

# Prevalence of Obesity and Overweight among Public Primary School Students in Kirkuk City

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## Abstract

**Background:** The prevalence of childhood obesity is increasing in both developed and developing countries. The purpose of this study was to identify the prevalence of overweight and obesity among public primary school student's and to find out the relationship between BMI and some socio-demographical characteristics for the child and his family in Kirkuk city. **Methodology:** A cross sectional study (multistage) random sample, were carried out for a period from the 1<sup>st</sup> of November ,2013 to the 1<sup>st</sup> of March ,2014, it consisted of (566); (306) boys and (260) girls. The sample age ranged between (6 -12) years. A constructed questionnaire conducted for data collection. Height and weight were measured by the researchers in the school. The data was analyzed through the application of descriptive statistical analysis (Frequency, Percentage %) and inferential statistic (chi-square). **Results:** The prevalence of overweight and obesity among public primary students was 24.2%, (18%) for overweight, (6.2%) for obese. A significant association was found between BMI category and some demographical characteristics for the child such as, age, grade, and being the only child in the family. **Conclusions and Recommendations:** The total prevalence of overweight and obese was (24.2%) among public primary school students. Further study needed to find out the association between body mass index and eating patterns among primary school students in Kirkuk city

**Keywords:** Prevalence, BMI, Public Primary School, Overweight, Obesity

## INTRODUCTION

Childhood obesity represents one of the most important and challenging public health problems in developed as well as developing countries.[1] Obesity and overweight are defined by the World Health Organization (WHO) as “abnormal or excessive fat accumulation that presents a risk to health. [2] Body mass index (BMI) is a number calculated from child’s weight and height. BMI is a reliable indicator of body fatness for more children and teens. [3] The WHO has warned of the escalating epidemic of obesity that could put the population in many countries at risk of developing non-communicable disease such as, cardiovascular disease, diabetes, musculoskeletal disorders, childhood obesity is associated with higher chance of obesity, premature death and disability in adulthood. [4],[5] Available studies in Eastern Mediterranean countries indicate that obesity has reached an alarming level among both children and adults.[6]

The percent of the world’s school-aged children are estimated to be carrying excess body fat, with an increased risk for developing chronic disease. Of these overweight children, a quarter are obese, with a significant likelihood of some having multiple risk factor for type 2 diabetes, heart disease and a variety of other co-morbidities before or during early adulthood. [7] The prevalence of overweight and obesity has increased at an alarming rate. Globally, in 2013 the number of overweight children under the age of five years is estimated to be over 42 million. Close to 31 million of these are living in developing countries.[2] There are multiple etiologies for overweight and obesity, hence, the rising prevalence of obesity cannot be addressed by a single etiology. Genetic factors influence the susceptibility of a given child to an obesity conducive environment. However, environmental factors, lifestyle preferences, and cultural environment seem to play major roles in the rising prevalence of obesity worldwide.[1, 8]

Overweight and obesity in childhood have significant impact on both physical and psychological health; for example, overweight and obesity are associated with hyperlipidemia, hypertension, abnormal glucose tolerance, and infertility. In addition, psychological disorders such as depression occur with an increased frequency in obese children.[8]

The purpose of this study was to find out the prevalence of obesity and overweight among public primary school students as well as to find out the relationship between BMI and some socio demographical characteristics for the child and the family such as, child age, sex, grade, does the child alone, socioeconomic status for the family, level of education for parents, age and occupation for parents.

## METHODOLOGY

### Design of the study and sampling

A cross sectional (multistage) random sampling technique was used to select the sample. Study was conducted

on 566 sample of students who attended public schools during 1<sup>st</sup> of November, 2013 to the 1<sup>st</sup> of March, 2014 in Kirkuk city. The size of primary student population with age ranging from 6 to 12 years is about 104183 students. The total number of public primary schools in Kirkuk city is 312 schools. The schools were classified according to two sectors (First, Second). Of these; 264 were mixed gender schools; 31 schools for boys and 17 schools were for girls. Only twenty schools were chosen for the purpose of the study.

### Data collection procedure

Permission was obtained from the head of educational directorates of Kirkuk city. Then the researcher visited the chosen schools to inform them about the survey. All the classes from the first to the sixth grade in each selected school were included in the study. Systematic randomization was used to select the sample where (5-10%) of boys and girls in each class were chosen to give them the parent consent form. After having got the agreement consent, the researcher measured the height, and weight for each student with light cloths in the head of school room. The researcher himself did all measurements and the registration; and then the parents asked to fill the questionnaire.

### Instruments of the Study

#### Questionnaire

- A self-administered questionnaire was used. The questionnaire had three sections; the first and second section was filled in the school by the parents include the; Demographic data for the child which consisted of 6 items: age of child, gender, grade, weight at birth, Gestational age at delivery, dose the child alone.
- The second section consisted of Socio-demographic data for the parents consisted of 7 items, which included: parent's age, level of education, socio-economic status, occupation and marital status.
- The third section was filled by the researchers. The researchers personally took different anthropometric measurements at the head of school room, after instructing the students to take off heavy clothes.
- Weight: One suitable weight balance measuring to nearest 0.5 kg was used. Students were weighed while wearing light school uniform.
- Height: Suitable metallic meter scale measuring to the nearest 0.5 cm, fixed on the scale was used. BMI: Calculating body mass index by dividing weight in kg by square height in meters (1).  
 $BMI = \text{weight (kg)} / \text{height}^2 (\text{m})^2$

### Statistical analysis

Data were checked for completeness and accuracy. Coded data were computerized, and analyzed using SPSS (version 17). So the study descriptive statistics were presented in frequency, percentage, mean and standard deviation, whenever appropriate and cross tabulation to show the comparison of key variables by BMI category. The Pearson Chi-Square was used to assess the statistical significance of the association between BMI category and other variables. ( $P < 0.05$ ) was considered statistically significant. BMI was measured according to the Centers for Disease control and prevention (CDC) growth chart (BMI for age percentile), overweight was defined as BMI more than 85th and less than 95th percentile for age and sex and obesity was defined as BMI more than 95th percentile for age and sex.[9]

### RESULTS :

**Table (1) Prevalence of Body Mass Index (BMI) in the study**

Body Mass Index (BMI)	Frequency (F)	Percentage (%)
Underweight	6	1.1
Normal weight	423	74.7
Overweight	102	18.0
Obese	35	6.2
<b>Total</b>	<b>566</b>	<b>100</b>

Table (1) shows the overall prevalence of obesity and overweight in the study sample was 24.2% , (6.2%) were obese and (18%) were overweight, while (74.7%) of the children had healthy weight.

**Table (2): Distribution of the Study Sample (children) According to the Demographical Characteristics:**

Items		Frequency (f)	Percentage (%)
Child age	6-< 8 year	103	18.2
	8-<10 year	172	30.4
	10-<12 year	173	30.6
	≥12 years	118	20.8
<b>Total</b>		<b>566</b>	<b>100</b>
<b>Mean ± SD = 2.54 ± 1.015</b>			
Gender	Boys	306	54.1
	Girls	260	45.9
<b>Total</b>		<b>566</b>	<b>100</b>
Grade	Grade 1	95	16.8
	Grade 2	91	16.1
	Grade 3	95	16.8
	Grade 4	95	16.8
	Grade 5	95	16.8
	Grade 6	95	16.8
<b>Total</b>		<b>566</b>	<b>100</b>
Weight at birth	≤ 2500 gram	90	15.9
	2600-3500 gram	325	57.4
	3600-4500 gram	119	21
	≥4600 gram	32	5.7
<b>Total</b>		<b>566</b>	<b>100</b>
<b>Mean ± SD = 2.16 ± 0.755</b>			
Gestational age at delivery	Preterm (< 37 weeks)	25	4.4
	Terms( ≥ 37 weeks)	541	95.6
<b>Total</b>		<b>566</b>	<b>100</b>
<b>Mean ± SD = 1.96 ± 0.206</b>			
Is the child alone?	Yes	11	1.9
	No	555	98.1
<b>Total</b>		<b>566</b>	<b>100</b>

Table (2) shows the socio-demographic characteristics for the child (age, gender, grade, weight at birth, gestational age at delivery and if the child was alone). The mean age and SD of the sample was 2.54±1.015. More than half of the samples were boys (54.1%) compared to (45.9%) girls, and (57.4%) of them had weight at birth from (2600-3500gm) with majority of them (95.6%) born term (≥ 37 weeks of gestation and (98.1%) of them were not the only child in the family.

**Table (3): Distribution of the Study Sample (Parents) According to the Demographical Characteristics:**

Socio-demographical data		Father		Mother	
		Frequency ( <i>f</i> )	Percentage (%)	Frequency ( <i>f</i> )	Percentage (%)
Age	≤25 year	1	0.2	5	0.9
	26-35year	76	13.4	211	37.3
	36-45 year	309	54.6	296	52.3
	46-55 year	145	25.6	51	9
	≥56 year	35	6.2	3	0.5
<b>Total</b>		<b>566</b>	<b>100</b>	<b>566</b>	<b>100</b>
		<b>Mean ± SD = 3.24± 0.766</b>		<b>Mean ± SD = 2.71± 0.660</b>	
Level of Education	Illiterate	12	2.1	6	1.1
	Read & Write	10	1.8	43	7.6
	Primary School	21	3.7	125	22.1
	Intermediate School	308	54.5	192	33.9
	Secondary School	187	33	116	20.5
	Institute & university	28	4.9	84	14.8
<b>Total</b>		<b>566</b>	<b>100</b>	<b>566</b>	<b>100</b>
Occupation	Employed	193	34.1	111	19.6
	Housewife	-	-	445	78.6
	Free work	314	55.5	-	
	Student	28	4.9	4	0.7
	Jobless	21	3.7	-	
	Retired	10	1.8	6	1.1
<b>Total</b>		<b>566</b>	<b>100</b>	<b>566</b>	<b>100</b>

Table (3) shows the socio-demographic characteristics for the parents (age, level of education, and occupation, ) More than half of both, mothers (52.3%) and fathers (54.6%) were in age group between (36-45) years old, they had graduated from intermediate school (54.5%) and (33.9%) respectively. According to occupation (55.5%) of fathers had free work and (78.6%) of mothers were house wife.

**Table (4): Distribution of the Study Sample (children) According to the Body Mass Index (BMI)**

Variables	BMI				Total 566 (100%)	P.<0.05
	Underweight N=6(1.1%)	Healthy weight N= 423(74.7%)	Overweight 102(18%)	Obese N=35(6.2%)		
<b>Sector</b>						
Sector 1	1 (0.8)	104 (86.7)	8 (6.7)	7 (5.8)	120 (100)	<b>0.003 H.S</b>
Sector 2	5 (1.1)	319 (71.5)	94 (21.1)	28 (6.3)	446 (100)	
Total	6 (1.1)	423 (74.7)	102 (18)	35 (6.2)	566 (100)	
<b>Grade</b>						
Grade1	0 (0.0)	84(88.4)	9 (9.5)	2 (2.1)	95 (100)	<b>0.0005 H.S</b>
Grade 2	0 (0.0)	82 (90.1)	6 (6.6)	3 (3.3)	91(100)	
Grade 3	0 (0.0)	73 (76.8)	18 (18.9)	4 (4.2)	95 (100)	
Grade 4	1 (1.1)	72 (75.8)	19 (20)	3 (3.2)	95 (100)	
Grade 5	2 (2.1)	64 (67.4)	20 (21.1)	9 (9.5)	95 (100)	
Grade 6	3 (3.2)	48 (50.5)	30 (31.6)	14 (14.7)	95 (100)	
Total	6 (1.1)	423 (74.7)	102 (18)	35 (6.2)	566 (100)	
<b>Age of the child</b>						
6-< 8 year	0 (0.0)	90 (87.4)	10 (9.7)	3 (2.9)	103 (100)	<b>0.0005 H.S</b>
8-<10 year	1 (0.6)	144 (83.7)	22 (12.8)	5 (2.9)	172 (100)	
10-<12 year	1 (0.6)	125 (72.3)	36 (20.8)	11 (6.4)	173 (100)	
≥12 years	4 (3.4)	64 (54.2)	34 (28.8)	16 (13.6)	118 (100)	
Total	6 (1.1)	423 (74.7)	102 (18)	35 (6.2)	566 (100)	
<b>Gender</b>						
Boys	4 (1.3)	228 (74.5)	56 (18.3)	18 (5.9)	306 (100)	<b>0.916 N.S</b>
Girls	2 (0.8)	195 (75)	46 (17.7)	17 (6.5)	260 (100)	
Total	6 (1.1)	423 (74.7)	102 (18)	35 (6.2)	566 (100)	
<b>Socio-economic status</b>						
Sufficient	2 (1.1)	147 (80.3)	23 (12.6)	11 (6.0)	183 (100)	<b>0.130 N.S</b>
barely Sufficient	4 (1.5)	190 (69.9)	58 (21.3)	20 (7.4)	272 (100)	
Insufficient	0 (0)	86 (77.5)	21 (18.9)	4 (3.6)	111 (100)	
Total	6 (1.1)	423 (74.7)	102 (18)	35 (6.2)	566 (100)	
<b>Child Weight at birth</b>						
≤ 2500 g	1 (1.1)	72 (80)	13 (14.4)	4 (4.4)	90 (100)	<b>0.569 N.S</b>
2600-3500 g	2 (0.6)	239 (73.5)	64(19.7)	20 (6.2)	325 (100)	
3600-4500 g	2 (1.7)	85 (71.4)	22 (18.5)	10 (8.4)	119(100)	
≥4600 g	1 (3.1)	27 (84.4)	3 (9.4)	1 (3.1)	32 (100)	
Total	6 (1.1)	423 (74.7)	102 (18)	35 (6.2)	566 (100)	
<b>Is the child alone?</b>						
Yes	0 (0.0)	6 (54.5)	2 (18.2)	3 (27.3)	11 (100)	<b>0.032 S</b>
No	6 (1.1)	417 (75.1)	100 (18)	32 (5.8)	555 (100)	
Total	6 (1.1)	423 (74.7)	102 (18)	35 (6.2)	566 (100)	

Table (4) shows the child characteristics distribution by BMI category. Significant association was found between many child variables and BMI categories. Obese (6.3%) and overweight (21.1%) children were mostly in schools that belong to sector 2 ( $p<0.003$ ). Highly significant associations has found between the body weight categories and the grade ( $p<0.05$ ). The prevalence of obesity and overweight increased while they were progressing in grade. Obese (13.6%) and overweight (28.8%) children were older in age  $\geq 12$  years ( $p<0.05$ ). The majority of obese (5.8%) and overweight (18%) children were less likely to be the only child in the family ( $p<0.032$ ). While, there was no significant association between gender of the child ( $p<0.916$ ), socio-economic status ( $p<0.130$ ) and child weight at birth ( $p<0.569$ ).

**Table (5): Distribution of the Study Sample (Parents) According to the Body Mass Index (BMI)**

Variables	BMI				Total 566 (100%)	P.<0.05
	Underweight N=6(1.1%)	Healthy weight N= 423(74.7%)	Overweight 102(18%)	Obese N=35(6.2%)		
<b>Father age</b>						
≤ 25 years	0 (0.0)	0 (0.0)	0 (0.0)	1 (100)	1 (100)	<b>0.020 S</b>
26-35 years	1 (1.3)	62 (81.6)	10 (13.2)	3 (3.9)	76 (100)	
36-45 years	2 (0.6)	238 (77)	50 (16.2)	19 (6.1)	309 (100)	
46-55 years	2 (1.4)	100 (69)	34 (23.4)	9 (6.2)	145 (100)	
≥ 56 years	1 (2.9)	23 (65.7)	8 (22.9)	3 (8.6)	35 (100)	
<b>Total</b>	6 (1.1)	423 (74.7)	102 (18)	35 (6.2)	566 (100)	
<b>Mother age</b>						
≤ 25 years	1 (20)	1 (20)	2 (40)	1 (20)	5 (100)	<b>0.0005 H.S</b>
26-35 years	2 (0.9)	165 (78.2)	33 (15.6)	11 (5.2)	211(100)	
36-45 years	2 (0.7)	230 (77.7)	47 (15.9)	17 (5.7)	296 (100)	
46-55 years	1 (2)	26 (51)	18 (35.3)	6 (11.8)	51 (100)	
≥ 56 years	0 (0.0)	1 (33.3)	2 (66.7)	0 (0.0)	3 (100)	
<b>Total</b>	6 (1.1)	423 (74.7)	102 (18)	35 (6.2)	566 (100)	
<b>Father Educational level</b>						
Illiterate	0 (0.0)	6 (66.7)	2 (22.2)	1 (11.1)	9 (100)	<b>0.982 N.S</b>
Read & Write	0 (0.0)	6 (85.7)	1 (14.3)	0 (0.0)	7(100)	
Primary School	0 (0.0)	11(73.3)	4 (26.7)	0 (0.0)	15 (100)	
Intermediate School	4 (1.3)	240 (76.4)	51 (16.2)	19(6.1)	314 (100)	
Secondary School	2 (1)	140 (72.5)	37 (19.2)	14 (7.3)	193 (100)	
Institute & University	0 (0.0)	20 (71.4)	7 (25)	1 (3.6)	28 (100)	
<b>Total</b>	6 (1.1)	423 (74.7)	102 (18)	35 (6.2)	566 (100)	
<b>Mother Educational level</b>						
Illiterate	0 (0.0)	2 (33.3)	2 (33.3)	2 (33.3)	6 (100)	<b>0.028 S</b>
Read & Write	0 (0.0)	35 (81.4)	4 (9.3)	4 (9.3)	43 (100)	
Primary School	0 (0.0)	97(77.6)	22 (17.6)	6 (4.8)	125 (100)	
Intermediate School	3 (1.6)	150 (78.1)	28 (14.6)	11 (5.7)	192 (100)	
Secondary School	1 (0.9)	78 (67.2)	26 (22.4)	11 (9.5)	116 (100)	
Institute & University	2 (2.4)	61 (72.6)	20 (23.8)	1 (1.2)	84 (100)	
<b>Total</b>	6 (1.1)	423 (74.7)	102 (18)	35 (6.2)	566 (100)	
<b>Father Occupation</b>						
Employee	2 (1)	140 (72.5)	37 (19.2)	14 (7.3)	193 (100)	<b>0.976 N.S</b>
Free work	4 (1.3)	240 (76.4)	51 (16.2)	19 (6.1)	314 (100)	
Jobless	0 (0.0)	15 (71.4)	5 (23.8)	1 (4.8)	21 (100)	
Retired	0 (0.0)	8 (80)	2 (20)	0 (0.0)	10 (100)	
Student	0 (0.0)	20 (71.4)	7 (25)	1 (3.6)	28 (100)	
<b>Total</b>	6 (1.1)	423 (74.7)	102 (18)	35 (6.2)	566 (100)	
<b>Mother Occupation</b>						
Employee	1 (0.9)	83 (74.8)	22 (19.8)	5 (4.5)	111 (100)	<b>0.885 N.S</b>
Housewife	5 (1.1)	330 (74.2)	80 (18)	30 (6.7)	445 (100)	
Retired	0 (0.0)	6 (100)	0 (0.0)	0 (0.0)	6 (100)	
Student	0 (0.0)	4(100)	0 (0.0)	0 (0.0)	4 (100)	
<b>Total</b>	6 (1.1)	423 (74.7)	102 (18)	35 (6.2)	566 (100)	
<b>Marital Status</b>						
Married	5 (0.9)	403 (74.9)	96 (17.8)	34 (6.3)	538 (100)	<b>0.075 N.S</b>
Widow	0 (0.0)	14 (73.7)	5 (26.3)	0 (0)	19 (100)	
Divorce	1 (11.1)	6 (66.7)	1 (11.1)	1 (11.1)	9 (100)	
<b>Total</b>	6 (1.1)	423 (74.7)	102 (18)	35 (6.2)	566 (100)	

Table (5) shows the sample parents characteristics by BMI category. Highly significant association was found between parents age (46-55) years and BMI categories. The prevalence of obesity/ overweight significantly increased with the increase in father ( $p<0.020$ ) and mother ( $p<0.0005$ ) age respectively. According to the educational level, there was significant association between sample's mother educational level and the prevalence of obesity/overweight ( $p<0.028$ ). While, there was no significant association between body weight categories and the sample's father educational level ( $p< 0.982$ ). Regarding parent's occupation and marital status, there was no significant association with the body weight categories.

### Discussion

Childhood obesity is a serious public health problem with a rapid increase in prevalence worldwide. In the present study. The overall prevalence of obesity among students aged from 6-12 year was 6.2%, while the overweight was 18%, so the overall prevalence of obesity and overweight among public primary school students in Kirkuk city was (24.2%).

No previous studies have carried out in Kirkuk city at this age group which makes it difficult to compare. Two recent studies were conducted, one in Baghdad city [10] and the second in Basra city [11]. The result of overall prevalence for obesity and overweight in Basra city showed 24.1% (10.5% were obese and 13.6% were overweight) and Baghdad city study were 32.9% (16.2% were obese and 16.7% were overweight).

Although the prevalence of obesity/overweight among public primary school students in Kirkuk was relatively high, it is still lower than the Baghdad study and than that reported for several neighboring countries such as the two Kuwaiti studies by Al-Bayumy et al (2009), which found the overall prevalence of obesity and overweight as 45.3% (30.7% overweight and 14.6% obese) and Al-Isa et al (2010) study which showed the overall prevalence as 37% (16.8% for obese and 20.2% for overweight) [12, 13]. Another study from Iran 29% (7.9% for obese and 21.1% for overweight) [14], and Kingdom Saudi Arabia 45% (27% for obese and 18% for overweight). Moreover, the Port Said city, Egypt study showed the overall prevalence as 31.2% (17.7% for obese and 13.5% for overweight) [8].

The prevalence of overall obesity and overweight in the current study (24.2%) was similar to the study from Basra city, while it was lower than the results of Baghdad city study and other neighbor countries. The differences seen in the overall prevalence of obesity and overweight among public primary school students in the current study and Baghdad study may be attributed partially to the difference in age group (6-17) years than the current study which is from (6-12) years. As well as the sample size was larger (2401, 1256 boys and 1145 girls). On the other hand, the differences with other studies can be explained as environmental and cultural differences, genetic factors, life style, as well as the sample size, variation in the sample age group included, study methods and definition of the obesity and overweight across the studies.

Some studies had shown that boys have a higher rate of obesity than girls [15]. Others showed that the female gender was a risk factor for obesity with a higher prevalence of obesity among females compared to males. [12] In the present study the prevalence of obesity and overweight was the same among boys and girls. This result was in agreement with the two Iraqi studies [10, 11] and the study from Egypt [8] as there was no significant association between the prevalence of obesity and overweight and the gender.

It was suggested that the prevalence of obesity and overweight increases with the increasing of age. This may give the impression that obesity is a progressing phenomenon that only present, tend to increase with time [16]. The present study showed the prevalence of obesity and overweight increase with age. It has increased for obese from (2.9%) at age 6<8 years to (13.6%) at age  $\geq 12$  years, and for overweight has increased from (9.7%) at age 6<8 years to reach (28.8%) at age  $\geq 12$  years.

This result was in consistent with the results of Basra study [11], while the Baghdad study showed no association between BMI and age.

The present study showed an increase in prevalence of obesity and overweight in the family that that the child was not alone and this result is in consistent with a study conducted by (Al-Isa, et al, 2010) in Kuwait, which found that the prevalence of obesity and overweight increased significantly four times in the families included  $\geq 11$  member compared to 1-6 members group of lower (1-6) members.

Children of working mothers and those of fathers involved in professional job showed higher prevalence of overweight and obesity [11, 15]. The present study showed no relation between parents occupation and the prevalence of obesity and overweight, and this result was in consistent with a result from Kuwait study showed that unemployed father was found to be significantly associated with higher risk of overweight and obesity. [13]

Family income is inversely proportional to child's BMI in developed countries and directly proportional in developing ones. [1, 17] The current study showed no significant association between the prevalence of obesity and overweight and the socio-economic status. This result was in contrast with the result of port Said City study which reported a significant direct association ( $p < 0.047$ ) with BMI and obesity were more prevalent among the children from high socio-economic class. [8] As well as with the result of Basra study which showed an increase in the prevalence of the obesity and overweight and the family income. [11]

The current study showed a significant association between the prevalence of obesity and overweight and the educational level for the mother ( $p < 0.028$ ), while there was no significant association between the BMI categories and the father's educational level ( $p < 0.982$ ). Previous studies showed a consistent increase in prevalence of obesity and overweight with the increase in parental education. [11], [15]

## Conclusion and Recommendation:

### Conclusion

based on the results of the present study, we can conclude that the prevalence of obesity and overweight was relatively high among public primary school students in Kirkuk city. In addition, it is significantly associated with child's age, grade, does he alone, parents age and mother's educational level.

## Recommendation

There is need to increase the awareness among primary school students regarding obesity, and the prevention methods by regular educational programs on healthy nutrition, physical activity to promote healthy life style and healthy dietary habits among the school children and their families. Moreover, further studies are needed to find out the relation between dietary patterns and the BMI categories in Kirkuk city.

## References

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