

# Analysis of the body composition of school age children 9-12 years old: Palestinian perspective

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**ABSTRACT**— Obesity is a serious common nutritional condition among children. The global childhood obesity prevalence has tripled since 1970. The purpose of this study was intended to assess gender and age groups that are greatest affected by obesity and overweight among 9 -12 years' Palestinian school-age children. A cross-sectional study was conducted. A random sample was composed of 971 children with ages ranging from 9 to 12 years old. The results of the study showed that the highest obesity found 13(8.7%) in females age 9 and 12 (12.6%) in males age 12 years. In females, those of age 12 had the highest mean in waist circumference of 65 (SD=7.9) and of 79 (SD=7.8) hip circumference. While, the highest mean of WHR were in those of age 10 of 0.847(SD=0.060) and WHtR of 0.453(SD=0.050) in those of age 9 and of 0.453(SD=0.043) in those of age 10. In males, the age 12 was the highest mean in waist circumference of 66 (SD=10.372) and hip circumference of 79 (SD=12.09). While the highest mean of WHR of 0.89 (SD=0.127) and WHtR of 0.4567(SD=0.066) were in those of age 9 years. This study reported a relatively high prevalence rate of overweight and obesity among children. Obesity among boys was higher than in girls.

**KEY WORDS:** body composition, body mass index, children.

## 1. INTRODUCTION

Obesity is the serious common nutritional condition amongst children [1]. The global childhood obesity prevalence has tripled since 1970 [2]. The probable reason of such epidemic is the extensive accessibility and intake of high-calorie nutrients with low value, in addition to increasing tendency regarding sedentary lifestyles, particularly among urban people [3]. Evidence showed that in 2013, over 1.9 billion adults worldwide were overweight. More than 600 million of those were obese. In addition, 42 million children (under 5 years of age) were overweight or obese [4]. In the developing countries, the prevalence of overweight and obesity in children has also enlarged from 8.1% to 12.9% in boys and from 8.4% to 13.4% in girls in 2013[5]. According to ministry of health, an epidemiological change has happened in Palestine like many developing countries throughout the previous century. There is some inconsistent confirmation concerning the prevalence of overweight and obesity in Palestine. According to a study, Palestinian adults' prevalence of obesity in a rural community among men and women were 58.7% and 71.3% respectively. Furthermore, prevalence of obesity among Palestinian college female students was 1.7% [6]. Consequently, combining the evidence and limiting the actual overweight and obesity prevalence is serious to confirm the policy decisions maker where health promotion should be determined. According to the literature, overweight and obesity are associated with increased incidences and prior onset of many chronic diseases, as well as hypertension, type 2 diabetes, asthma, sleep apnea, dyslipidemia, orthopedic problems, fatty liver disease, depression and reduced self- esteem [7]. Obesity of childhood may also be an element factor for cardiovascular diseases in adults for instance atherosclerosis. These diseases are the main causes of illness and deaths in Palestine [8]. Moreover, evidence showed that overweight children are accompanying with poor school achievement and a greater of risk-taking actions [9]. Therefore, the current study aimed to

investigate the prevalence of obesity and overweight among Palestinian children to allow well decision-making processes as rapid as childhood by involving parents, schools and the wider society. Moreover, this study was intended to assess gender and age groups that are greatest affected by obesity and overweight among 9 -12 years' Palestinian school age children.

## **2. Methods**

### ***2.1 Research Design, sample and setting***

A cross-sectional study was conducted for a five months' period starting from February 2018 at four Governmental mixed schools in the following cities; Jenin, Hebron, Nablus, and Tulkarem for both gender. Participants were school aged between 9 to 12 years. Schools and participants were randomly selected until a total of 971 participants, including 486 males and 485 female completed the study. Thirty-two participants were recruited from each of 30 selected schools. Random sampling technique was used to recruit participants consecutively from each arm until 8 participants were recruited from each grade (primary 3 to 6 grade) of the primary schools. Only 971 cases were amenable to statistical analyzed and to overcome attrition rate. Students who took insulin, anticonvulsants, glucocorticoids or any type of cardiovascular medication were excluded from the actual study.

### ***2.2 Ethical consideration***

Ethical approval for this study was obtained by the Ethics and Research Committee of the Arab American University, Palestine. Permission has been obtained from the Palestinian Ministry of education, Palestine before the data collection process started. To protect confidentiality and volunteer participation, each participant had the authorization of his/her parents by signing the written informed consent. Procedure for data collection was explained to participants and subsequently measurements were done. Participant's age, sex and grade level were first recorded and then the following anthropometric measurements were taken.

### ***2.3 Data collection procedure***

Height of the participants was measured using a standardized height meter calibrated from 0 to 200 cm. The participants' heels, back, and occiput were made to touch the scale, with the participants looking straight ahead during measurement. The height of each participant was measured to the nearest 0.1m. Weight of participant, without shoes and with light clothes, was measured using a standardized weighing scale, using the in kilograms to the nearest 1.0 kg. All measurements were taken twice using a standard method of anthropometric assessment and then averages were used to calculate body mass index (BMI). BMI was calculated by dividing weight in kilograms by height in meters squared ( $\text{kg}/\text{m}^2$ ) [10], and was categorized based on age and sex-specific cut-off values of the 2000 Centers for Disease Control and Prevention (CDC) growth charts. The categories were underweight (< 5th percentile), normal weight (5th to 85th percentile), overweight (85th to 95th percentile), and obese (> 95th percentile) [11]. Waist circumference of participant was measured using a tape measure. The umbilicus was used as a standard reference point for waist circumference [12]. Waist circumference of each participant was measured to the nearest 0.1cm. Hip circumference of participant was measured using a tape measure. Measurement was taken using the greater trochanter as the standard reference point [13]. Hip circumference of each participant was measured to the nearest 0.1cm. The collecting data for each child took between 15 to 20 minutes.

### ***2.4 Statistical analysis***

The data were analyzed by SPSS Statistics 23. Descriptive analyses were applied.

### 3. Results

Nine hundred and seventy-one participants in the study, with response rate of 100.0%. Of those, 486 (50.05%) were female and 485 (49.05%) were male. In the female sample in table 1, the results of overweight girls indicated that 27(18.0%) were in the age of 9 years old group, 24(17.8%) were in 10 years old group, 26(18.1%) were in 11 years old group, and 14(24.6%) were in age 12 years old group. The results of obesity indicated that 13(8.7%) were in the 9 age years old group, 7(5.2%) were in age 10 years old group, 12(8.3%) were in age 11 years old group, and only one obese in age 12 years' age group. On other hand, the overweight findings of male analysis showed that 15(11.5%) were in age the 9 years old group, 15(14.0%) were in the age 10 years old group, 26 (17%) were in the 11 years old group, and 19(20%) were in the 12 years old group. The results of obesity revealed that, 11(8.5%) were in the 9 years' group, 8 (7.5%) were in the 10 years old group, 6 (3.9%) were in age the 11 years old group, and 12 (12.6%) were in the 12 years old group.

**Table 1: Distribution of body mass index in terms of (overweight and obesity) in both gender (N=971)**

Age (year)	Female					Male				
	N	Overweight		Obesity		N	Overweight		Obesity	
		n	%	n	%		n	%	n	%
9	150	27	18.0%	13	8.7%	130	15	11.5%	11	8.5%
10	135	24	17.8%	7	5.2%	107	15	14.0%	8	7.5%
11	144	26	18.1%	12	8.3%	153	26	17.0%	6	3.9%
12	57	14	24.6%	0	0.0%	95	19	20.0%	12	12.6%
Total	486	91	18.7%	32	6.6%	485	75	15.5%	37	7.6%

In the female samples in table 2, the results of the anthropometric measurements of the girls indicated that the 12 years old group was the highest mean in waist circumferences and Hip circumferences, 65 (SD=7.9) and 79 (SD=7.8) respectively. While, the highest mean of WHR was in the 10 years old group, 0.847(SD= 0.060). The highest WHtR was in the 9 and 10 years old groups, 0.453(SD= 0.050) and 0.453(SD= 0.043) respectively. On the other hand, the lowest mean of waist circumference and Hip circumference were in the 9 years old group, 59(SD= 7.74) and 70(SD= 8.26) respectively. The lowest mean of WHR and WHtR were found in the 12 years old group, 0.828(SD= 0.06) and 0.444(SD= 0.046) respectively.

**Table 2: Anthropometric measurements in girls according to age (n= 486)**

Age (year)	N	Waist circumference		Hip circumference		WHR		WHtR	
		M	SD	M	SD	M	SD	M	SD
		9	150	59.00	7.74	70.00	8.26	.846	.080
10	135	62.00	7.299	73.00	8.013	.847	.060	.453	.043
11	144	63.00	9.07	76.00	9.473	.835	.082	.445	.057
12	57	65.00	7.909	79.00	7.817	.828	.060	.444	.046

M mean, SD standard deviation, WHR Waist hip ratio, WHtR weight height ratio

Table 3 shows the results of the mean and standard deviation of the anthropometric measurements of the waist, hip, WHR and WHtR in Boys. The results show that the 12 years old group was the highest mean in waist circumferences and Hip circumferences, 66 (SD=10.372) and 79 (SD=12.09) respectively. The highest mean of WHR and WHtR were in the 9 years old group 0.89(SD= 0.127) and 0.4567(SD= 0.066) respectively. The lowest mean of waist circumference and Hip circumference were noticed in the 9 years old group, 59(SD= 9.708) and 66(SD= 8.116) respectively. The lowest mean of WHR and WHtR were in

the 12 years old group 0.853(SD= 0.057) and 0.443(SD= 0.065) respectively.

**Table 3: Anthropometric measurements in Boys according to age (n= 485)**

Age (year)	Waist circumference			HIP circumference		WHR		WHtR	
	N	M	SD	M	SD	M	SD	M	SD
9	130	59.00	9.708	66.00	8.116	.893	.127	.456	.066
10	107	61.00	8.668	70.00	8.651	.867	.080	.448	.057
11	153	64.00	9.296	75.00	9.136	.864	.060	.446	.056
12	95	66.00	10.372	79.00	12.090	.853	.057	.443	.065

#### 4. DISCUSSION

Increasing the prevalence of overweight and obesity in school children is now a major public health problem with major short and long-term health and economic consequences [14–16]. Obesity-related disorders, such as metabolic syndrome, insulin resistance, type 2 diabetes and cardiovascular diseases, which are known to occur only in adults now appear in children [17]

Accordingly, determining the current prevalence and understanding the factors related to obesity and/or underweight in children are vital. The results in the current study indicated that obesity is becoming one of the biggest health issues among Palestinian children as they are in some other parts of the world, such as the United States [18]. It is widely believed that nutritional habits in the Eastern Mediterranean region, including Palestine, have changed over the past few decades largely due to urbanization with the traditional diet, replaced by a westernized diet that includes high calories, fat, low vegetables and fiber content [19].

Noticeably, the prevalence of overweight was found to be higher amongst female than male, while the prevalence of obesity was higher amongst male than female. Our results support a previous study, which indicated that, obesity in children varies by gender around the world [20]. According to Sweeting, West & Young study, obesity prevalence among 15 years old Scottish children, the prevalence of obesity increased 2.5 times between 1987 and 2006. His study revealed that obesity prevalence was higher among male (15.9%) in comparison to female of 14.9% [20]. This difference may be related to the fact that females are more concerned about their shape, appearance and weight than their male counterparts. Palestinian females are more likely to worry about and take care of their weight and dieting than males in order to look attractive and beautiful. The results of this study were similar to previous studies, where the prevalence of obese Chinese boys was higher than girls [21]. In contrast, the results of the current study were inconsistent with findings from studies in Saudi Arabia, Bahrain, and Iran where obesity among women was higher [12, 23, 24]. This may be due to culture, weight-related beliefs and attitudes. The girls in the Palestinian society consider less fatty tissue on their abdomen, hips and waist as marriage requirements. Limitation of this study includes only age between 9-12 years old. The findings of this study, however, represent important additions to the literature on obesity in Palestine and can begin to inform practice and policy.

#### 5. CONCLUSION

This study confirmed the Palestinian community a relatively high prevalence rate of overweight and obesity among male and female children aged 9–12 years. Obesity among boys was higher than girls.

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