

## **Prevalence and trends of overweight and obesity amongst Saudi school children, a study done by using three noninvasive methods**

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### **Abstract**

Obesity has become a global epidemic. Its level in the Middle Eastern and Asian countries have reached to an alarming level. Rapid transition of life style and urbanization has not only affected adults but also the younger population.

**Objective:** This study records the trends of prevalence of obesity and over weight in the school children of both genders of Al Qassim region by employing three different non-invasive methods and recorded their differences.

**Subjects and methods:** This cross-sectional study was conducted on Saudi students of secondary and intermediate levels between 12-14 years of age. The total number of the students who participated in the study was 242, 129 males and 113 females. A self-administered pre-coded questionnaire was used. Body mass index, skin fold thickness and bioelectrical impedance analyzer (BIA) readings were recorded. Data was analyzed on SPSS version 11. Descriptive statistical analysis was performed. Chi square test with a *P value* <0.05, was used to compare the prevalence rates.

**Results:** Prevalence of obesity and over-weight recorded were higher in the boys but the rates recorded by three methods have shown a wide variation. Several factors, such as change in dietary habits, socioeconomic status and the family history of obesity have shown association but physical inactivity and father's obesity were found significant contributory factors. There is an urgent need for intervention to prevent and control obesity and its consequences amongst children in Saudi Arabia.

**Key words:** obesity, overweight, children, BMI, BIA, SFT

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## Introduction

Obesity is the most common nutritional disorder in developed countries and is becoming significant in the developing countries. It is affected generally by factors such as genetics and environment, in addition to social, physiological and psychological factors. <sup>[1]</sup> The importance of obesity and overweight among children has only been highlighted relatively recently. <sup>[2, 3]</sup> Worldwide, there are a total of 155 million overweight children or roughly every tenth child is overweight, and around 30–45 million are classified as obese. <sup>[4-6]</sup> A study of 94 developing countries showed that the nations with the highest prevalence of overweight were located mainly in the Middle East, North Africa and Latin America. <sup>[7]</sup>

Studies show that 50% to 77% of children and adolescents who are obese carry their obesity into adulthood, thus increasing their risks of developing serious and often life-threatening conditions. The risk increases to 80% if just one parent is also obese. <sup>[8]</sup> The dramatic rise in childhood obesity in developing countries is considered a major driving force behind the high prevalence of the pediatric metabolic syndrome in these countries. Rapid urbanization and demographic trends have been associated with a cluster of non-communicable diseases and unhealthy lifestyles, described as the “lifestyle syndrome” or the “New World syndrome” and is considered as the most important etiology for the very high obesity rates and its consequent morbidity and mortality in developing nations. It is also noteworthy that reported quality of life scores for obese children were significantly lower than those for children of normal weight. <sup>[9]</sup>

The population of Saudi Arabia is going through a nutrition transition where customary and traditional food is being replaced by fast food which is usually high in fat, sugar and salt. Fried foods and carbonated drinks are now common edibles in the country. <sup>[10]</sup> Very little information is currently available on obesity trends in childhood. Obese children generally live in obese families. Dietary choices seem to be responsible for familial clustering. <sup>[11]</sup>

## Methodology

This cross-sectional study was conducted on Saudi male and female secondary and

intermediate students between ages 12-14 years from the schools of three big towns of Qassim region of Saudi Arabia during the period of December 2013 to May 2014. All students of the required aged in the selected classes were included in the study except those who were on any kind of medication for any chronic illness. The total number of the participants was 242 with 129 males and 113 female students.

A self-administered pre-coded questionnaire was used. The questionnaire contained questions on family history, dietary habits, amount of daily food, sweets and soft drink consumption, time daily spent in sports or physical activity & passive indoor activity. Anthropometric measurements were recorded using physician's standard digital weighing scale & height measuring scale. Skin fold thickness (triceps) at mid arm circumference was measured in both arms using digital caliper. Body mass index (BMI) and Body fat contents were recorded using digital full body sensor & composition monitor and scale (BIA) model HBF-516. Descriptive statistical analysis of BMI, skin fold thickness, bioelectrical impedance, weight, height and socioeconomic factors was performed. Estimations of the prevalence of overweight and obesity were based on the reference values issued by W.H.O. for BMI, for Skin fold thickness cutoff values for the US children were used <sup>[12]</sup> and for BIA, values used from the table provided along with the bioelectrical impedance analyzer by the Tanita Corporation. The questionnaire was given to the participating students with verbal and written instructions. The data was analyzed by SPSS version-11. Chi square test with a ‘P’ value <0.05, was used to compare the prevalence rates and was considered as statistically significant. This study was conducted after approval from university research deanship, college ethical committee, and obtaining necessary permissions from the school authorities.

## Results

### Associated predisposing factors

129 (53%) of the study participants were males while 113 (47%) were females. According to our scoring system, 90% of all participants drank at least one soft drink daily and 30% of them consumed 3 soft drinks / day,

predominately males. 81% of the participants consumed junk food at least once a week and 36% of them consumed at least 3 times/ week, more boys than girls have this tendency. 86% of the participants have a tendency to eat sweets and chocolates, predominately females. 26% fathers and 22% mothers of the study participants were obese and one of the siblings of the 39% study participants is having obesity. One of the family members of the 45% of the study participants is suffering from diabetes and one family member of 37% of the study participants is suffering from hypertension. 72% of the our study participants spent at least four or more hours every day in recreational activities like watching TV, playing videogames or sitting in front of computer. Only 25% of the students spent 2-4 hours in indoor or outdoor physical activity or sports. Fathers of the 41.7%, 26.4 and 31.8% study participants were having university, intermediate and secondary education respectively.

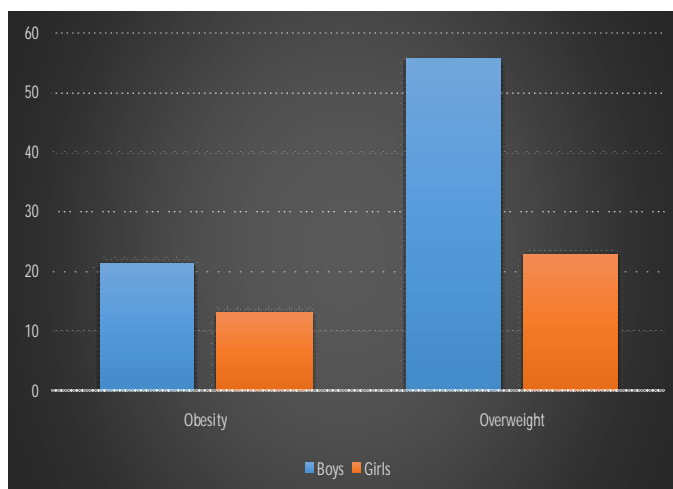
### Obesity and overweight prevalence:

#### By Body mass index (BMI) method

According to the findings of this study, 21.7% of the boys and 13.3% of the girls are obese and 55.8 of the boys and 23% of the girls are overweight (Figure 1). Statistically there is a highly significant difference in the prevalence of obesity and over-weight between the boys and girls.

#### By Skin-fold thickness method

For the estimation of prevalence of obesity based on the measurement of skin fold thickness. According to our findings, 37.3% of the boys and 15% of the girls are obese and 62.7% of the boys and 36.3% of the girls were overweight (Figure 2). Statistically, there is a highly significant difference in the prevalence of obesity and overweight between the boys and girls.



**Figure 1: Chart showing prevalence of Obesity and Overweight amongst school children in Saudi Arabia measured using body mass index (BMI)**

#### By Bioelectrical impedance analysis (BIA) and body fat percent estimation

According to our findings 11.8% of the boys and 8.8% of the girls in this age group are obese with a body fat content of more than to 28.4% and 32.9% respectively and 66.7% of the boys and 13.3% of the girls are overweight (Figure 3) and having a body fat content of up to 28.5% and 33% respectively. Statistically there is a highly significant difference in the prevalence of obesity and overweight between the two genders.

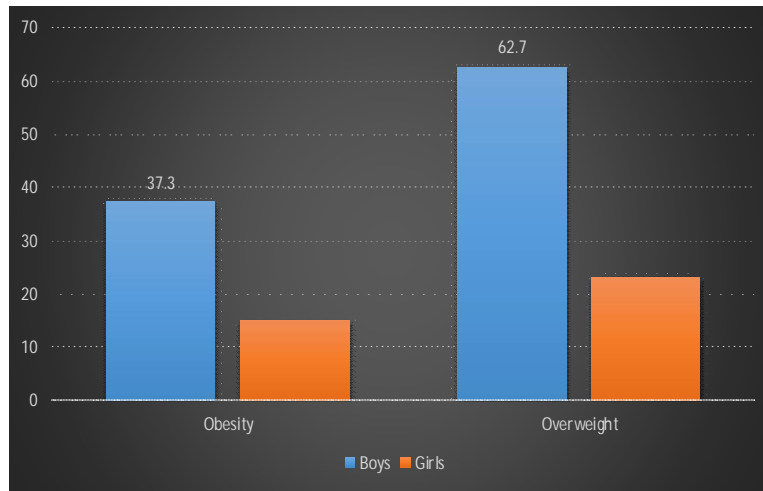


Figure 2: Chart showing prevalence of Obesity and Overweight amongst school children in Saudi Arabia, measured using skin fold thickness

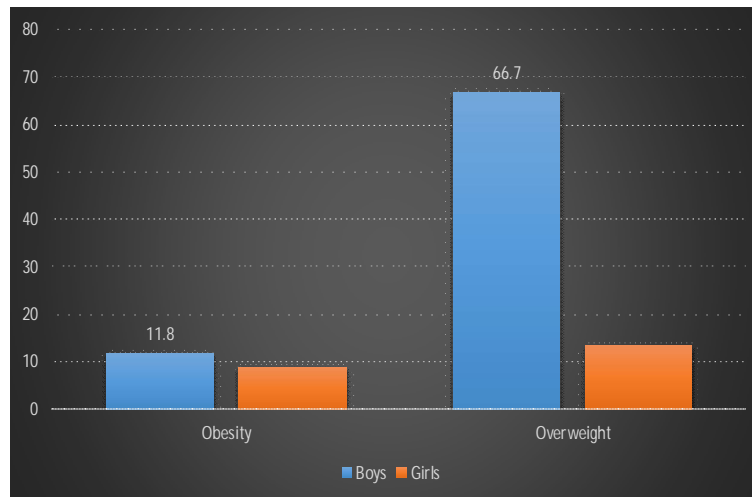


Figure 3: Chart showing prevalence of Obesity and Overweight amongst school children in Saudi Arabia, measured using bioelectric impedance

Table 1. Showing, % of school children in Saudi Arabia measured using body mass index, skin fold thickness and bioelectric impedance

	Body mass index (BMI)		Skin fold thickness		Bio electric impedance	
	Boys	Girls	Boys	Girls	Boys	Girls
Obesity	21.7%	13.3%	37.3%	15%	11.8%	8.8%
overweight	55.8%	23.3%	62.7%	36.3%	66.7%	13.3%

## Discussion

While examining the predisposing factors, our study finds that less physical activity, long hours of sedentary recreational activities, high socioeconomic class and family history of obesity are the contributing associations towards a high rate of obesity. Farlex online medical dictionary defines 'junk food' as 'any of various pre-packaged snack foods that are high in calories but low in nutritional value.'<sup>[13]</sup> Our Study finds that 80% of the school going children consumed junk food and drinks regularly at least once to thrice a week but interestingly they have no significant relation rather an inverse relationship was found with prevalence of obesity and overweight. The possible explanations to this could be either recording of a false statement or at this point in time the obese and overweight study population was avoiding junk foods and drinks. Considering university education of father as a determinant of the high social class of the family, this study does not find any statistically significant relation however studies from Middle Eastern countries and Egypt have reported a higher prevalence of childhood obesity in urban areas and among the higher socioeconomic classes.<sup>[14, 15]</sup> Studies done on adult Saudi population have reported a positive correlations but findings are inconsistent for children.<sup>[16]</sup> It is also important to consider the value of cultural importance and positive influence of high diet and being overweight in these societies where childhood obesity is still considered a sign of healthiness and high social class.<sup>[17]</sup> Rapid rate of social development and modernization have been associated as one of the contributing factor<sup>[10]</sup> which is creating inequalities in socioeconomic status within populations.<sup>[18]</sup> Our study finds a statistically significant positive relationship between the boys' obesity and the family history of father's obesity while a statistically significantly inverse relationship between the boys' obesity and hours spent in the outdoor physical and sports activity. Similar findings have been reported by a recent study conducted in Saudi Arabia and has held lack of physical activity and the ability of boys to drive motor vehicle and an easy access to unhealthy diets as the main attributing factors.<sup>[19, 20]</sup>

Our study finds a higher prevalence of obesity in the boys by all the three methods employed and statistically a significant

difference lies among the two genders (Figures 1, 2, 3 & Table 1). There may be many other possible explanations to this. Firstly, the cultural background of the Saudi Arabia where girls are dependent on their parents or elder siblings and have less choices to go out and eat. Secondly, that the girls are more conscious about their weight and furtherance into obesity range. Another fact to be considered is this age, when most of the girls are passing through pubertal changes and their height grows faster than the weight gain. Obesity rate recorded in boys by skin fold thickness method were highest among the three methods. Skin fold thickness measurement is more sensitive to degree of fatness than BMI alone.<sup>[21]</sup> Distinct patterns of body fat distribution in the pubertal males and females could possibly provide an explanation to this.<sup>[22]</sup> In males, fat typically accumulates in the upper segment of the body, both subcutaneously and intra-abdominally. In females, adipose tissue accumulates subcutaneously, particularly over the thighs.<sup>[23]</sup> Children with a high BMI are much more likely to have adverse risk factor levels and to become obese adults than are thinner children. Skin fold thicknesses and the waist circumference may be useful in identifying children with moderately elevated levels of BMI (85th to 94th percentiles) who truly have excess body fatness or adverse risk factor levels.<sup>[24, 25]</sup> Bioelectric impedance analysis (BIA) is not strictly a direct measure of body composition. It is based on assumption that fat mass is anhydrous and that conductivity reflects fat-free mass.<sup>[26, 27]</sup> However the measurement may vary with hydration status and ethnic status.<sup>[28]</sup> BIA has shown the similar pattern with a high prevalence of overweight than obesity in both sexes but the obesity prevalence estimated by this method is least amongst the three methods used in this study (Table). Wheeler and Twist (2010) in their study while comparing the predictive accuracy of indirect methods of body fat assessment has concluded that predictive accuracy of indirect methods varies considerably with children.<sup>[29]</sup> Non- invasive methods used in our study have also shown a wide variation in the rates of obesity and overweight though the trends shown were consistent with higher prevalence of obesity for boys and highest by the skin fold thickness

method. 80% of obese adolescents become obese adults. [30, 31] A high body fat content amongst the study population is a major risk factor for chronic diseases and plays a central role in the “insulin resistance” or “metabolic” syndrome, which includes hyperinsulinemia, hypertension, hyperlipidemia, type II diabetes mellitus, and an increased risk of atherosclerotic and cardiovascular disease. [32] Hence, intervention before this age is vital for both future health and the ability to sustain long-term weight control. [33]

### Conclusion

Our study finds a higher prevalence of overweight than obesity among the school going children. Boys were found more prevalent to obesity. Prevalence rates recorded by different methods showed wide variation. Control over the rapid increase in obesity among children and adolescents in the kingdom requires a multi-pronged approach by schools, families, communities, industry, and the government.

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