



## Impact of Diarrhoea on the Nutritional Status among Children under Five Years old

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### ABSTRACT

The aim of the study was to identify the impact of diarrhoea on the nutritional status (N.S) of children under five years, attending Omdurman pediatrics hospital. Khartoum State. The study involved 60 children (33 boys and 27 girls). A questionnaire was used to collect data; weights and heights were measured for each child and converted to nutritional indices (WHO.NCHS, 1995). The study showed that there was significant difference ( $p \leq 0.05$ ) between the nutritional status of children affected by diarrhoea, and the family size, weaning practices and the presence of animals at home for meat, milk or eggs. The result showed that 96.7% of children were affected by malnutrition (Acute, Mild, Moderate). 91.7% of children their age ranged between one day – 2 years , 44.9% of mothers educational level were low, 73.3% of them their family income ranged between 100-300 Sudanese pounds , 41.7% were living in scattered areas. 77.8% of children were forbidden from breast feeding , milk and juice . 61.7% did not use oral rehydration therapy at home, 41.7% were using smoking (Dokhan) treatment, 93.3% of their mothers used incorrect preparation of homemade solution. The study recommended that attention must be directed towards an environmental hygiene, provided safe water supplies, promotion and continuity of breast feeding, nutrition and health education is needed to raise awareness of mothers to correct the incorrect practices of diarrhoea.

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## INTRODUCTION

Diarrhoea remains the second leading cause of death among children under five years globally, nearly one in five child deaths (WHO, 2009), diarrhoea was defined as a digestive disorders, which make it secretes a large amount of liquid stool (Morgan, 1986), also was defined by Primary Health Care (2006) as three or more abnormally loose or watery stools during the previous 24 hours. Causes of diarrhoea in children less than five years including: changing the type of foods, food not cooked well and not saved it in a cold place, parasitic and bacterial infections which result from eating contaminated food or water (Abdul Qadir, 2001).

Individuals who live in deprived areas with poor sanitation, inadequate hygiene, and unsafe drinking water have greater exposure to enteric pathogens and an increased risk of morbidity and severity of diarrheal illnesses (Shaker, 1993). Complications associated with diarrhoea can lead to significant fluid loss and dehydration, which may result in death or other severe consequences if fluids are not replaced at the first sign of diarrhoea (Altayeb and Musaad, 1993), there are few studies of children in Sudan that investigate the association between diarrheal disease severity and nutritional status.

Therefore, the present study was conducted to identify the impact of diarrhoea on the nutritional status of children less than five years, and determine the association between diarrheal illnesses severity and malnutrition among children who were less than five years.

## MATERIALS and METHODS

The study was conducted in Mohamed Elamin Hamid Pediatric Hospital in

Khartoum State in Sudan, the children were 0-60 months of age, who attending inpatient diarrhoea treatment unit, the study composed of 60 children (33 boys and 27 girls). A structured questionnaire was administered to mothers of children suffering from diarrhoea to collect information on demographic, socioeconomic status, personal characteristics of under five years old, identification data of their Parents and nutrition knowledge of mother was evaluated, feeding patterns, mothers practices related to additional and weaning food, treatment practices at home.

### Anthropometric measurements

Weight and length/height were measured for each enrolled child. To calculate weight (to the nearest 0.1 kg) for children 0–23 months of age, the weights of the mother alone and with the child were recorded, and the child's weight was computed during analysis; the weight of children ages 24–60 months was taken in light clothing using a digital scale.

The length/height of children 0–23 months of age or children who were older but unable to stand alone was measured (to the nearest 0.1 cm) in the recumbent position using a board with a fixed head and sliding foot piece apparatus was used to measure. standing height in children 2 years of age and older, were measured by making the child to stand on the stadiometer with heels against the board, feet flat and small board placed at the highest point on the head and converted to nutritional indices (WHO, 1995), to determine the nutritional status into four categories as follows :

Indicator	Nutritional status
- 3 SD	Severe malnutrition
-2 SD	Moderate malnutrition
-1 SD	Low malnutrition
Mean	Normal

SD: Standard Deviation

Educational levels of the parents had been divided into three groups, low education; including parents who read and write only, medium education including parents with primary and intermediate certificate, high education including parents with secondary and university certificate.

The data collected was analyzed using the Statistical Package for Social Sciences (SPSS version 11) Program. Cross-Tabulation was done comparing various factors and chi-Square used to determine the significance of the differences. The significant P- value was less than 0.05 ( $P < 0.05$ ).

## RESULTS and DISCUSSION

Table (1) shows the nutritional status in relation to identification data of the malnourished children, higher prevalence (96.6%) of malnourished children, Males (53.3%) were found to be more malnourished than female (43.3%). This results agree with Mbago and Namfua (1991). Boys considered to be favoured by the mothers than girls and the probability of being malnourished is considered to be lower for the boys than the girls, but the needs of males are more than needs of females because of the different in weight and activity (Moragan, 1986), Immediate causes of malnutrition are inadequate dietary intake and childhood diseases

such as diarrhoea. On the other hand inadequate food intake may impair the immune system thereby leading to infection and increased severity of illness.

Statistically significant differences were found in children age. The study revealed that 91.7% of children their age were less than two years, this can be explained that food supply did not meet rapid rate of growth. It is found that 86.7% of malnourished respondents their birth order were second and third, increase of the birth order also increases of family size, this may affect relative food allocation among children and care time received by each child. This result agrees with a study of Khin-Maunget *al.*, (1994) who described that, mothers with more than three children is among risk factors for diarrhoea and malnutrition, and with a study which indicated that more children were most vulnerable to malnutrition second and third order (Sommerfelt and Kathryn, 1994). 48.3% of the respondent had children in family less than five years that means low care given to the children. Findings of this study are in agreement with Louran et al, (2013) who found that, early marriage, negative perceptions on family planning still predominant among the Sudanese communities.

**Table 1:** Nutritional status in relation to identification data of the malnourished children

Sex		Normal	Low malnutrition	Moderate malnutrition	Severe malnutrition	Chi-Square
Male	NO	1	3	7	22	6.20
	%	1.7	5.0	11.6	36.6	
Female	NO	1	2	8	16	22.78
	%	1.7	3.4	13.3	26.7	
Age		N				
0 – 12 Months	NO	1	4	12	20	***
	%	1.7	6.6	20	33.3	
13 –23 Months	NO	1	1	3	13	22.78
	%	1.7	1.7	5	21.7	
24-36 Months	NO	0	0	0	4	4.81
	%	0	0	0	6.6	
> 36 Months	NO	0	0	0	1	4.81
	%	0	0	0	1.7	
Order						
First	NO	0	0	2	6	4.81
	%	0	0	3.3	10	
Second	NO	2	2	5	12	4.81
	%	3.3	3.3	8.3	20	
Third	NO	0	3	8	20	4.81
	%	0	5	13.3	33.3	
Family Size						
2 -4	NO	2		1	5	***
	%	3.3		1.7	8.3	
5 -7	NO	0	4	8	19	45.00
	%	0	6.6	13.3	31.7	
8 - 10	NO	0	0	2	10	4.75
	%	0	0	3.3	16.7	
Number of Children less than five years						
Not Found	NO	2	3	10	16	4.75
	%	3.3	5.0	16.7	26.7	
Found	NO	0	2	5	22	4.75
	%	0	3.4	8.3	36.6	

As shown in Table (2) higher prevalence (44.3%) of low education level among mothers, while higher education constituted among 25% of fathers. The lowest educational level of the mothers was considered as a risk factor for malnutrition, i.e. mothers who have better knowledge on nutrition may allocate their resources more effectively and efficiency in improving their children's nutritional conditions (Musaiger, 2005). Khin-Maung *et al.*, (1994) stated that low level of mothers

education was associated with high relative risk and high etiologic for malnutrition. The majority (96.7%) of the mothers were house wife while the fathers occupation were not Professional Working (71.1%), low education and not Professional Working means low income. When a mother is a house wife, the total household income is decreased and there may be a low chance of getting better quality foods in sufficient quantities (Hamza, 2003). Because of that, quantity as well as quality of food

consumption will be decreased. Although many factors are involved in the development of malnutrition, it is believed that low income at the family level is the principal cause of childhood malnutrition. Therefore, a positive relationship between the child malnutrition and the total household income is expected (Aldwaik and Abdel

mageed, 2006). Statistically significant differences were found in ownership of animals. This study showed that the economic risk factors included parent's low income, lack of ownership of animals (83.3%). Moreover, ownership of animal may increase in both nutrient availability and income (Nichlsonet *al.*, 2003).

**Table 2:** Nutritional status of children in relation to identification data of their Parents

Educational level of		Normal	Low malnutrition	Moderate malnutrition	Severe malnutrition	Chi- Square			
Mother	Low	NO 1	2	8	16	4.93			
		% 1.7	3.3	13.3	26				
Medium	NO 1	2	4	14	5.93				
		% 1.7	3.3	6.6			23.3		
Higher	NO 0	1	6	8			6.2		
		% 0	1.7	10				13.3	
Educational level of Father									13.32
Low	NO 1	1	5	7				6.2	
		% 1.7	1.7	8.3		11.7			
Medium	NO 1	3	4	23		13.32			
		% 1.7	5	6.6	38.3				
Higher	NO 0	1	6	8	13.32				
		% 0	1.7	10			13.3		
Occupation of Mothers									
House wife	NO 2	5	13	38			13.32		
		% 3.3	8.3	21.7				63.3	
Not Professional Working	NO 0	0	2	0				13.32	
		% 0	0	3.3		0			
Occupation of Fathers									13.32
Not working	NO 0	0	0	2	13.32				
		% 0	0	0		3.3			
Not Professional Working	NO 1	3	9	30		13.32			
		% 1.7	5	15			50		
Trade	NO 1	0	2	3			13.32		
		% 1.7	0	3.3				5	
Governmental Job	NO 0	2	2	5				13.32	
		% 0	3.3	3.3					8.3
Monthly income/Pounds									13.32
100 -349	NO 2	3	10	29	13.32				
		% 3.3	5	16.7		48.3			
350 -649	NO 0	1	4	7		13.32			
		% 0	1.7	6.6			11.7		
650- 900	NO 0	1	1	2			13.32		
		% 0	1.7	1.7				3.3	
Availability of animals									
None	NO 2	3	15	30				13.32	
		% 3.4	5	25	50				
Sheep	NO 0	1	0	8	13.32				
		% 0	1.7	0		13.4			
Poultry	NO 0	1	0	0		13.32			
		% 0	1.7	0			0		

Table (3) shows that no statistically significant differences were found in availability of kitchen, latrine, and sources of water. About 16.6% of children lived in a rent house, 41.7% lived in scattered house. The type of housing and the prevalence of malnutrition in this study may reflect the generally poor construction standard of most of the houses. The provision of adequate, safe and clean water is a component of Primary Health Care, more than half (58.3%) of respondent get their water from Caro (donkey cart). These results agree with Bark (2002) who stated that where family living conditions are poor children suffer from

malnutrition. The provision of adequate and proper housing is essential for the normal growth and development of a child. (Abidoye, Ihebuzor.2001). The study found that 86.7 % of household have a shallow pit toilets, that means unhealthy drainage of human waste which leads to a favourable environment for the growth of flies and thus spread of the disease specially diarrhoea (Shaker 1993) .The factors, which are usually interlinked, are insufficient food security, inadequate child care, and inadequate basic services particularly those related to health, water and sanitation (Thabet, 2002).

**Table 3:** Nutritional status in relation to Family living conditions of the malnourished children

Type of house property		Normal	Low malnutrition	Moderate malnutrition	Severe malnutrition	Chi-Square
Owner	NO	2		1	5	12.08
	%	3.3		1.7	8.3	
Rent	NO	0	4	8	19	12.08
	%	0	6.6	13.3	31.7	
Squatter	NO	0	0	2	10	16.7
	%	0	0	3.3	16.7	
Availability of kitchen	None	NO	0	1	2	0.50
	%	0	1.7	3.4	10	
Found	NO	2	4	13	32	53.3
	%	3.3	6.6	21.7	53.3	
Availability of latrine	None	NO	0	1	3	6.11
	%	0	1.7	5	6.6	
Found	NO	2	4	12	34	56.7
	%	3.3	6.6	20	56.7	
Availability of Water	Pipe at home	NO	1	2	13	12
	%	1.7		3.4	21.6	
Street Pipe donkeycart ( Caro)	NO	1	0	1	3	3.72
	%	1.7	0	1.7	5	
	NO	0	3	9	23	38.3
	%	0	5	15	38.3	

As shown in Table (4) 70% of children were on breast feeding, while artificial feeding was constituted in 30%. Study revealed that 83.3% of mothers stop breastfeeding suddenly. This confirms findings from several studies which have shown that early cessation of breast feeding are a risk factor for severe malnutrition (Serventi *et al.*, 1995). The results also showed that using of bottle was more prevalent (83.3%) among children, while 16.7% of children were using cup. The stress of cessation of

breastfeeding and unfamiliarity with feeding from a cup or bottle can lead infants to refuse to eat, statistically significant differences were found regarding items of types of sterilization, 10.0 % were using boiling water, 70.0 % were using soap and water, but the major source of drinkable water was the Caro (58.3%) which leads to various organisms contaminating the water and the apparent is high association between source of water and poor childhood nutrition.

**Table 4:** Nutritional status of children in relation to feeding patterns

Type of Feeding		Normal	Low malnutrition	Moderate malnutrition	Severe malnutrition	Chi-Square
Breast Feeding	NO	1	5	12	24	4.08
	%	1.7	8.3	20	40	
Artificial Feeding	NO	1	0	3	14	32.2
	%	1.7	0	5	32.2	
<b>Method of Artificial Feeding</b>						
Plastic bottle	NO	0	0	0	2	4.085
	%	0	0	0	11.1	
Class bottle	NO	0	0	2	11	16.1
	%	0	0	11.1	16.1	
Class Cup	NO	1	0	1	1	5.6
	%	5.6	0	5.6	5.6	
<b>Type of Sterilization</b>						
Boiling water	NO	1	0	2	3	***
	%	1.7	0	3.3	5	
Soap with water	NO	0	3	10	29	1.480
	%	0	5	16.7	48.3	
Water only	NO	0	0	0	12	20
	%	0	0	0	20	
<b>Methods of Weaning</b>						
Gradually	NO	0	1	3	4	5.65
	%	0	1.7	5	6.6	
Suddenly	NO	2	4	12	34	56.7
	%	3.3	6.6	20	56.7	
<b>Causes of Weaning</b>						
Time Factors	NO	1	4	12	20	33.3
	%	1.7	6.6	20	33.3	
Illness of Mother	NO	1	1	3	13	9.18
	%	1.7	1.7	5	21.7	
Illness of Children	NO	0	0	0	4	6.7
	%	0	0	0	6.7	
Pregnancy of Mother	NO	0	0	0	1	1.7
	%	0	0	0	1.7	

Causes of artificial feeding were pregnancy of mother (44.4%), illness of children (38.9 %), illness of mother (11.1%), and time factors (5.6%). There is a belief that they must wean the baby when mothers were pregnant, Al-Shazali and Al-Shazali (1998) recommended that weaning the baby due to pregnant of mothers does not expose the child to disease and a pregnant mother's milk not causes any harmful material to a child.

Table (5) shows the nutritional status in relation to time of starting the additional food. Statistically significant differences were found, two third (66.6%) of mothers start additional foods before 4 months, giving your baby additional foods before 4 months can cause

problems because they may be not drink enough breast milk and their system is not ready to digest that food, in addition to that diarrhoea sometimes occur following a change in the milk , a new type of food for the child, especially if the food was not suitable for the child's age (Al-Shazali and Al-Shazali, 1998).while 20.0% of mothers started additional food from 4-6 months. To facilitate optimal growth of newborns, many countries have developed infant feeding recommendations, usually suggesting 4–6 months of exclusive breastfeeding and then the gradual introduction of complementary foods (Vaahtera *et al.*, 2007).

**Table 5:** Nutritional status of children regarding to their mothers practices related to additional and weaning foods

Time of starting the additional food		Normal	Low malnutrition	Moderate malnutrition	Severe malnutrition	Chi-Square
<b>&lt; 4 Months</b>	NO	2	2	4	32	
	%	3.3	3.3	6.6	53.3	
<b>4- 6 Months</b>	NO	0	1	2	9	***
	%	0	1.7	3.3	15	69.048
<b>7- 8 Months</b>	NO	0	0	2	2	
	%	0	0	3.3	3.3	
<b>&gt; 8 Months</b>	NO	0	2	0	2	
	%	0	3.3	0	3.3	
<b>Preparation of Food</b>	NO	1	0	4	14	
	%	1.7	0	6.7	23.3	*
<b>Special food With family</b>	NO	0	3	5	21	15.542
	%	0	5	8.3	35	
<b>Breast feeding</b>	NO	1	2	6	3	
	%	1.7	3.3	10	5	

The report of WHO (2001) emphasized that, because of a great importance of early weaning and the characteristic of weaning food it is essential to start weaning foods at 6 months of age in addition to being high quality food. It was found that 48.3% of children ate their meals with the family, and that

means food was provided poor in content of nutrients which can helps the child malnutrition, and 31.7% have special meals for children, when children usually start complementary foods. Children need special feeding, good complementary foods are easy to eat and digest; hygienically prepared and fed;

contain no bones or hard pieces that might cause choking; not too spicy or salty and so much salt is bad for children (Thabet, 2002).

As shown in table (6) 61.7% of children who were ill with diarrhoea were treated with Oral Rehydration Salt packet or Home Made Solution at home and 38.3% have treated with traditional methods. Study revealed that 89.2% of women gave children Oral Rehydration Salt (ORS), while 10.8% of children were treated with Home Made Solution. Very small percentages (6.7%) of children who fall ill with diarrhoea were treated correctly with Recommended Home Made Solution. The Study showed that 38.3% of children have treated with traditional methods. 78.3% of children treated with Dokhan

(smoke), which is a traditional Sudanese married women process 8.7% of children treated with water rice and 12.9% treated with custard. Basic causes of malnutrition include factors such as human, political, social and ideological or cultural factors (food taboos and wrong cultural beliefs) which may lead to inadequate accessibility of food to the children. On conclusion these findings indicate a lack of awareness of proper treatment of diarrhoea among mothers at home. There is clearly a need to strengthen education programmed for mothers. This also is in agreements with Thabet (2002) who examined maternal beliefs and practices in feeding young children during diarrhoea and found that lower educational level of the mother consider a risk factor for malnutrition.

**Table 6:** Nutritional status of children regarding to their mothers treating diarrhoea

Use of Oral Rehydration Salt		Normal	Low malnutrition	Moderate malnutrition	Severe malnutrition	Chi-Square
Yes	NO	1	4	12	20	4.397
	%	1.7	6.7	20	33.3	
No	NO	2	2	7	12	20
	%	3.3	3.3	11.7	20	
<b>Source of Oral Rehydration Salt</b>						
Ready Made	NO	0	3	8	22	0.387
	%	0	8.1	21.6	59.5	
Home Made Solution	NO	0	0	0	4	0.387
	%	0	0	0	10.8	
<b>Awareness of Mother Home Made</b>						
Correct	NO	0	0	0	4	2.481
	%	0	0	0	6.7	
Incorrect	NO	2	5	15	34	56.7
	%	3.3	8.5	25	56.7	
<b>Source of Information</b>						
Health Center	NO	0	3	3	13	6.000
	%	0	5	5	21.6	
Media	NO	0	1	3	3	6.000
	%	0	1.7	5	5	
Mothers	NO	0	1	3	8	13.3
	%	0	1.7	5	13.3	
Not aware	NO	2	0	6	14	23.3
	%	3.3	0	10	23.3	

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