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Assessment of Nutritional Status in Endogeneous Children in Rural Area in Northern Sudan

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Abstract One hundred twenty four children (56 boys & 68 girls) aged 6-7 years old, from Elshagalwa village basic school in Nile state, North Sudan, were invited to assess their nutritional status. Mean± standard deviations of measured anthropometric parameters were (18.7 ± 2.2 kg, 113.4 ± 5.9cm, 15.9±1.3 cm and 8.9 ± 1.6 mm) for body weight, height, mid upper arm circumference and triceps skin fold. Z scores for the level of W/H the values below -2Zscore were recorded in 5.6% of children and all of them were moderately wasted. At the level of W/A; the values below -2Zscore were recorded in 11.3% of children and all of them were moderately under weight, whereas at the level of H/A; the below -2Zscore values were recorded by 20.9% of children of whom 4% were found to be severely stunted and 16.9% moderately stunted. Only 12.8% of the study samples were found suffering from malnutrition. Increases family economic level and inauguration of health education promotion are recommended for prevention of malnutrition in rural communities.

Keywords: *child nutrition, rural area, Sudan*

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1. Introduction

The anthropometry encompasses a variety of body measurements, such as weight, height, and size, including skin fold thicknesses, circumferences and lengths. It is a key component of nutritional status assessment in children and adults (Simko, *et al*., 1995). Moreover, it is an essential feature of geriatric nutritional evaluation for determining malnutrition, being overweight, obesity, muscular mass loss, fat mass gain and adipose tissue redistribution. It also used as indicators to evaluate the prognosis of chronic and acute diseases (Garcia, *et a*l., 2007).

Nutritional status was assessed by using the patient-generated subjective global assessment, and patients were classified as well nourished, moderately malnourished, or severely malnourished (Ottery, 1996). Stunting is a marker of systemic dysfunction during a sensitive phase of child development, in which growth failure occurring, accompanied by failure of development of other organ systems, including the brain and neurological system (Victora, *et al*., 2008). The percentage of children with a low height for age (stunting) reflects the cumulative effects of under nutrition and infections since and even before birth (WHO, 2010).

A common statistical way of standardizing data on one scale so a comparison can take place is using a z-score. Each z-score corresponds to a point in a normal distribution and as such is sometimes called a normal deviate since a z-score will describe how much a point deviates from a mean or specification point (Z= data point – mean/ standard deviation) (Sauro, 2004). The current WHO recommendation is to use the Z-Score or SD system to grade under nutrition which allows us to measure all the three indices (weight, height and age) and express the results in terms of Z scores or standard deviation units from the median of the international reference population (Seetharaman, *et al.*, 2007). Children who are more than 2 SD below the reference median (i.e. a Z-Score of less than -2) are considered to be undernourished i.e. to be stunted, wasted or to be underweight. Children with measurements below 3 SD (a Z-Score of less than-3) are considered to be severely undernourished. (WHO,1995).

Child growth is internationally recognized as an important indicator of nutritional status and health in populations. (WHO, 2010). The percentage of children who have low weight for age (underweight) can reflect 'wasting' indicating acute weight loss. Weight for height, expressed as a z score, is used to define severe wasting. A weight-for-height level less than a z score cutoff value of −3 is internationally recognized as severe wasting (Onis, *et al.*, 2006). There have been quite a few attempts at grading the degrees of undernutrition. Weight-for-age classifications (Gomez, I.A.P) are the most commonly used. Height-for-age and Weight-for-height classifications (McLaren, Waterlow's) have been used less frequently (Sachdev, 1996).

The three indices stunting, wasting and underweight reflect distinct biological processes and their use is necessary for determining appropriate interventions· It must be remembered here that these indices overlap - i.e. a child who is underweight may also have wasting and/or be stunted and other similar combinations. On the one hand, none of the three indices is able to provide a comprehensive estimate of the total number of undernourished children in a community and on the other hand - since they overlap- we cannot add these three indices to get the overall prevalence (WHO, 1995).

This study was conducted due to lack of information regarding children nutrition in rural area in Sudan. This study aims to assess the nutritional status for endogenous children in northern Sudan.

2. Material and Methods

2.1. Study Area

Elshagalwa is small village lies in Nile state two hundred kilometer North Khartoum the capital city. It is agricultural district with dry hot weather all year around, rainy months expand from June to September. Elshagalwa is rural community occupied with less than two thousand people, who depend on some agricultural products.

2.2. Subjects

One hundred twenty four children (56 boys: 68 girls) aged 6-7 years, from Elshagalwa basic school Nile state – Sudan, were invited to take part in this cross sectional community based study. All participants lived whole their live in this rural area.

2.3. Inclusion Criteria

Those who lived whole their life in the rural area and their dietary habit completely depend upon traditional food recipes.

2.4. Exclusion Criteria

Those under medical treatment, has body weight fluctuation more than three kilos three months prior the study and those who live with single parent were excluded.

2.5. Ethical Consideration

An informed consent, aims and benefits of this study were explained to the participants**.** Authors declare that there is no conflict of interest.

2.6. Anthropometric Measurements

Nutritional assessment was done using anthropometry. Children were weighed and measured (weight, height, mid upper arm circumference and triceps skin fold) as per the WHO guidelines on Anthropometry and Z scores were calculated.

2.7. Statistical Analysis

The data was analyzed by using Statistical Package for Social Sciences (SPSS), Windows version16, 2012 SPSS, Inc, Chicago, IL, and USA. Percentage in addition to mean and standard deviation were calculated.

3. Results

Mean± standard deviations of measured anthropometric parameters for children from local inhabitant were (18.7±2.2 kg, 113.4±5.9cm, 15.9±1.3 cm and 8.9 ± 1.6 mm) for weight, height, mid upper arm circumference and triceps skin fold respectively. Z scores for W/H and W/A were 94.4%, 88.7% for normal versus 5.6%, 11.3% moderate. While, H/A showed percentage of 79.1%**,**16.9% and 4.0% for normal, moderate and severe respectively (Table 1, Table 2).

Table 1. Anthropometric measurements Mean± SD of study participants

Anthropometric	Mean	Standard deviation
Height (cm)	113.2	5.9
Weight (kg)	18.7	2.2
Mid upper arm circumference (cm)	15.9	1.3
Triceps skin fold	8.9	1.6

Table 2. Anthropometric parameters according Z score ()

Z score	Severe (%)	Moderate (%)	Normal (%)
W/H Z score	-	5.6	94.4
W/A Z score		11.3	88.7
H/A Z score	4.0	16.9	79.1

Table 3. Anthropometric percentile of study sample

Anthropometric Measurement		5th	10th	15th	25th	50th	75th	85th	90th
Weight	Male	5	7	8	12	11	5	3	2
	Female	5	9	10	13	18	5	4	2
Height	Male	4	6	8	10	12	6	5	1
	Female	1	8	9	15	19	6	3	2
MUAC	Male	5	8	10	12	14	5	5	1
	Female	-	6	11	13	18	6	2	2
TSF	Male	6	8	10	12	11	3	3	1
	Female	1	8	12	10	21	7	2	2

According to Margaret and Katherine, 2008, the anthropometric percentile of study sample children were recorded in (Table 3).

4. Discussion

The study revealed that mean values of physical measurement fell in the normal range according to World Health Organization (2010). However, 12.8% of the study samples were found suffering from malnutrition. Using anthropometric percentile according to (Margaret and Katherine, 2008), 4.03% of our study sample were

suffering from acute or sub acute illness or nutritional deficiencies, 8.1% were underweight and the remaining percentage was normal. The presence of malnutrition was either due to recent food shortages or because the development in body height was greater than weight change. Stunting or wasting would result from the intensity and duration of exposure to these deficits, as well as from specific nutrient deficiencies or their combination. Mild, long-acting deficits would lead to stunting, whereas wasting is usually associated with short-term, intense deficits (Golden, 1995).

These results as same as those reported by (El-Beily, 1997&) who documented 5.3% of his study population were stunted. Data reported from other Arab countries in Bahrain 11.8% and 0.7%, in Kuwait 9.7% and 2.2%. While, in Oman 17.9% and 1.3% of children were moderately and severely malnourished respectively (Musaiger, 1993).Children had severe protein energy malnutrition as evident from the WHO percentage prevalence of stunting 64% wasting 43% and underweight 82%. Waterlow classification showed that children were either stunted or wasted, or stunted and wasted, or stunted and obese (Brahmbhatt, *et al*., 2001).The prevalence rates for males and females, respectively, in the nutritional groups were 5.3% stunted group, 31.9% wasted group and 3.8% stunted and wasted group (Prista, *et al*., 2003).

5. Conclusion and Recommendation

Malnutrition was encountered for 12.8% of the study participant. Improvement of economic level and spread of health education are recommended measure for the prevention of malnutrition in Elshagalwa village. More widespread use of the Z-Score system is recommended for identifying all the facets of undernutrition.

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