

# Malnutrition Among Under-five Children in Tawila Administrative Unit (TAU) at Tawila Locality in North Darfur State in Sudan, 2017

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**Abstract:** Malnutrition in all its forms is still a major public health problem in the world, especially in developing countries, including Sudan. It's an underlying factor in over 50% of deaths in children under five years of age who die each year from preventable causes. Malnutrition prevents children from reaching their full physical and mental potential. The Specific objective of this paper was to determine the magnitude of malnutrition among children aged 6-59 months in Tawila Administrative Unit (TAU) in Tawila locality in North Darfur State at Sudan, 2017. This paper was comparative cross-sectional community-based study applied the quantitative research method. Five-hundred and ninety seven children at the age ranged between 6-59-month were studied. To assess the malnutrition status of the children under the study, anthropometric measurements for height, weight and edema examination were applied. The collected data analyzed by using Epidemiological Information (Epi-Info), emergency nutritional assessment software version 11 (ENA). The anthropometric result was classification based on WHO standard, 2006. The results showed that the prevalence rate of wasting was 14.7% (10.4 - 20.4 95% C.I.), stunting was 48.9% (44.1 - 53.8 95% C.I.) and underweight was 35.6% (30.4 - 41.1 95% C.I.). Male children and those aged between (12 -23 months) are at higher risk of acute malnutrition and those aged (12-35 month) are at higher risk to stunting and underweight. The study concluded that the malnutrition is an important major public health problem among under five children ages in Tawila locality. Under-five children in Tawila locality suffer high rates of malnutrition. Therefore, health facility-based interventions, community-based program, nutritional education programs are strongly recommended in Tawila locality. In addition to that ensuring food security including the availability and adequacy of general rations (including iodized salt and fortified grain/cereals).

**Keywords:** Acute Malnutrition, Under Nutrition, Stunting, Chronic Malnutrition, Wasting, Under Five Age Children's, Prevalence Rate

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## 1. Introduction

Now a day, nutrition has increasingly been recognized as a basic pillar for social and economic development [1]. And more than half of Sustainable Development goals are related to nutrition, because one-third of the world population is malnourished, while 30 percent of food is wasted [2]. Nutritional status is the result of complex interactions between food consumption and the overall status of health and health care practices [3]. Malnutrition is a broad term commonly used as an alternative to under nutrition but technically it also refers to over nutrition. People are malnourished if their diet does not provide adequate calories and protein for growth and maintenance or they are unable to fully utilize the food they eat due to illness (under nutrition) [4]. Malnutrition prevents children from reaching their full physical and mental potential. Health and physical consequences of prolonged states of malnourishment among children are: delay in their physical growth and motor development; lower intellectual quotient (IQ), greater behavioral problems and deficient social skills; susceptibility to contracting diseases [5]. According to the World Health Organization (WHO), malnutrition has three commonly used comprehensive types named stunting, wasting and underweight measures by height for age, weight for height and weight for age indexes respectively [6]. In 2011, the estimated data showed that the 26% (165 million) of the under-five of age children were stunted globally compared to 35% in 1990. More than 90% of the world's stunted children live in Africa and Asia [7]. Child malnutrition is associated with approximately 60% of under-five mortality in Sub-Saharan Africa countries [5]. In 2015, the developing countries showed that the 27% of under-five deaths are related to the malnutrition disorders, the case fatality rates (CFRs) in hospitals treating severe acute malnutrition (SAM) remain at 20–30% [8-10]. Sudan available data indicated the poor child feeding practices across the country, and shows critical situation regarding the nutritional status of under 5 of age children, especially in rural areas [3]. Sudan National Center for Health Statistics reference showed that the prevalence of chronic malnutrition, moderate malnutrition and severe malnutrition was 23.1%, 10.2% and 12.9%, respectively, which is higher than the global figures [11, 12]. Out of the eighteen states in Sudan, five states including North Darfur carried 51% of the national severe acute malnutrition (SAM) burden [13]. In North Darfur one in every three children aged under five is stunted and one in six weighs too little for his or her height [13]. Again, North Darfur is the most area affected by conflicts in Sudan for more than ten years since 2004 which led to distraction of the infrastructures including health services. The Global Nutrition Report confirms the urgency of collective action to combat malnutrition's impact on people, communities, and whole societies. Actions and specific attention are required for people who are been affected by crisis and the effects of climate change [14]. This paper intended to assess the magnitude and status of malnutrition among the children

aged 6–59 months in rural and urban areas of Tawila administrative unit (TAU) of Tawila locality in North Darfur at Sudan in 2017.

## 2. Methods

### 2.1. Study Design

Comparative and cross-sectional community-based study, used the quantitative research method.

### 2.2. Study Area

This study was carried out in Tawila administrative unit (TAU) in Tawila locality in North Darfur state, Sudan.

Background on the study area: Tawila locality is one of eighteen localities in North Darfur state at west Sudan. Tawila locality had experienced high number of internally displacement of population from neighbor states, which has continued since 2004 at the beginning war till the beginning 2017. Tawila locality located about 165 kilometers southern of El-Fashir city, the capital of north Darfur state. It is about 97,026 populations, with 17,103 under 5 age children. Most of its populations are internal displaced peoples (IDPs), who are located in 5 IDPs camps namely; Dalli Argo camp, Rawanda camp, Dappanaira camp, Borgo camp and the remaining residential population lives in Tawila town and in scattered 11 villages in rural area (Tabara).

### 2.3. Study Population

The primary target group were children aged 6 to 59 months in Tawila administrative unit at Tawila locality in North Darfur.

a) *Inclusion criteria:* All children aged of 6-59 months, in Tawila administrative unit.

b) *Exclusion criteria:* Agitated children and/or who refused to be measured were excluded from the study. Also, Very sick child who needed emergency treatment was excluded and referred to emergency unit.

### 2.4. Sample Size

The Emergency Nutritional Assessment software for smart version 11 (ENA) had been used to calculate sample size for this study, and hence the sample size was 597 children between 6-59 months, selected from 401 households.

### 2.5. Sampling Technique

a) *First stage:* Two-stage/cluster sampling was used to obtain representative of the whole population. The sample frame consisted all households in selected cluster (Sample size divided on 30 clusters, which resulted on 18 child with in each cluster), and each cluster had considered as if it was a "small population". Households have been selected by using the Expanded Program of Immunization (EPI) method, then all children meet the criteria have been selected for anthropometric measurements and mothers/caregivers of target children have been interviewed. The same sampling

technique has been used throughout the study. The targeted populations were distributed in seven homogeneous groups in different geographical areas. The population data for each geographical area were estimated and numbers of clusters

were determined from these geographical areas with “probability proportional to population size” (PPS). The distribution of clusters in the study area illustrated in the below table.

**Table 1.** Geographical distribution of clusters of under-five in Tawila administrative unit using ENA.

Geographical unit	Total population size	Under five population size	Assigned cluster	Total number of cluster
Tawila town	7,000	1,195	1, 2	2
Dali IDPs camp	9,251	1,600	3, 4, 5	3
Argo IDPs camp	8,105	1,395	6, 7, 8	3
Rwanda IDPs camp	28,831	4,901	9, 10, 11, 12, 13, 14, 15, 16	8
Dapanaira camp	10,339	2,247	17, 18, 19, 20	4
Tabara villages	2,500	425	21	1
Borgo IDPs camp	31,000	5,341	22, 23, 24, 25, 26, 27, 28, 29, 30	9
Total	97,026			30

*b) Second stage:* Because of no accurate population registers were available and households cannot be visited systematically, this was achieved by choosing households at random so that each household in the populations has the same equal chance of being selected. The households were chosen from within each cluster, using Epi method because, households were arranged in a non-organized manners.

The EPI method procedure that used and followed by all teams within a cluster.

- When the data collector's team arrived the geographical center of the village, camp site, randomly choose a direction to identify the starting point for data collection by spinning pencil, or pen on the ground and noting the direction it points when it stops.
- Then walked in the direction indicated, to the edge of the village or camp.
- At the edge, spin the pencil again until it pointed into the body of the village or camp.
- Walked along this second line counting each house on the way until the edge of village or camps.
- Randomly select the first house to start from it and follow the right side direction by the end.

## 2.6. Data Collection Tools & Techniques

*a)* The pre- structured questionnaire to collect the sociodemographic data (non-anthropometric data) in regard to the age, sex and residency of the studied children between 6 to 59 months.

*b)* Weighing scales and height/length measurement board and physical examination techniques were used to collect anthropometric data; i.e. weight, height, length, edema and wasting among the studied under – five children.

## 2.7. Data Management and Analysis

The collected data were cleaned manually, then coded and

entered into computer program by well qualified nutritionist. The anthropometric data analyzed by adapted software ENA version 11. Composite indices like weight for age (WAZ), height for age (HAZ), and weight for height (WHZ) were compared with the WHO reference data ( *Children with below -2 Z-scores and -3 Z-scores of the reference population were considered as malnourished and severe under nourished respectively*).

## 2.8. Ethical Clearance

The permission was taken from the Ministry of health of North Darfur state, then the local authority informed. Leaders of the population were met and parents/care givers verbal approval of children were informed and their verbal consent was taken, including full explanation of the study objectives, the nature of the data collection procedures, and expected outcomes.

The confidentiality of research data was protected by ensuring that information leading to identification of individual subjects was not shared. Also and Participants who showed signs or symptoms that require immediate clinical attention were referred to nearby health facility.

## 3. Result

A total of 597 of children aged 6 to 59 months from 401 households participated in this study with a 100% response rate, 91.5% of studied household were internal displaced population. Among the studied children 50.3% were girls, and 49.7% were boys. Also, the results indicated the boys at the 36 to 47 months had a higher frequency in this study  $n=80$ ), and the girls had a higher frequency at the age of 48 to 59 months ( $n=75$ ). Table one below table showed the distribution of the study participants by age and by gender in this study.

**Table 2.** Distribution study respondent children aged between 6-59 months by age and gender in Tawila administrative unit, February 2017.

Age / months	Boys		Girls		Total	
	Frequency	%	Frequency	%	Frequency	%
6 - 11	28	51.9	26	48.1	54	9.0

Age / months	Boys		Girls		Total	
	Frequency	%	Frequency	%	Frequency	%
12 - 23	60	52.2	55	47.8	115	19.3
24 -35	59	45.4	71	54.6	130	21.8
36 - 47	80	52.3	73	47.7	153	25.6
48 - 59	70	48.3	75	51.7	145	24.3
Total	297	49.7	300	50.3	597	100.0

In general the analysis revealed that the overall prevalence of acute malnutrition (wasting) was 14.7% (10.4 - 20.4 95% C.I.), chronic malnutrition (stunting) was 48.9% (44.1 - 53.8 95% C.I.), and 35.6% (30.4 - 41.1 95% C.I.) was underweight. In this study the analysis indicated that the acute malnutrition (wasting) among the studied boys is 18.2% and 11.3% among the studied girls. However, the

wasting is 21.7% among age group of 12 to 23 months and 17.7% among 24 to 35 months for both sex, yet it was higher among the boys at 36 to 47 months of age ( 52.3%). The figures in table two showed that the 6.4% of the boys who had acute malnutrition (n= 54) were severely acute malnourish in comparison to 3.3% among the girls who had acute malnutrition.

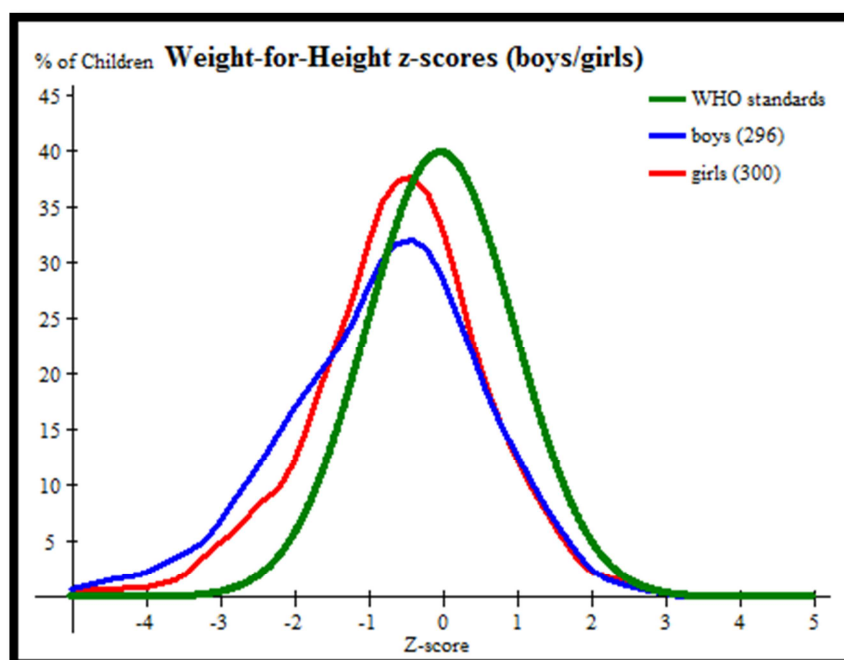
**Table 3.** Distribution acute malnutrition (wasting) based on weight-for-height z-scores (and/or edema) and by gender among 6-59 months.

Malnutrition level	Male		Female		Total	
	Frequency	%	Frequency	%	Frequency	%
Moderate acute malnutrition (<-2 z-score and >=-3 z-score, no edema)	35	11.8	24	8	59	9.9
SEVER acute malnutrition (<-3 z-score and/or edema)	19	6.4	10	3.3	29	4.9
Total	54	18.2	34	11.3	88	14.8

The chronic malnutrition (stunting) among the studied children was 48.9%, yet prevalence was higher among studied boys than girls (53.2% to 44.7% respectively). Also, the findings showed that the stunting was prevalent at age group 12 to 23 months of both sex (61.7%). Other findings showed that the 39.5% (n=117) of studied boys classified as underweight in- comparison to 31.7% of girls (n=95), and the prevalence of underweight was higher in the age groups 12 to

23 and 24 to 35 months (44.3% and 44.6% respectively).

The analysis showed that the mean z-score standard deviation of weight-for-height, and for age by sex, using WHO reference shift to the left for both sex (Figure 1 and 2). Also, figure three indicated that the mean z-scores standard deviation of weight for age using WHO 2006 reference shifted to the left (Figure 3).



**Figure 1.** Weight-for-Height of mean z-scores curve among study group by sex in TAU district at Tawila locality in ND, February 2017.

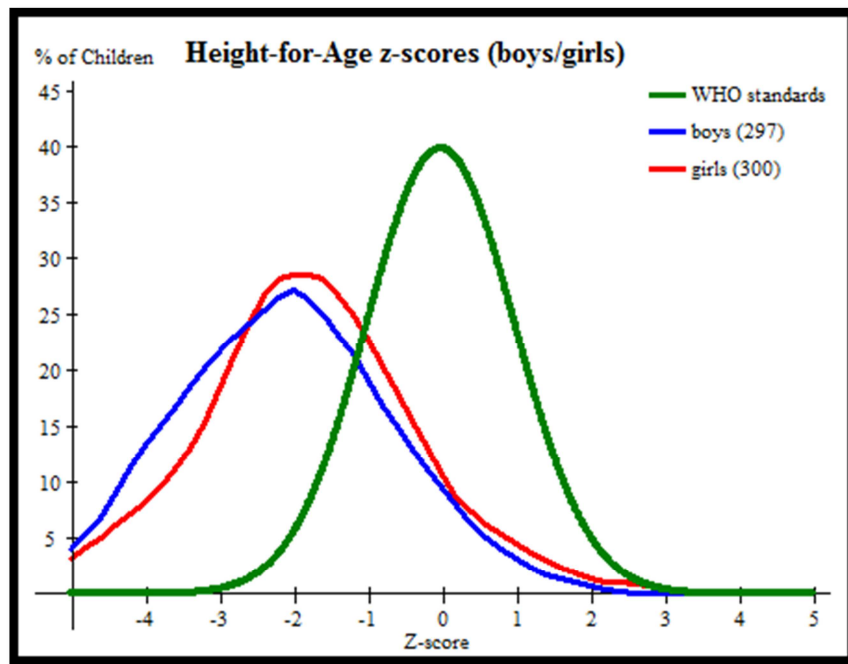


Figure 2. Height -for- Age of mean z-scores curve among study group by sex in TAU district at Tawila locality in ND, February 2017.

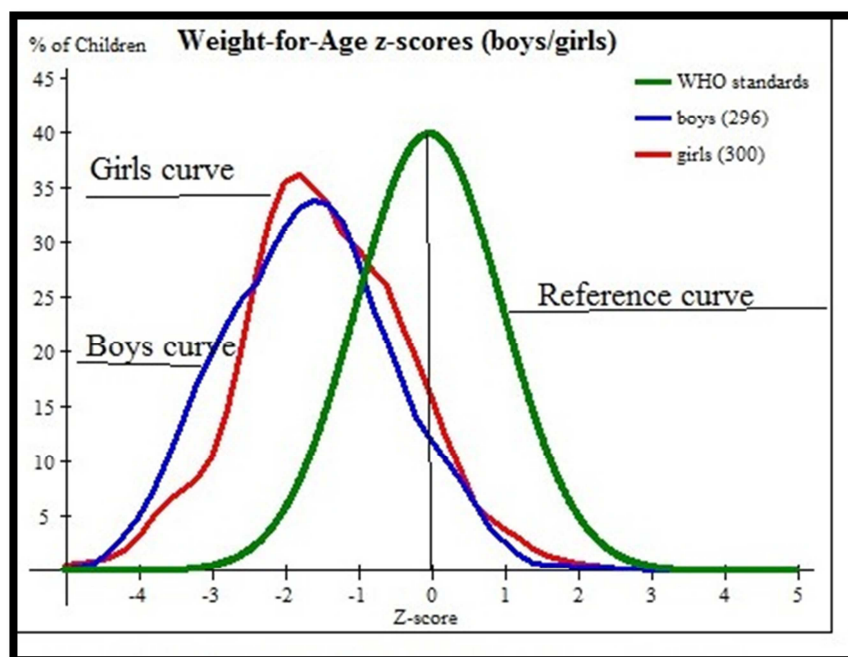


Figure 3. Weight-for-Age of mean z-scores curve among study groups by sex in TAU district at Tawila locality in ND, February 2017.

## 4. Discussion

This study included 597 children from 401 households in 30 clusters distributed among 7 geographical units. Most of study population (91.9%) were internal displacement populations; accordingly, we can consider our study as malnutrition among IDPs, also it is indicated that the homogeneity of study population in most socioeconomic variables.

In this study, the percentage of studied boys and girls was

49.7% & 50.3% respectively, and the overall prevalence rate of chronic malnutrition (stunting) is 48.9%, underweight is 35.6%, and acute malnutrition (wasting) is 14.7%. Our finding is similar to results in the nutritional assessment carried out for under 5 year's children among the Syrian refugees in which the malnourished male represented 49.2% of the studied child [15]. But, in another study conducted among under five children in Libya, the distribution of male compared with female were 53% to 46.7 which is controversy with our result [16]. In this paper the high level

of stunting reflects the longstanding displacement and poor availability of and access to food in the IDP settings. Also, all types of malnutrition indicating problems in water and sanitation at household level.

Comparing the different types among male and female, the study revealed that male child were at higher prevalence rate of all malnutrition status than female child. Study conducted in Bangladeshi to assess malnutrition in relation to gender, its findings revealed that the percent of wasting stunting and underweight was significantly higher in males than females. This may be due to male consume more calories than female at all ages due to activity levels of males [17]. However, many studies in sub-Saharan Africa consistent with previous findings, it has frequently reported higher prevalence of stunting in male children compared to female [18].

Regarding the prevalence of malnutrition among boys children, the findings of this study is similar to study findings of the study conducted among under five year's children at Al-Ruhal Internal Displaced Population Camp at Kass locality in South Darfur State, 2011; i.e. The malnutrition was higher in males (12.5%) than females (8.5%) [19]. this may due to the male children in rural are more active, so they need more energy. In addition to that male children in rural areas spend their time outside household and by this they loss care of families and may miss an efficient meals which make them more liable for under nutrition. Also, in contrast to our study findings, the prevalence of under nutrition was higher among girls than boys in Indian study assessed the associated factor and justified that by discrepancy might be gender-centric discrimination in early childhood and negative family and community attitudes towards the girl child. Also, the belief in the community is that males are the working group and they are helping their families in earning their living [20-21]. The Prevalence of stunting, underweight and wasting among the under 5 years of age children worldwide were 24.7%, 15.1%, and 7.8%, respectively [22]. While this study revealed that the overall prevalence of, chronic malnutrition (stunting) was 48.9%, 35.6% was underweight, and acute malnutrition (wasting) was 14.7%, this figures exceeded the national center for Health Statistics reference showed that the prevalence of global malnutrition, moderate malnutrition and severe malnutrition was 23.1%, 10.2% and 12.9%, respectively [22]. Another study described the prevalence and the associated factors of stunting, underweight and wasting and underweight and their associated factors among pre-school children living in in Evodoula health district at center region of Cameroon, where 733 preschool children were enrolled and the analysis, and the results showed 19.4%, 8.3%, and 14.5% were respectively stunted, underweight and wasted [23]. Another study conducted in Somali region in Ethiopia showed the overall prevalence rate of stunting, underweight and wasting were 33.4%, 24.5% and 20%, respectively [24]. In contrast to our study above mentioned studies showed the acute malnutrition is lower than Evodoula study, yet the figures of our study showed that the children in unstable areas are at higher risk for long standing malnutrition (Chronic malnutrition and the

underweight) by more than 10% to residential children. These prevalence rates of malnutrition indicated that the under five children of this study area were vulnerable to long standing malnutrition in comparison to other under-five children at the residential areas.

## 5. Conclusion

Our study among children aged between 6-59 months living in (TAU), Tawila district, in North Darfur state has shown high prevalence rate of malnutrition that preceded the serious levels according to WHO standards (wasting 14.7%, stunting 48.9% and underweight 35.6%). All Age groups of (12-23 and 23-35) months were at high risk of malnutrition. Male children were higher prevalence of all types of malnutrition. Because malnutrition has many causes, only multiple and synergistic interventions embedded and are required; a) the stakeholders (local governments and relief organizations) involved in provision of care and support to Tawila locality should intensify efforts to improve the nutritional status of the entire population especially children. b) Emphasis should be put on effective management of childhood diseases, water and sanitation provision because of its positive effects on nutritional status. c) Intensify the nutritional, nutrition and health education program.

## References

- [1] Bibi Leila Hoseini *et al.* Child Malnutrition at Different World Regions in (1990-2013). *Int J Pediatr*, Vol. 3, N. 5-1, Serial No. 21, Sep 2015.
- [2] Abdulrahman O. Musaiger, Abdelmonem S. Hassan, and Omar Obeid The Paradox of Nutrition-Related Diseases in the Arab Countries: The Need for Action *Int J Environ Res Public Health*. 2011 Sep; 8(9): 3637–3671.
- [3] Gritly S, Albashir A, Ibrahim B. Risk Factors of Malnutrition among Children under Five Year of Age in Mohamed Alamin Pediatric Hospital. 2015; 2319-7064 *Index Copernicus Value* (2013): 6.14 | *Impact Factor* (2014): 5.611.
- [4] Kramer, Christine V. Malnutrition in developing countries, *Pediatrics and child health*. 2015; 25(09):422-427.
- [5] Mandala *et al.* Malnutrition among children under the age of five in the Democratic Republic of Congo (DRC): does geographic location matter, *BMC Public Health*. Available from: <http://www.biomedcentral.com/1471-2458/11/2612011>; [Accessed 19th June 2017].
- [6] World Health Organization (WHO), Dept. of Nutrition for Health and Development. Nutrition for health and development: A global agenda for combating malnutrition. ITS (WHO 2000) Available at [http://whqlibdoc.who.int/hq/2000/WHO\\_NHD\\_00.6.pdf](http://whqlibdoc.who.int/hq/2000/WHO_NHD_00.6.pdf).
- [7] Humanitarian Bulletin-Sudan, Poor nutrition levels across Sudan; Issue32 | 3 – 9 August 2015.
- [8] M A Hogue *et al.* Nutritional Status among under-5 Children of a selected slum in Dhaka city Northern International Medical College Journal. 2016;7 (02): 143-145.

- [9] FAO: State of Food Insecurity in the World. 2008, Retrieved on 30 March, 2016. Food Security Statistics.
- [10] Jim Mann & Stewart Truswel, Essential of Human Nutrition, 5th edition, New York. April 2017; 720 (05):289-197.
- [11] Abdalla MA, Saad A, Abdullahi HE, Abdul Gader H. Socioeconomic aspects influencing food consumption patterns among children under age of five in rural area of Sudan. 2009; Pak. J. Nutr. 8:653-659.
- [12] Robert E. Black et al., "Maternal and Child Under nutrition: Global and Regional Exposures and Health Consequences," The Lancet 371, 9608 2008, doi: 10.1016/S01406736 (07) 61690-0.
- [13] Collins S. Treating severe acute malnutrition seriously Arch Dis Child. 2007 May; 92(5): 453–461 Sphere book.
- [14] Alredaisy MAS, Ibrahim SH Assessment of nutritional status of children less than 10 years old in rural western Kordofan. 2011; 2 (4):40-49.
- [15] Unicef Rapid Nutritional Assessment for Children (6-59) Months of Age in Syrian Refugee Families in Al-Anbar Governorate/Al Qa'im District. 2012.
- [16] Adel El Taguri et al. Risk factors for stunting among under-fives in Libya Public Health Nutrition: 12(8), 1141–1149.
- [17] Iffat, N, Nadia, B, Eliias B. A, Muhammed. M. A. *STUDY ON NUTRITIONAL STATUS OF RURAL SCHOOL CHILDREN OF BANGLADESH*. Bangladesh J Physiol Pharmacol 2014; 30(1):6-10.
- [18] Wamani H, Nordiehaug A, Stefan P, et al. Boys are more stunted than girls in Sub-Saharan Africa: a meta-analysis of 16 demographic and health surveys. BMC Paediatrics 2007; (17).
- [19] Ahmed. M. Hussein, Dawria. A. *Risk Factors of Protein Energy Malnutrition Deficiency among Children under Five Years at Alruhal Camp-Kass Locality South Darfur State 2012 Sudan*. doi. org/1 0.4172/2155-9597.1000252.
- [20] SK, Kumar SG, Bhat BV, et al. Malnutrition among under-five children in India and strategies for control. Journal of Natural Science, Biology, and Medicine. 2015;6(1):18-23. doi:10.4103/0976-9668.149072.
- [21] Letham GM. Human nutrition in developing countries FAD of UN, Rome 2008.
- [22] M. de Onis<sup>1</sup>, C. Monteiro<sup>2</sup>, J. Akré<sup>3</sup> and G. Clugston. *The worldwide magnitude of protein-energy malnutrition: an overview from the WHO Global Database on Child Growth Bulletin of the World Health Organization*, 71 (6):703-712 (1993).
- [23] Patricia M. N, Anne Christine A. N, Véronique J. E, Julie Judith T. T, Gabriel N. M, Carl M. F. M. *Under Nutrition and Associated Risk Factors among Pre-School Age Children In Evodoula District, Central Region Cameroon*. Received on 04 May 2017. Revised on 25 May 1 2017. Accepted on 14 June 2017. DOI: 10.20959/wjpps20177-9537.
- [24] Solomon Demissie<sup>1</sup>, Amare Worku<sup>2</sup>. Magnitude and factors associated with malnutrition in children 6-59 months of age in pastoral community of Dollo Ado district, Somali region, Ethiopia. Science Journal of Public Health 2013; 1(4): 175-183.