

Effects of Displacement from War On Growth of Children Under Five Years old in West Darfur

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ABSTRACT

Port A total of 470,000 people were displaced in Darfur during 2014, of which an estimated 60% are children. In North Darfur there are increasing rates of malnutrition with Global Acute Malnutrition (GAM) at 28.3%. **Aim of the study:** was to assess the effects of displacement from war on growth of children under five years old in west Darfur. **Methodology:** A convenience sample of 100 participants was taken from children under five years old **Results:** 10% & 64% of non-displaced and displaced child were underweight, with statistical significant differences between both groups respectively. Regarding length/ height for age, 8%, 6% of non-displaced and displaced group were stunting with no statistical significant differences between both groups. Regarding height for weight, 86%, 96% of non-displaced and displaced group were wasting with statistical significant differences between both groups. also, it observed that, 38%, 38% of non-displaced and displaced group were under -3 score according to z score with statistical significant differences between both groups. Also, regarding arm circumferences for age, 12.2 %, 79.6% of non-displaced and displaced group were under - 3 score according to z score with no statistical significant differences between both groups. **Conclusion:** Residents of the refugee camps are at higher risk of malnutrition than children living at home denoting that urgent settlement is needed in the area of the study. **Recommendation:** there is a need for initiation of longitudinal studies on growth and development of children in Darfur state using larger samples to understand the exact causes behind these differences.

Key words: Displacement, Growth, Under Five Years, West Darfur

INTRODUCTION

About 3.7 million vulnerable people live in the greater Darfur region, with the majority concentrated in North and South Darfur. People in need comprise several groups: 2.5 million internally displaced, representing almost a third of the total Darfur population (in west Darfur number of children < 18 years' male 96,255 female 95,698) and 1.2 million food-insecure resident populations **Sudan Humanitarian country team, 2015.**

A total of 470,000 people were displaced in Darfur during 2014, of which an estimated 60% are children. In North Darfur there are increasing rates of malnutrition with Global Acute Malnutrition (GAM) at 28.3%. **United nations high commissioner for refugees (UNHCR), 2016** In East Darfur, a MUAC screening conducted in Khor Omer among 4,117 children under five identified a GAM rate of 8.1 %, with a severely acutely malnourished (SAM) rate of 1.9 % and a moderate acute malnutrition (MAM) rate of 6.2 %. Data on malnutrition collected at the onset of the influx identified much high levels of malnutrition among newly arriving

children, before they were provided with nutritional support. **United nations high commissioner for refugees (UNHCR), 2016.**

These groups remain at a heightened risk before, during and after displacement. Acute malnutrition is a nation-wide issue, with 1.2 million children below 5 years old suffering from wasting – half of them living in conflict-affected states. The burden, based on prevalence and incidence, is estimated to be 2 million who will be in need of immediate life-saving nutritional support. The regions with the highest GAM rates are the Red Sea, Blue Nile, South Kordofan as well as North, South and East Darfur States. The most vulnerable groups are children under 5 years **Sudan Humanitarian country team, 2015.**

War Conflict impacts children's health in four important ways. First, conflict-driven displacement increases child death and injury, mainly through increased susceptibility to infectious disease from unsanitary living conditions. A case study on Southern Sudan illustrates that conflict reduces sanitation, clean water, and health services making it difficult to stop the spread of neglected tropical diseases, such as visceral leishmaniasis and trachoma. **Jaspars, & O'Callaghan, (2008)** Second, children have a higher risk of food insecurity and malnutrition during times of conflict. The country case of Chad illustrates that food insecurity is heightened by the resettlement of displaced people leading to higher rates of malnutrition. Third, children, especially girls, are subjected to an increased risk of sexual violence from armed combatants during conflict. Fourth, conflict induces long-term physical and psychological disability in children, especially among child soldiers.

Globally, just over 1 billion children under the age of 18 live in countries or territories affected by armed conflict – almost one sixth of the total world population. Of

these, approximately 300 million are under the age of five. In 2006, an estimated 18.1 million children were among populations living with the effects of displacement. Within that group were an estimated 5.8 million refugee children and 8.8 million internally displaced children, The Machel study noted that “an estimated two million children have been killed in armed conflict. Three times as many have been seriously injured or permanently disabled. **(Machel, 2009.**

Malnutrition is major cause of child mortality in low income countries and is exacerbated by conflict **(Bhutta, Yousafzai, 2010)**. It is estimated that there are 98.5 million undernourished children below the age of five living in conflict-affected countries, which is more than two-thirds of the 143 million children under five who suffer from undernutrition globally **(UNICEF April 2009)**. Conflict-driven malnutrition is eventually lethal in an overwhelming number of children, but its severe effects can be seen in children's stunted growth. High rates of growth stunting have been observed in conflict areas around the world especially in **Sudan WHO survey 2016** reported that, 38.2 / 100.000 live births. These malnourished children in conflict areas are at risk for poor school and work performance and greater likelihood of death **Tamashiro, 2010**

Nutritional outcomes for children can be measured by several anthropometric indicators. The three most common used are acute malnutrition, chronic malnutrition and general malnutrition **(WHO, 1995)**. Acute malnutrition, or weight-for-height, is an indicator of wasting caused by severe, recent onset of adversities such as rapid reductions in food availability or interference with food intake due to infections. Thereafter, reflects current malnutrition status (e.g. at the time of the survey) relative to height. Chronic malnutrition, or height-for –age, is an indicator of stunting.

Long-term malnutrition resulting from low growth due to protein deficiency, low-food intake for longer periods, concurrent illnesses, or detrimental health of the mother during pregnancy. It reflects the accumulated detrimental effect over a period of time. Underweight, or weight-for-age, is an indicator of general malnutrition; it reflects the body mass relative to age. From the above mentioned indicators, chronic malnutrition is important because children that become stunted during their early months/years of life are likely to remain, in future periods, short in height for their age (Martorell and Habicht, 1986). While wasting is an indicator of short-term health, and general under nutrition can reflect both, short and long term nutrition status, they might be overcome at later stages in life by the gain of weight. The literature on nutrition indicates that these measures do not necessarily move together (Victoria 1991).

Aim of the study:

It is aimed to assess the Effects of Displacement from War On Growth of Children Under Five Years old in West Darfur

Research question

Is displacement from war effect on weight of children under five years old in west Darfur?

Methodology

Research design: A cross-sectional design was used

Setting: hospital-based study was conducted between 1st of January to 30th of May 2009 in Aljenainah hospital.

Sample: A convenience sample of 212 participants was taken from children under five years visited or referred to Aljenainah hospital from nearby refugee camps.

Children who are not resident in west Darfur or with chronic diseases were excluded; this has leaved a total number of 100 participants.

Tool of data collection:

One tool was used in this study, **it consisted from two parts**

Part I: personal data which include name, sex, age.

Part II: WHO child growth standard which included weight for age, height for age, height for weight, head circumference for age, and arm circumference for age.

Operational designs: It includes:

I. Preparatory phase:

- The study tools had been designed after extensive literature review.
- The content and validity was done by 3 expertise opinion in the pediatrics department.
- A pilot study was conducted in december-2008 on 10% of sample. It was conducted to evaluate the applicability and clarity of the developed tools and includes in the study.
- Sampling was started from 1st of January to 30th of May 2009 in Aljenainah hospital. The purpose of the study was simply explained to participants who agreed to participate in the study.

Ethical consideration:

The study was given ethical approval by the Ministry of Health and approval was also obtained from Parents or Relatives All other ethical requirements including informed consent and confidentiality were ensured.

Field of work

Anthropometric parameters were collected for each child whose parents agreed; and on the basis of the measured weight, height, mid-upper arm circumference (MUAC), chest circumference and head circumference. Body mass index (BMI) was calculated as the ratio of weight (kilograms) to height (meters) squared.

The staff was trained to collect all anthropometric measurements in a standardized way by following standardized international procedures (**Lohman, Roque, and Martorell, 2003**) Weight was measured in kilograms using a Scales with a precision of 0.5 kg.

Each child was weighed in light underclothing, without shoes. Height was measured to a precision of 0.5 cm in the upright position using a **Length/Height Boards** without shoes. The measurements were made by trained personnel while an assistant checked the correct position of the children. Mid-upper arm circumference was measured using a **MUAC Tape** with a precision of 2 mm and was identified as being half-way between the acromion and the olecranon process. All measurements were done on the left side of a standing subject.

The nutritional status was assessed by looking at the distributions of the z-scores of weight-for-age (WAZ), height-for-age (HAZ) and weight-for-height (WHZ) in relation to the growth charts of the National Center for Health Statistics reference –Sudan Federal Ministry of Health (Weight, height, and BMI are indicators of nutritional status, with an international agreement in the literature with regard to adults, but with some controversy with regard to children).

There exist recommendations to use age- and sex specific BMI percentiles (as an alternative to rough BMI values) in the age

range of 0–18 years (Huybrechts, et al., 2006 & Reilly, et al., 2000)

Administrative design:

An official permission was obtained from the Aljenainah hospital director to conduct the study. Parents' agreement for voluntary participation was obtained and the purpose and nature of the study was explained.

Statistical analysis:

Data management and analysis was done on Statistical Package for Social Studies version 20 (SPSS, Inc., Chicago, IL, USA). Descriptive analysis was conducted by calculating means and proportions for continuous and discrete data respectively and associations were tested using the Chi square test. Children participated (50% residents and 50% refugee), Amongst them (50%) were males.

Results

A total of 100 (50%) were females, with male to female ratio 1:1. Table 1 Shows children' characteristics (non- displaced and displaced groups) participating in this study. It was found that, 42% of children' were under 2 years among both groups, the mean of children' age for both groups were 29.9 ± 16.9 months, 29.7 ± 16.6 months respectively, and half of both group were males (50 %, 50% respectively).

Fig. 1 demonstrates percentage distribution of weight for age, 10% & 64% of non-displaced and displaced child were underweight, with statistical significant differences between both groups respectively ($t = 5.294$, $p = .0001$). Regarding length/ height foe age, 8%, 6% of non-displaced and displaced group were stunting with no statistical significant differences between both groups ($t = .487$, $p = .243$). Regarding height for weight, 86%, 96% of non-

displaced and displaced group were wasting with statistical significant differences between both groups ($t = 2.959, p = .005$).

Fig. 2 shows percentage distribution of head circumference for age, it observed that, 38%, 38% of non-displaced and displaced group were under -3 score according to z score with statistical significant differences between both groups ($t = 2.498, p = .01$). also, regarding arm circumferences for age, 12.2 %, 79.6% of non-displaced and displaced group were under - 3 score according to z score with no statistical significant differences between both groups ($t = .656, p = .513$).

Table 2 & Fig 3 presents percentage distribution of studied children' as regard to child age / moth related to weight for age. it was found that, 10%, 64% of non-displaced and displaced group were underweight in different age categories.

Table 2 & Fig 4 shows percentage distribution of studied children' as regard to child age / month related to gender. it was found that, 10%, 30% of non-displaced and displaced group were male complain from underweight while no girls' child in the non-displaced group vs 34% in displaced group complain from underweight.

Table 3 shows percentage distribution of the studied children' as regards to socio-demographic data related to Length / height for age. It found that, 6% of children aged ranged between 0 up to 6 months were stunting in both group, while as regarding gender 8%, 6% were male complain from stunting

Table 4 illustrates that, percentage Distribution of the studied children' as regards to socio-demographic data related to height for weight. It observed that, 26%, 28% of children age ranged between 12 up to 24 months in both group were wasting, and 44%, 50% of female in both groups were complain from wasting.

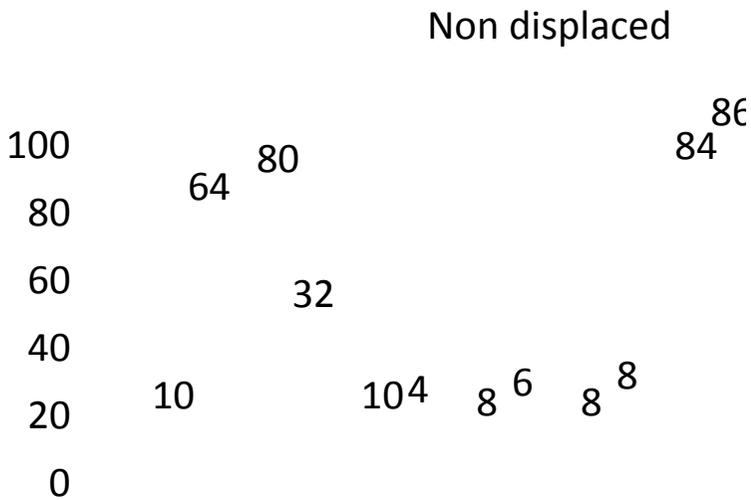
Table 5 Comparison between child gender and their mean Z scores of weights, Length / height for age & height for weight. It were found that, mean \pm SD of weight for age in male and female were $.5 \pm 1.3, .3 \pm .8$ vs $-1.4 \pm 1.4, -1.3 \pm 1.2$ in both group respectively, mean \pm SD of height for weight in male and female were $-1.8 \pm 1.5, -2.2 \pm 1.1$ vs $-2.4 \pm 1.1, -2.9 \pm .2$ in both group respectively, mean \pm SD of arm circumference for age in male and female were $-1.9 \pm .8, -1.8 \pm .5$ vs $-2.8 \pm .4, -2.8 \pm .4$ in both group respectively with statistical significant difference between both groups.

Table 6 shows positive correlations between mean Z scores of head circumference for age and age in both group and there was positive correlation between length / height for age, height for weight and gender in both group.

Table 7 illustrates differences among children' age and their mean Z scores of weights, Length / height for age & height for weight. It was found that, there were statistical significance difference between non displaced and displaced child as regard weight for age, length / height for age height for weight and head circumference for age.

Table 1: Children’ characteristics of both groups in percentage distribution (n = 100)

Children’ characteristics	Groups			
	Non displaced		Displaced	
	No	%	No	%
Age /month				
0-5	4	8	4	8
6- 11	3	6	3	6
12- 23	14	28	14	28
24-35	7	14	7	14
36- 47	11	22	11	22
48- 60	11	22	11	22
Mean ± SD	29.9 ± 16.9 month		29.7 ± 16.6 month	
Gender				
Boys	25	50	25	50
Girls	25	50	25	50
Total	50	100	50	100



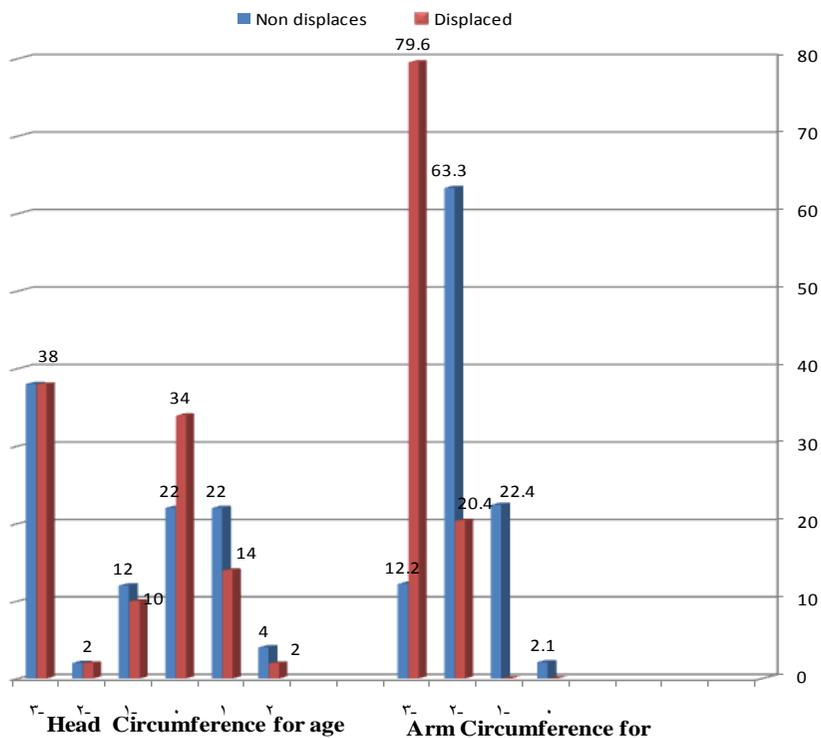


fig.2: head and arm circumference among both groups in percentage distribution (n=100)

Table 2: Percentage Distribution of the studied children' as regards to age & gender related to weight for age (n= 100).

Weight for age	Groups											
	Non displaced						Displaced					
	Under weight		Normal weight		Over weight		Under weight		Normal weight		Over weight	
Age /month	No	%	No	%	No	%	No	%	No	%	No	%
0-	4	8	0	0	0	0	4	8	0	0	0	0
6-	1	2	2	4	0	0	2	4	1	2	0	0
12-	0	0	12	24	2	4	8	16	5	10	1	2
24-	0	0	6	12	1	2	1	2	5	10	1	2
36-	0	0	9	18	2	4	9	18	2	4	0	0
48- 60	0	0	11	22	0	0	8	16	3	6	0	0
Total	5	10	40	80	5	10	32	64	16	32	2	4
Gender												
Boys	5	10	19	38	1	2	15	30	9	18	1	2
Girls	0	0	21	42	4	8	17	34	7	14	1	2
Total	5	10	40	80	5	10	32	64	16	32	2	4

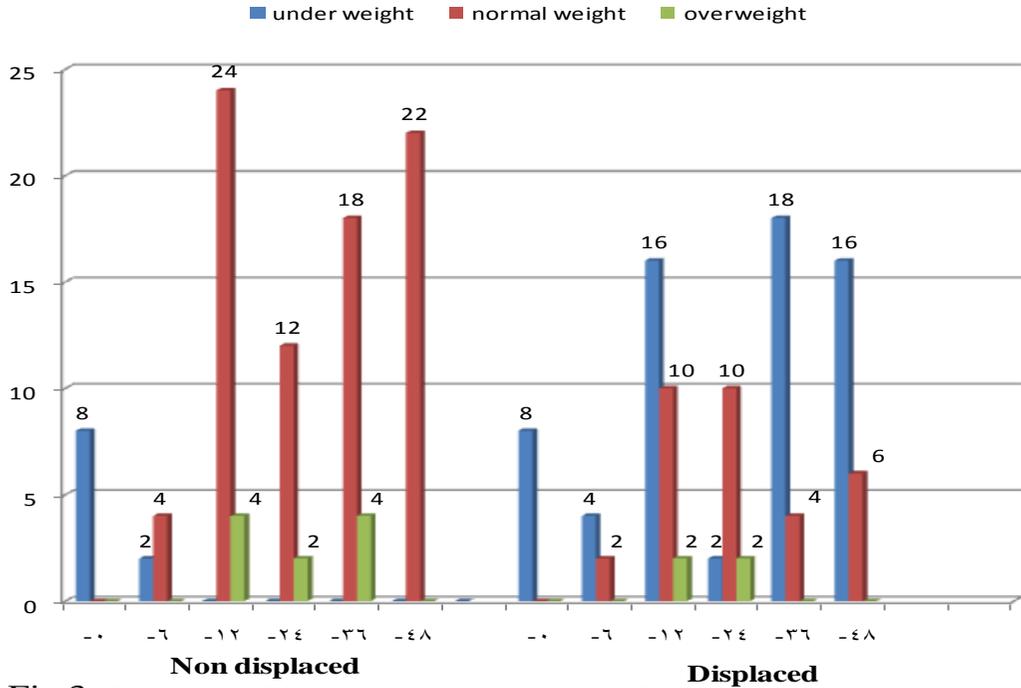


Fig.3: *Percentage Distribution of the studied children 'as regards to child age/ month related to weight for age (n= 100).*

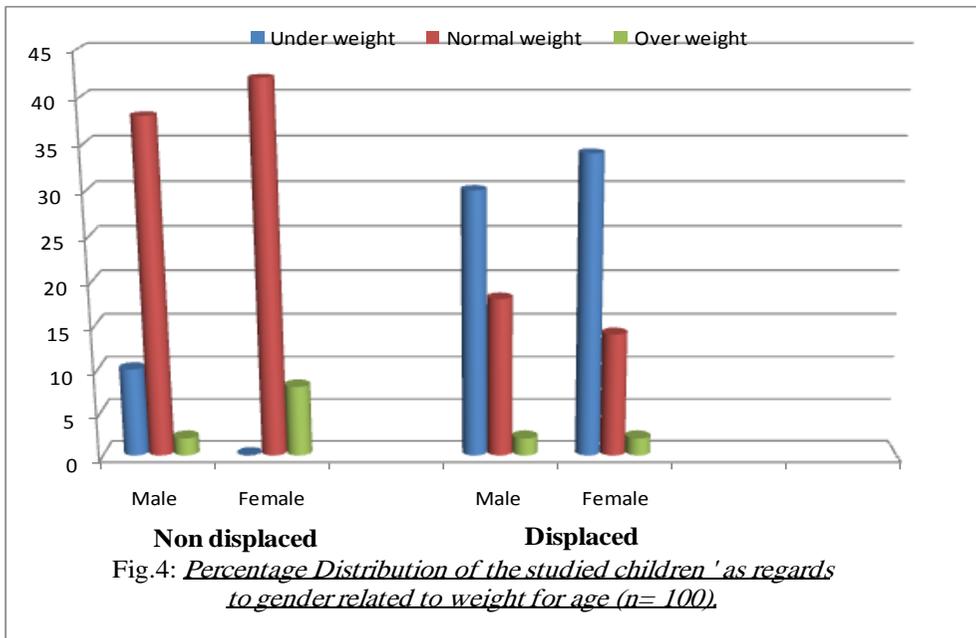


Fig.4: *Percentage Distribution of the studied children 'as regards to gender related to weight for age (n= 100).*

Table 3: Percentage Distribution of the studied children' as regards to socio-demographic data related to Length / height for age (n= 100).

Length / height for age	Groups											
	Non displaced						Displaced					
	Stunting	Within normal	Taller	Stunting	Within normal	taller	Stunting	Within normal	taller	Stunting	Within normal	taller
Age /month												
0-5	3	6	0	0	1	2	3	6	0	0	1	2
6- 11	0	0	2	4	1	2	0	0	1	2	2	4
12- 23	1	2	0	0	13	26	0	0	0	0	14	28
24-35	0	0	0	0	7	14	0	0	0	0	7	14
36- 47	0	0	0	0	11	22	0	0	1	2	10	20
48- 60	0	0	2	4	9	18	0	0	2	4	9	18
Total	4	8	4	8	42	84	3	6	4	8	43	86
Gender												
Male	4	8	0	0	21	42	3	6	4	8	18	36
Female	0	0	4	8	21	42	0	0	0	0	25	50
Total	4	8	4	8	42	84	3	6	4	8	43	86

Table 4: Percentage Distribution of the studied children' as regards to socio-demographic data related to height for weight (n= 100).

Height for weight	Groups											
	Non displaced						Displaced					
	Wasting	Normal	Over	Wasting	Normal	Over	Wasting	Normal	Over	Wasting	Normal	Over
Age /month												
0-5	1	2	0	0	3	6	2	4	1	2	1	2
6- 11	2	4	1	2	0	0	3	6	0	0	0	0
12- 23	13	26	0	0	1	2	14	28	0	0	0	0
24-35	7	14	0	0	0	0	7	14	0	0	0	0
36- 47	10	20	1	2	0	0	11	22	0	0	0	0
48- 60	10	20	0	0	1	2	11	22	0	0	0	0
Total	43	86	2	4	5	10	48	96	1	2	1	2
Gender												
Male	21	42	0	0	4	8	23	46	1	2	1	2
Female	22	44	2	4	1	2	25	50	0	0	0	0
Total	43	86	2	4	5	10	48	96	1	2	1	2

Table 5: Comparison between child gender and their mean Z scores of weight, Length / height for age & height for weight (n= 100)

Items	Groups				P
	Non displaced		Displaced		
	Male	Female	Male	Female	
	Mean± SD	Mean± SD	Mean± SD	Mean± SD	
Weight for age	-0.5 ± 1.3	0.3 ± 0.8	-1.4 ± 1.4	-1.3 ± 1.2	0.001*
Length / height for age	1.9 ± 2.2	2.4 ± 1.1	1.5 ± 2.0	2.5 ± 0.5	0.628
Height for weight	-1.8 ± 1.5	-2.2 ± 1.1	-2.4 ± 1.1	-2.9 ± 0.2	0.004*
Head circumference for age	-1.4 ± 1.7	-0.6 ± 1.8	-1.6 ± 1.5	-0.6 ± 1.6	.768
Arm circumference for age	-1.9 ± 0.8	-1.8 ± 0.5	-2.8 ± 0.4	-2.8 ± 0.4	.000*

Table 6: orrelations between mean Z scores of weight, Length / height for age & height for weight & socio demographic data (n=100)

	Age				Gender			
	Non displaced		Displaced		Non displaced		Displaced	
	r	p	r	p	r	p	r	p
Weight for age	.388*	.005	.073	.616	.162	.107	.031	.831
Length / height for age	.354*	.012	.099	.493	.233*	.020	.318*	.024
height for weight	-.166	.250	-.273	.055	-.200*	0.046	-.345*	.014
Head circumference for age	.510*	.0001	.465*	.001	.208	.148	-.285*	.045
Arm circumference for age	.025	.865	-.207	.153	.091	.533	.091	.534

*Correlation is significant at the 0.05 level (2-tailed).

Table 7: Differences among children' age and their mean Z scores of *weights, Length / height for age & height for weight* (n= 100)

Age/ months	Groups												p
	Non displaced						Displaced						
	0-6	6-12	12-24	24-36	36-48	48-60	0-6	6-12	12-24	24-36	36-48	48-60	
Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	
Weight for age	-3 ± 0	-7 ± 1.6	.3 ± .7	.3 ± .8	.4 ± .8	.0 ± .0	-3 ± 0	-2 ± 1.7	-1.1 ± 1.4	.000 ± 1.2	-1.6 ± .8	-1.5 ± 1.0	0.01*
Length / height for age	-1.5 ± 3	1 ± 1.7	2.6 ± 1.6	2.9 ± .4	2.6 ± .5	2.4 ± 1.2	-1.8 ± 2.5	2 ± 1.7	3 ± 0	2.7 ± .9	2 ± .8	1.6 ± .8	0.002***
Height for weight	.00 ± 2.0	-1.7 ± 1.5	-2.6 ± 1.3	-1.9 ± .7	-2.1 ± .9	-2.1 ± 1.2	-7.5 ± 1.7	-3 ± 0	-2.9 ± 3	-2.6 ± .8	-3 ± 0	-2.7 ± .5	0.02*
Head circumference for age	-3 ± 0	-3 ± 0	-1.4 ± 2	-9 ± 1.9	-5 ± 1.5	.1 ± .8	-3 ± 0	-3 ± 0	-1.3 ± 1.9	-1.3 ± 1.4	-5 ± 1.7	-2 ± .6	0.001***
Arm circumference for age	-2.33 ± .6	-2 ± 0	-1.8 ± .7	-1.6 ± .9	-1.9 ± .5	-1.9 ± .5	-2.33 ± .6	-3 ± 0	-2.8 ± .4	-2.9 ± .4	-2.7 ± .5	-2.9 ± .3	0.821

Discussion

The major global health problem faced by the developing countries today is malnutrition. (UNICEF, 1990) The causes of malnutrition are multi-factorial, with dietary and environmental factors contributing to the risks of malnutrition in children. (Onis, Montriro, and Akre, 1993) In the present study, among the total of 100 children studied 50% were girls and 50% were boys and their age ranged one day to 60 months in

both groups (non - displaced and displaced children). This confirms that these two groups were homogenous groups prior to the study. Anthropometry has become a practical tool for evaluating the nutritional status of children in developing countries. (Hakeem, Shaikh, and Asar, 2004). According to WHO's classification of the severity of malnutrition, a prevalence of acute malnutrition of 10% is considered as serious.

The prevalence of moderate and severe underweight was defined as the proportion of children whose weight-for-age was below _2

and ± 3 standard deviation scores (SDS), respectively. In the present study the majority (64%) of displaced children had moderate underweight. Similarly, Mahdi, and Abdalla, 2016 mentioned in their abstract about Prevalence of Malnutrition among Children under 5 Years at El **Geneina** Internally Displaced Population Camp /2013 that, prevalence of malnutrition was 48% underweight in west Darfur state

This study found that, girls were more than boys affected with moderate malnutrition (underweight) the percentage of boys who suffering from moderate underweight near to study done by **Mahdi, and Abdalla, 2016** who reported that, males were more affected 30.5% with significant difference between genders, also, underweight were more among children in age categories between 36 to 60 months. Contradict with Mahdi, and Abdalla, 2016 who mentioned that, Malnutrition was more among children in the age group 0-2 years 30%.

The prevalence of moderate and severe wasting and stunting was defined as the proportion of children whose weight-for-height (wasting) and height-for-age (stunting) were below ± 2 and ± 3 SDS, respectively. In this study it was found that, 6% of displaced children had stunting aged between 1 day to 6 months and male child. Contradict with UNICEF Soudan, 2016 reported that, 2/3 children in Darfur are stunted due malnutrition and Reeves, 2016 says that, in west Darfur 40% of children under five years suffering from stunting. Musa et al., (2014) mentioned that, the prevalence of global stunting, moderate stunting and severe stunting was 26.2%, 13.1% and 11.4%, respectively. Also, UNICEF annual report 2014 reported that, according to Multiple Indicators Cluster Survey (MICS) 2010, the prevalence of stunting estimated at 32%, with at least 550,000 children suffering from life-threatening SAM every year and **Olwedo, Mworozzi , and Bachou, (2008)** reported

that, the prevalence of stunting was higher in the age groups 0–24 months compared to the other age groups.

Wasting in individual children and population groups can change rapidly and shows marked seasonal patterns associated with changes in food availability or disease prevalence to which it is very sensitive.⁷ In the current study severe wasting and moderate wasting were highly 96%. Emergency operation Sudan, (2015) reported in July 2013, it was estimated that, almost 4 million people are in food security ‘crisis’ situations in the conflict-prone areas of Darfur, South Kordofan and Blue Nile states. In most States, the prevalence of global acute malnutrition is above the ‘critical’ threshold of 15% meaning that more than one million children are wasted nationwide. UNICEF annual report 2014 reported that, UNICEF annual report 2014 reported that, according to the MICS 2010, the prevalence of wasting was estimated at 16%, with at least 550,000 children suffering from life-threatening SAM every year. In the **Musa et al., (2014)** study mentioned that, severe wasting and moderate wasting were highly presented at age 6–17 months 36.4% and 13.6%, respectively. **Nyirandutiye, Iknane, and Fofana, (2011)** surveyed 1740 children using MUAC, and found that the prevalence of acute malnutrition was 6.3%, with the prevalence being significantly higher among girls (8.3%) than boys (4.5%) and 11.0% among children aged 6–11 months compared to 5.4% in older children. Also, **Olwedo, Mworozzi , and Bachou, (2008)** mentioned that, the prevalence of acute malnutrition was higher in the age groups 0–12 months and 13–24 months compared to the other age groups.

Conclusion

- Residents of the refugee camps are at higher risk of malnutrition than children living at home denoting that urgent settlement is needed in the area of the study.

Recommendation

- There is a need for initiation of longitudinal studies on growth and development of children in Darfur state using larger samples to understand the exact causes behind these differences.

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