.3%) were not strongly believers in food taboos. Mostly, the families of the respondents were from low socioeconomic society. They were earning low income and with low education and occupational levels. Income and education are among the determinant factors of child's nutritional and health status leading mostly to hospital admission.

Infections causing diarrhea, weight loss, respiratory tract infection, urinary tract infection, and loss of appetite as well as vomiting and nausea were reported among the studied hospitalized children, which indicated close association to malnutrition and other types of nutritional disorders among the studied group.

Key words: Socioeconomic; Education; Admission Criteria

INTRODUCTION:

Malnutrition in children is a term most commonly used to indicate protein energy malnutrition (PEM) that is related to under nutrition.

According to the World Health Organization (WHO, 2000), malnutrition is the cellular imbalance between supply of nutrients and energy and the body's demand for them to ensure growth, maintenance and specific functions. It is the greatest risk factor for illness and death hospital admission worldwide among children. It is due to state of deficiency of energy, protein and other nutrients and leads to measurable adverse effects on tissues, body function, appearance and clinical outcomes (Dimosthenopoulos, 2010). PEM is an important public health issue particularly for children under five years' old who have a significantly higher risk of mortality and morbidity than well-nourished children in low and middle income countries where it is linked with poverty. New research estimates that the risks related to stunting and severe wasting are linked to 2.2 million deaths and 21% of disability-adjusted life years worldwide for children under five years old. Sub-optimum breast feeding, particularly for infant less than six months, is also a leading factor in childhood morbidity and mortality (Robert, 2008).

Children with severe malnutrition are at risk of several life-threatening problems like hypoglycemia, hypothermia, serious infection and severe electrolyte disturbances. Because of this vulnerability, they need careful assessment, special treatment and management, with regular feeding and monitoring. Their treatment in hospital should be well organized and given by specially trained staff. As recovery may take several weeks, their discharge from hospital should be carefully planned in order to provide outpatient care to complete their rehabilitation and to prevent relapse (WHO, 2000). Living standards, water and sanitation, parity, birth interval, sex of child, weaning practices and mothers level of education are a few of the important contributory factors which have been highlighted. However, dietary inadequacy is the basic cause of malnutrition in pre-school children (Raheela, 1994)

The level of income is by far the greatest single cause of variability in food intake although income is not the only measure of poverty. When the household income decreases, it is usually the women who try earning extra wages causing the mother to have less time for child care (Lipton, 1998).

Malnutrition is worsened by a lack of nutritional information and knowledge, especially maternal nutrition education. This leads to

unhealthy dietary habits, poor nutrition related practices and attitudes, perceptions and socio-cultural influences (NDoH, 2003). For families to be healthy with a good nutritional status, they need knowledge, awareness and good nutritional practices regarding child growth, purchasing, processing, and preparation of food, in the right quantities and combinations (NDoH 2005a).

Female children are involved in household responsibilities resulting in poor school attendance, which influences education leading to poor knowledge and caring practices for her present and future families (UNICEF, 2002). Lack of nutritional knowledge can also lead to misconceptions about food and negative food traditions that are passed on from generation to generation (NDoH 2005b).

Better maternal knowledge leads to better childcare practices like breastfeeding for longer than six months and the delayed introduction of solids (Kalanda et al., 2006). Uneducated mothers have trouble preparing infant formula correctly and the milk is too expensive to give sufficient amounts hence end up using diluted cow's milk (Berdanier, 1995).

Statement of Problem:

Malnutrition is a serious health problem that threatens child's life. The early years in child's life are critical because the child in state of rabid growth. This rabid growth involves tissue and organ maturation that mean energy and nutrient requirements are high relative to body size during the first years of life. Good nutrition is an essential component of good health. Malnutrition is a known contributing factor to disease and death in the developing world. Malnutrition affects approximately 800 million people (WHO, 2003), greater than 340 million of whom are children under the age of five, over six million of these children die every year from malnutrition related causes (UNS-SCN, 2004).

Justification for the work:

In Sudan, Protein-Energy Malnutrition (PEM) is believed to lead to an increased susceptibility to infection, or cause impaired immunity. Infection, occurring with malnutrition, is a major cause of morbidity in all age groups and is responsible for two-thirds of all death under five years of age in developing countries (WHO, 2009).   Malnutrition

is increasingly recognized as a prevalent and important health problem in many developing countries including Sudan. This problem has serious long-term consequences for the child and adversely influences their development besides increasing the health care loads.

General objective:

This study was a comparative analysis of different factors involved in hospital admission criteria for Malnourished children attending major hospitals in River Nile State, Sudan.

Specific objectives:

- To assess nutritional status of children under two years admitted to the hospitals
- To look into the effects of economic and social factors on the nutrition status of children.
- To measure MUAC, Length and Head Circumference of the Malnourished children attending the hospitals.

Materials and Methods:

Study Area: Major Hospitals (Aldamer, Atbara, Shendi) in River Nile State (RNS), Sudan.

Study population: Malnourished children of the ages 0-23 months admitted to (RNS) major Hospitals.

Sample size: The sample size was determined according to the available subjects who were admitted to hospitals during 2015 to 2018 (220 children; 110 males and 110 females) who were admitted and stayed for one week).

Inclusion Criteria: All children suffering from malnutrition of the ages 0-23 months and had less than the normal weight for their ages and showed other clinical symptoms of malnutrition.

Control Group: All children suffering from malnutrition of the ages 0- 23 months, and had normal weights for their ages but had other clinical symptoms of malnutrition.

Data collection: Primary data was collected by using a questionnaire, designed to recall information on demographic and socio-economic characteristics of malnourished patients and their dietary patterns. An assessment of patient's bodies including weight

for height was conducted to determine their nutritional status and weight change during the period of staying in hospital. The secondary data was collected by reviewing the available literature.

Plan of work: Two years were allocated for conducting the study and data collection.

Admission Criteria: Admission Criteria for inpatient Care for Children 0-23 months were upon bilateral pitting edema +++, or any grade of bilateral pitting edema with severe wasting, or SAM (bilateral pitting edema + or ++ or severe wasting) with any of the following complications: Anorexia, Poor appetite, Intractable vomiting, Convulsions, Lethargy, Not alert, Unconsciousness, Hypoglycemia, High fever, Hypothermia, Severe diarrhea, Lower respiratory tract infection, Severe anemia, Eye signs of vitamin A deficiency and Dehydration.

Anthropometric Measurements:
*MUAC
*Weight
*Length
*Head Circumference

Results and Discussion:
As shown in Table (1) the majority of fathers (71.4%) and mothers (64.1%) were illiterate, followed by (12.7%) of fathers and (21.4%) of mothers who had primary level of education. 12.3% of mothers and 8.6% of fathers had secondary level of education and only 2.3% of mothers and 7.3% of fathers were university graduates.

These results indicated the prevalence of low levels of education among the parents. This could affect the introduction of complementary feeding and diversity of food that should be introduced to children.

This result agreed with (Raheela, 1994) who studied living standards, water and sanitation, parity, birth interval, sex of child, weaning practices and mothers level of education. She stated that these were a few of the important contributory factors which had been highlighted. However, she confirmed that dietary inadequacy was the basic cause of malnutrition in pre-school children.

The parents of the respondents in this study showed low economic status. 86.4% of families were having a monthly income of

1000 SD and (13.6%) their monthly income ranged between 1000 - 2000 SD per month. This finding indicated both low education and low income were closely associated with poor nutrition and nutritional disorders among their children. This result agreed with (Lipton, 1998) who indicated that the level of income was by far the greatest single cause of variability in food intake although income was not the only measure of poverty. When the household income decreased, it was usually the women who tried earning extra wages causing the mother to have less time for childcare.

Thus one may expect high prevalence of malnutrition among the study population that had affected directly both the quality and quantity of food and the purchasing power (WHO, 2004).

Table (1) Demographic data

		N	%
Gender	Male	110	50.0
	Female	110	50.0
Group Total		220	100.0
Age	0-6 months	*40*	*18.2*
	7-12 months	*60*	*27.3*
	13-18 months	*60*	*27.3*
	19-23 months	*60*	*27.3*
Group Total		*220*	*100*
Socioeconomic status	<1000 SDG	190	86.4
	1000-2000 SDG	30	13.6
Group Total		220	100.0
Education: Father	Illiterate	157	71.4
	Primary	28	12.7
	Secondary	19	8.6
	University	16	7.3
Group Total		220	100.0
Education: Mother	Illiterate	141	64.1
	Primary	47	21.4
	Secondary	27	12.3
	University	5	2.3
Group Total		220	100.0

As shown in Table (2) the percentage of the families who had children less than five years were (49.1%) who had two children, (42.3%) who had two to three children and (8.6%) who had more than three children respectively. (91.4%) of these families might have good spacing interval between children or had lost some of their children. This could mean that they had no additional burden to care regarding

the malnourished child. The mother could have much time to look after the diseased child and give him or her all required attention. The rest of the families (8.6%) had more than three children whom are expected to face many difficulties to care about such number (Maxwell and Smith, 1992).

UNICEF, (2002) reported that for the health of both mothers and children, there should be a space of at least two years between births. The risk of death for young children increases by nearly 50% if the space between births is less than two years.

Table (2) Number of children below 5 years in the family

Number of children below 5 years in the family	N	%
1-2 children	108	49.1
2-3 children	93	42.3
3-4 children	19	8.6
Total	220	100.0

More than half of the study participant 123 representing (60.5%) of the mothers said there had no previous hospital admissions for malnutrition. (Table 3). The recurrent of malnutrition for most of the children did agree with the previous study by (WHO, 2013). If the child was discharged before full recovery or he/ she did not pass the appetite test had to complete treatment and should be readmitted.

Table (3) History of recurrent malnutrition in the child

		N	%
Previous admission to hospital due to Malnutrition	Yes	87	39.5
	No	133	60.5
Group Total	220	100.0	220

The results in Table (4) revealed that nearly half of the study participants 123 representing (55.9%) had no background knowledge about malnutrition. They had stated some signs and symptoms such as wasting of the child's body (31.8%) and loss of appetite (12.3%).

Mother knowledge about malnutrition among children is of great importance particularly when accompanied with adequate information about the required nutritional needs for malnourished child as well as the right nutritional practices for infants. Nutritional

education for mothers represents the corner stone in combating malnutrition and associated disorders (Gomez, 2006).

Table (4) Knowledge of mothers regarding malnutrition

		N	%
Background about malnutrition	Yes	97	44.1
	No	123	55.9
Group Total		220	100.0
Signs and symptoms of malnutrition	Wasting	70	31.8
	Loss of appetite	27	12.3
Total		*97*	*44.1*
No knowledge		123	55.9
Group Total		*220*	*100.0*

Table (5) pointed out that some diseases and complications were found accompanying the case of malnutrition among the study group. The main reasons behind the cause of malnutrition were due to diarrhea among the respondents (72.3%) followed by low food intake (19.5%) and (8.2%) due to vomiting respectively.

This complication did agree with the previous study by (WHO, 2013) which stated that the child was usually presented with one or more of the integrated childhood illness. Danger signs should be treated as inpatient. So this is the main reason that leads to malnutrition reflecting the poor sanitation and lack of food and the hygienic source of drinking water.

Table (5) Reasons behind the admission of the current child

Reasons behind malnutrition	N	%
Diarrhea	159	*72.3*
Low food intake	43	19.5
Vomiting	18	8.2
Total	220	100.0

Table (6) shows that (76.4%) of respondents were taking other foods than therapeutic milk and this was good because since this would increase nutrients and energy intake (Michael et al., 2005). Those children passed appetite test and were discharged or referred to outpatient setting. Food taboos were not highly prevalent among the attitudes of the respondents; the majority of them (87.3%) were not strongly believers in food taboos.

In the same table the results showed that the most common advices given by the dietitian to the majority of (90.9%) were: the importance of breastfeeding, when to give formulae, general hygiene, educating mothers about child nutrition, formulae preparation and timing, food quantities and following up of prescriptions and regular hospital visits. All these advices were provided to the mothers through forums and individual counseling following the protocol of Newcomb, (1994).

Table (6) Hospital meals and nutrition education during admission

		N	%
Eating foods other than therapeutics	Yes	168	76.4
	No	52	23.6
Group Total		220	100.0
Certain food taboos for child feeding	Yes	28	12.7
	No	192	87.3
Group Total		220	100.0
Types of foods	Eggs	*17*	7.7
	Milk	9	*4.1*
	Meat	2	.9
Total		*28*	*12.7*
No		*192*	*87.3*
Group Total		*220*	*100.0*
Reception of food guidance on combating malnutrition	Yes	139	63.2
	No	81	36.8
Group Total		220	100.0
Source	Dietitian	99	90.9
	Doctor	40	9.1
Total		139	63.2
No		*81*	*36.8*
Group Total		*220*	*100.0*

In Table (7) some anthropometric values of the malnourished children during their 7 days stay in the hospitals were shown. As expected no changes on MUAC, length, and Head circumference were detected since the duration periods of the intakes of therapeutics formulae were only 7 days. Weights increased as expected. (Figure 1)

The anthropometrics Measurements in Table (7) were optimum as the admission criteria of inpatient care program of the World Health Organization. WHO, (2009) recommends the use of a cut-off weight for-length of below -3 standard deviations (SD) to identify infants and children as having Severe Acute Malnutrition (SAM).

World Health Organization (WHO, 2009) stated that Mid-Upper Arm Circumference (MUAC) for-age in a well-nourished population, only very few children aged 6–60 months would show a MUAC less than 115 mm.

Table (7) Comparison of mean ± SD of MUAC, Head Circumference, Length and Weight with age at Day 0

Anthropometric Measurements		0-6 months	7-12 months	13-18 months	19-23 months
MUAC (cm)	Total	10.11±.96	10.33±.77	10.42±.81	10.65±.7
	Males	10.29±.96	*10.38.±.82*	*.7910.47±*	10.75±.47
	Females	9.92±.95	10.28±.73	10.37±.84	10.54±.87
Head Circumference (cm)	Total	40.37±2.83	44.81±1.7	46.42±.94	47.2±1.15
	Males	40.43±3.14	45±1.54	46.52±.93	47.52±1.49
	Females	40.31±2.58	44.62±1.86	46.32±.42	46.86±.42
Length (cm)	Total	52.66±6.32	62.7±5.36	67.18±4.66	69.5±5.79
	Males	54.48±7.15	62.95±6.71	67.68±4.65	70.3±5.14
	Females	50.75±4.78	62.47±3.71	66.68±4.69	68.74±6.32
Weight (kg)	Total	4.83±1.2	5.27±1.3	5.47±1.2	5.91±1.4
	Males	4.99±1.3	5.39±1.5	5.54±1.2	5.92±1.4
	Females	4.67±1.02	5.15±1	5.39±1.2	5.89±.7

Figure 1: Comparison of mean weights of male and female children with age at Day 0 and day7
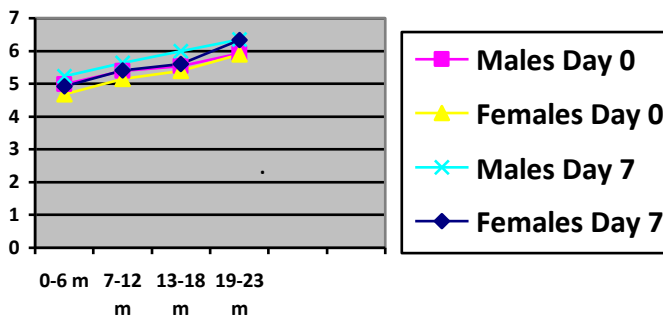
World health organization (WHO, 2009) recommends the use of a cut-off for weight for-height of below -3 standard deviations (SD) to identify infants and children as having Severe Acute Malnutrition (SAM). The commonly used cut-off is the same cut-off for both the new (2006) WHO child growth standards as with the earlier National Center for Health Statistics (NCHS). The reasons for the choice of this cut-off are as follows (WHO, 2009):

1) Children below this cut-off have a highly elevated risk of death compared to those who are above.

2) These children have a higher weight gain when receiving a therapeutic diet compared to other diets, which results in faster recovery.

3) In a well-nourished population there are virtually no children below -3 SD (<1%). 4) There are no known risks or negative effects associated with therapeutic feeding of these children applying recommended protocols and appropriate therapeutic foods.

Children with a MUAC less than 115 mm have a highly elevated risk of death compared to those who are above. Thus it is recommended to increase the cut-off point from 110 to 115 mm to define SAM with MUAC. When using the WHO child growth standards to identify the severely malnourished among 6–60 months old children, those below -3SD cut-off for weight-for height classifies two to four times as many children compared with the NCHS reference. The prevalence of SAM, i.e. numbers of children with SAM, based on weight-for-height below -3 SD of the WHO standards and those based on a MUAC cutoff of 115 mm, are very similar. The shift from NCHS to WHO child growth standards or the adoption of the new cut-off for MUAC will therefore sharply increase caseloads (WHO, 2009).

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