

## Nutritional Assessment of Schools' Children of Six Years Old in Al-Dora Family Medical Center in Baghdad/Iraq

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### Abstract

**Background:** Assessment of the nutritional status of children is a rising concern all over the world. Since school health services play an important role in the development of every child, so assessment of nutritional status of this segment of the population is essential. The term malnutrition "refers to both undernutrition and overnutrition". Malnutrition has various forms including both macro and micronutrient deficiencies affect a large sector of the population which include; underweight, thinness, stunting, overweight and obesity according to WHO classification.

**Objectives:** Assessment of the nutritional state of six years old children.

**Subjects and methods:** This is a descriptive cross-sectional study, comprehensive sampling technique, included children registered to schools, of ages six years old. Weight and height were measured for each child by using standard scales. nutritional status is assessed by using growth charts which include; BMI to age (Z score), weight to age (Z score), height to age (Z score) conducted in the catchment area of Al-Dora Family Health Center in Al-Dora suburb in Baghdad city capital of Iraq from 1/7/2017 to 25/9/2017. The study adopted by taking the records of schools' registration of children of 6 years old. It included 1202 students.

**Results:** Girls consists 50.9% of the sample. In general, malnutrition was prevalent in 25.4%, and it was significantly higher among boys. The analysis showed that 2.1% of the students were stunted, (5.9%) were underweight and (10.3%) were overweight. The prevalence of thinness was higher among boys (9.2%) while severe low weight was significantly higher among girls (1.5%).

**Conclusions:** One in every four of the registered children was malnourished. The highest prevalent malnourished category was overweight and the lowest was severe stunting.

**Keywords:** Nutritional; Undernutrition; Overnutrition; School; Health

### Introduction

The nutritional status of an individual is often the outcome of many inter-related factors and it is influenced by food intake as quantity and quality and physical activity [1].

Primary school age is an energetic period of physical growth and mental development of the child. Health problems due to bad nutritional status in primary school-age children can cause insufficient classroom performance, in addition to multiple health and psychological issues, so school health services can aid in the development of every child as health education can be achieved best in the school. Growth monitoring is generally used to assess nutritional status in simple available tools [2].

The term malnutrition "refers to both undernutrition and overnutrition". Undernourished children are classified as underweight which is "low weight-for-age and it reflects past (chronic) and present (acute) undernutrition. Children with z-scores <-2.00 are said to be underweight" [3]. Stunting is defined as "a low height-for-age for children and it measures the past (chronic) child undernutrition.

Children with z-scores <-2.00 are said to be stunted and those <-3.00 severely stunted" [3]. "Low anthropometric values are those more than 2 SD) [4]. Thinness is defined as "BMI-for-age is z-score between -2 and -3" which mean <-2SD while severe thinness z scores less than -3 which mean <-3SD [5].

Overweight is defined as "one standard deviation body mass index for age and sex". Obesity is defined as "two standard deviations body mass index for age and sex" [6]. Good nutrition provides a stronger immune system, better health, and productivity. Malnutrition has various forms including both macro and micronutrient deficiencies affect a large sector of the population which include; underweight, thinness, stunting, overweight and obesity according to WHO classification [1].

The anthropometric examination is the cornerstone for assessment of health and nutritional condition in childhood. Physical measurements like body weight, height, arm and calf circumference, triceps skinfold of children have been widely used to assess health and nutritional status of communities. Based on the age, body weight and height, a number of indices such as height-for-age and weight-for-height have been suggested for nutritional assessment of children [7].

The nutritional status of children reflect the socioeconomic status of the family and social well-being of the community, and the most important it can show the efficacy and productivity of the health care system, and the effect of the surrounding environment that can give a highlight to the role of family medical center as not only a source of curative, preventive, and rehabilitative medical services but as a responsible of family health [8].

According to UNICEF data, "90% of developing world's undernourished children live in Asia and Africa while 40% of the worlds malnourished live in India. The most recent estimates (1996-2005), in developing world, approximately 146 million children are underweight, out of these 57 million children live in India" [9]. Prevalence of malnutrition among school-aged children propose that these indicators do not improve much with age as in 2010, according to the "Growth and Assessment Surveillance Unit of the WHO", " the international prevalence rate of stunting among school-age children (5-14 years old) was approximately 28% (171 million children), with Eastern Africa suffering a higher rate of 45%" [10].

Childhood obesity is still one of the most serious public health problems of the twenty-one century and it is progressively affecting many low- and middle-income countries, chiefly in urban sites. The prevalence has increased showing that overweight and obese children are more likely to have a tendency of obesity and overweight in adolescence and adulthood [11].

Iraq is a developing country experiencing constraints on economic and social development due to issue of conflicts, wars, displacement, refugees and most of the environmental factors that affect the physical growth of children before puberty, including poor food consumption patterns, illness, lack of sanitation, poor hygiene practices, and poor health care coverage and resources, are present. Almost half of Iraq's total populations of 27 million are children [12]. As a study done by Guerrero-serdan in Iraq displaying war and displacement effect on physical growth of children, where those born after the war in area of severe conflicts had lower height-for-age Z-scores than children born in less violent areas that the weight-for-age Z-scores increased in 2004 but decreased in 2006 due to violent conflicts. These results propose that children are actually not losing weight rather than do not growing properly in length in areas under battles effect [13].

#### **Objectives:**

- Assessment of nutritional status of six years old children.
- Detection of malnutrition cases, and their distributions according to the gender

## **Subjects and Methods**

### **Study design**

This is a descriptive cross-sectional study, comprehensive sampling technique, included children registered to schools, of ages six years old. Weight and height were measured for each child by using standard scales, nutritional status is assessed by using growth charts which include; BMI to age (Z score), weight to age (Z score), height to age (Z score).

### **Settings**

This study was conducted in Al-Dora Primary Health-care Center for Family Health /Al Dora Primary Health-care Sector/ Al-Karkh

Health Directorate within the catchment area of Al-Dora suburb in Baghdad city capital of Iraq.

### **Sampling**

The study was adopted by taking the records of schools' registration in the catchment area of Al-Dora primary Health-care Center for nutritional assessment of children 6 years old. Al-Dora Primary Health-care Center is serving total population 39600 persons.

### **Tools and instruments**

Scales were used that are available in Al-Dora Primary Health-care Center provided by Iraqi Ministry of Health for measurement of weight and height which include an electronic scale of Seca Company for weight measurement and Seca scale for height measurement. Assessing nutritional status was done by using charts approved by Iraqi Ministry of Health according to WHO guidance which includes; BMI to age (Z score), weight to age (Z score), height to age (Z score).

### **Administrative approvals**

Official approval is obtained from managers of Al-Dora Primary Health-care Center for Family Health, Al Dora Primary Health-care Sector, and Al-Karkh Health Directorate.

### **Data collection**

The sample included the children of six years of age since 1/7/2017 to 25/9/2017, which involved those of dates of birth 1/2/2011 to 31/1/2012 as this age corresponds to the appropriate age for entering first grade, according to local school regulations, so ages out of range were excluded from data. The trained medical staff of Al-Dora Primary Health-care Center measures the weight and height of each child using the standard scales fixing the data in the records. Staff measured children after taking off their shoes and any extra clothes as hats or sweaters. The data was collected from these records with assessing nutritional status using charts approved by Iraqi Ministry of Health which include; BMI to age (Z score), weight to age (Z score), length to age (Z score).

In this study (1202) children registered to (15) schools in the catchment area of Al-Dora Primary Health-care Center.

### **Anthropometric measurements**

BMI Measured as continuous variable using the equation: weight (kg)/height<sup>2</sup> (m). The WHO school age Children Growth References 2007 [11] was used to assess the growth problems by comparing the obtained value of BMI with the Z-score on the child growth.

### **Data management**

SPSS version 18 was used for data entry and analysis. Proportions, means and standard deviations were calculated. Chi-square test was used to assess differences between two or more categorical variables. Student t test was used to compare between continuous variables. Multivariate regression analysis was performed to identify the most influential risk factors. An Alpha (p) value of  $\leq 0.05$  was the cut-off level of significance and all variables regardless of their level of significance in the univariate analysis were introduced.

### Ethical considerations

The following ethical considerations were ensured:

- Data forms were anonymous.
- Confidentiality of data throughout the study was assured.
- All collected data were used for research purpose only.

### Statistical analysis

Each child assigned a serial identification number. The data were reviewed, cleaned with double check entry into the computer using Statistical Package for Social Sciences (SPSS) version 20; then, it was coded. Body mass index was obtained by dividing weight by height squared, z-scores for height for age and weight for age according to growth charts references approved by the Iraqi ministry of health and WHO guidance [5]. The data presented as frequency and percentages tables, line graph and bar chart were used also. Student t-test used for comparison of continuous variables. Pearson's chi-square used to assess the association between categorical variables. P value considers significant if alpha less than 0.05.

### Results

This study included 1202 students registered to schools within the catchment area of Al-Dora Primary Health-care Center for Family Health.

The registered girls were 612 (50.9%). Results showed that mean of weight and height was significantly higher in boys than girls.

Anthropometrics	Boys		Girls		T-test	P value
	Mean	St. Dev.	Mean	St. Dev.		
Weight (Kg)	21.1	3.8	20.5	3.7	2.457	0.014*
Height (cm)	118	5.4	116.7	5.6	3.889	<0.001**
Body mass Index (Kg/m <sup>2</sup> )	15.08	1.95	15	1.84	0.737	0.462
* <0.05 Significant						
** <0.01 Significant						

**Table 1:** shows the comparison of students' weight, height, and body mass index according to gender.

Application of anthropometric measures on growth charts revealed that 25.4% of the registered children were malnourished. The highest

Z-scores	-4	-3	-2	-1	0	1	2	3	4	5
height/age	0.30%	0.00%	1.80%	5.70%	24.10%	37.30%	26.50%	3.80%	0.30%	0.10%
Weight/age	0.10%	0.80%	5.00%	11.60%	41.20%	22.50%	15.90%	2.60%	0.30%	0.10%
BMI/age	0.70%	0.50%	6.90%	20.00%	33.70%	24.50%	10.30%	2.50%	0.50%	0.30%

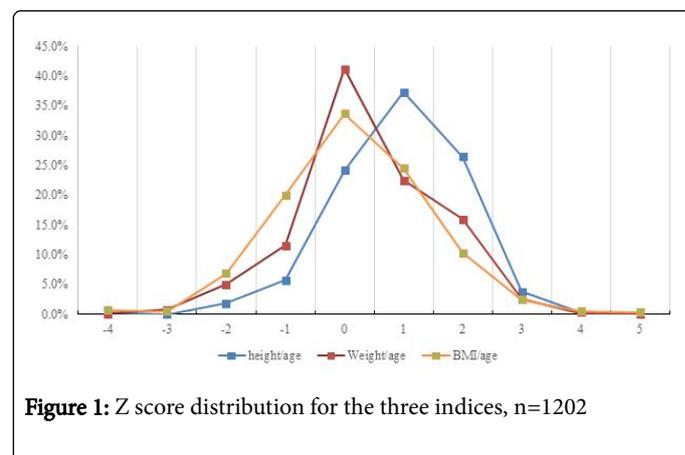
**Table 3:** Nutritional Status of students According to the Three Indices.

The prevalence of malnourishment was significantly higher among boys. According to malnutrition categories; the prevalence of thinness

prevalent malnourishment category was overweight 10.3% and the lowest was severe stunting 0.3%.

Nutritional status	Numbers	Percentage (%)
Total malnourished children	305	25.40%
Overweight	124	10.30%
Thinness	83	6.90%
Underweight	60	5.00%
Obesity	40	3.30%
Stunting	22	1.80%
Sever Thinness	14	1.20%
Severe underweight	11	0.90%
Increase height	5	0.40%
Sever stunting	4	0.30%
Grand total	1202	100.00%

**Table 2:** Shows the prevalence of malnourishment in registered children.



**Figure 1:** Z score distribution for the three indices, n=1202

Overweight & obesity were prevalent in 13.6% (BMI for age >1 z-scores) while Underweight were prevalent in 5.9% (weight for age <-2 z-score). The analysis showed that 2.1% of the students were stunted (Height for age <-2 z-score) (Table 3).

was higher among boys while severe low weight was significantly higher among girls.

Parameters	Boys (N=590)		Girls (N=612)		Chi-sq. test	P value
	Numbers	Percentage (%)	Numbers	Percentage (%)		
Malnourished children	174	29.50%	131	21.40%	10.373	0.001**
Overweight	66	11.20%	58	9.50%	0.949	0.33
Thinness	54	9.20%	29	4.70%	9.105	0.003**
Low weight	36	6.10%	24	3.90%	3.011	0.083
Obesity	25	4.20%	15	2.50%	2.98	0.084
Stunting	11	1.90%	11	1.80%	0.008	0.931
Sever Thinness	9	1.50%	5	0.80%	1.31	0.252
Severe low weight	2	0.30%	9	1.50%	4.242	0.039*
Increase height	3	0.50%	2	0.30%	0.239	0.681
Sever stunting	0	0.00%	4	0.70%	-	Not valid
* <0.05 Significant						
** <0.01 Significant						

**Table 4:** show the prevalence of malnourishment according to students' gender.

## Discussion

The current study showed that boys were heavier and taller, this could be due to normal variation in muscle mass of the body and skeletal structure in each gender [14]. Out of 1202 students, a percent of 25.4 of them were malnourished as 10.3% of registered students were overweight and 3.3% were obese. Increasing weight in children is a significant problem that could be due to bad dietary habits and decreased physical activity as many children in recent years spending the whole day on video and electronic games.

In addition to the deteriorated security situation in Iraq in latest years due to a fighting issue that forced the parents to keep their children in homes. As well as children's homes themselves increasing the impact of the problem that they become gradually smaller and more crowded due to the declined economic state under conflicts and battles situations leading to decrease the space available for physical activities of children. A study done by Hasanain et al in 2014 on primary school children in Iraq showed 38.8% either overweight or obese. Other study included Eastern Mediterranean Region showed the prevalence of overweight and obesity of school children; in Qatar, male prevalence 16.3% and 3.5% while female 15.5% and 2.8%, in Saudi Arabia male showed 19.9% and 7.8%, while female showed 19.2% and 11.0% [15].

These results could vary from the current study due to different study design and set but they still pay attention to increasing the rates of overweight and obesity throughout the years [16-17]. The present study showed that 6.9% of students had the thinness and 5% were underweight while 1.8% were stunted. The study paid attention that the problems of increasing weight were more prevalent than those of decreasing weight in school students. This is a global issue recently emerging in latest years.

Several studies in different parts of the world offered the same result such as a study done in Iran on 6 years old children revealed that

overweight and obesity prevalence was higher than underweight that the prevalence of overweight and obesity in boys was 7.84% and 6.52% and in girls were 10.38% and 3.89% while underweight in boys was 4.34% and in girls 3.89% [18]. The same results were perceived in a study in Chile and other in Germany [19-20].

Other studies presented variant results as a study in Vietnam within the South East Asian Nutrition Survey showed the prevalence of overweight and obesity were higher than underweight in urban area, 15.7% and 18.0% in compared to undernutrition forms; stunting 8.9%, underweight 13.8% and thinness 9.6% while in rural area the opposite arisen as undernourishment was more prevalent [21]. The same variance can be seen in other studies as in Pakistan, India, Afghanistan, Bangladesh, Nepal; revealed that underweight prevalence was higher than overweight [22,23]. This discrepancy could be due to different dietary norms, economic circumstances, and lifestyle in each country.

The existing study showed 1.9% of boys and 1.8% of girls was stunted. The results show some similarity in stunting percent between the two gender, the same issue can be seen in other studies as in Karachi survey; stunting in boys of 6 years old was 14.3% and in girls was 14.1% and in South East Asian Nutrition Survey showed 9.2% of girls and 8.7% of boys were stunted [21,24]. The current study showed the lower percent of stunting, in another hand, higher prevalence can be seen in other studies as a study done on school children by Al Saffar in Baghdad/Iraq as 18.7% were stunted and other in South Africa as 5% were stunted [25].

Almost similar results to the present study can be seen in a study in Chile on 6 years old children as 1.7% were stunted in boys and 2.0% in girls [19]. It could be a result of bad dietary habits by preferring unhealthy diet as sweet and candy on a healthy diet as fruits, vegetables and meat without parents' guidance which could be due to ignorance, inexperience or neglect. Recurrent infections with poor sanitation could have a role in undernourishment state, too. In addition to bad

economic circumstances that affect families and their diet especially in displacement and refugee issue as many displaced families were settled in Aldora city.

## Conclusion

This study showed that; in general boys were significantly taller and heavier than girls. Application of anthropometric measures on growth charts revealed that one in every four of the registered children were malnourished (25.4%). The highest prevalent malnourishment category was overweight 124(10.3%) and the lowest were severe stunting 4 (0.3%). The prevalence of malnourishment was significantly higher among boys (29.5%). The prevalence of thinness was higher in boys (9.2%). Severe low weight was significantly higher among girls (1.5%). This study recommends focusing on school health programs which need more support and activation and Increase the trust of auditors in the services offered by the family health center in caring their families by creating an integrated strategy with the Ministry of Education to develop health nutrition awareness of special health conditions such as obesity, underweight and stunting, with the implementation of early intervention programs as increasing number of classes that involving physical activities, monitoring the type of snacks offered in schools, focusing on healthy diet as fruit and vegetables, making home visits to malnourished children to state the reasons and how to manage them and increase awareness of parents of malnourishment and its effects on children health.

## Limitation of Study

The study lacks socio-economic determinants and dietary data due to a shortage in the records of Primary Health Care center and these can be added in further studies as part of a follow up strategy of malnourished cases.

## Conflict of Interest

None declared.

## Funding

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## Ethical Approval and Consent

Obtained.

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