Early Puberty and Its Relation to Body Mass Index among Schoolgirls in the City of Jeddah, Saudi Arabia

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Abstract: Puberty is a stage of maturation between childhood and adulthood which is a signal of the onset of the female reproductive cycle. While there is clue that the age of puberty among girls appears to have been decreased in recent decades in different countries around the world, the data concerning the age of puberty for girls is considered scarce in Saudi Arabia. The purpose of this study is to evaluate the current age of puberty among schoolgirls in the city of Jeddah, Saudi Arabia and to find out whether the trend in the rate of fall in pubertal age has stopped or it is continuing. Also, to examine the correlation between age of puberty and the body mass index (BMI). Overweight was defined as higher than or equal to the 85th percentile and obesity as higher than or equal to the 95th percentile using growth charts provided by the Centers for Disease Control and Prevention (CDC, 2000). A research was conducted on 508 randomly selected female elementary school students from the city of Jeddah. Data of puberty was collected by conducting interviews with these students while at school. Then the researcher performed measuring the height and weight for each student by using the scale and height board that was a standardized scale in Saudi Arabia. The research findings of the study showed that the mean age at puberty for Saudi girls was 10± 0.80 years old. The prevalence rate of obesity and overweight among pubertal girls was 5% and 60.5% respectively. Age of puberty was significantly associated with probability of overweight and obesity with (P = 0.00), (df = 2) and a weak positive correlation (R= 0.26). The pubertal age among Saudi girls is still decreasing that means it follows the secular trend in declining and there is significant association between early puberty and body mass index.

Key words: Puberty • Pubertal Age of Girls • Body Mass Index • Jeddah • Saudi Arabia

INTRODUCTION

Puberty is the time in which a child's sexual and physical characteristics mature. Also it is a period of elevated secretion of gonads hormones, so it occurs due to hormone changes [1]. Early puberty involves the development of secondary sexual characteristics, physical changes, initiation of menstrual cycle, acceleration in growth and maturation before the usual age [2]. A secular trend towards earlier onset of puberty has been noted in some countries[3], including Ireland [4] Sweden, [5], Croatia [6], Hong Kong [7], the Netherlands [8] and Japan [9].

Moreover, early pubertal timing is itself influenced by biological and environment factors such as body mass index [10].

A number of studies have shown that age of puberty is associated with risk for metabolic syndrome including overweight and obesity [11], While other studies have linked between nutritional status, weight and the timing of sexual development, that leads to early puberty in obese girls [12]. The study of Tremblay and Lariviere [13] stated that there was a relationship between pubertal development and obesity in girls but not in boys. In addition, Wang [14] noted that early pubertal maturing girls demonstrate an increase in BMI (equal to or greater than the 95th percentile) between 8 and 14 years of age compared to normal and late pubertal maturing girls. Also, Adair and Gordon Larsen [15] found the rate of overweight (BMI at or above the 85th percentile) was significantly higher in girls who had attained an early puberty, than the girls who was lower in later maturing girls.

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MATERIALS AND METHODS

This project was supported by the ministry of education in Saudi Arabia and king Abdulaziz University at Jeddah city. We conducted a cross sectional study among 508 Saudi schoolgirls. Data of the age of puberty was collected by the interview with each student while at school. Then the height and weight for each student were measured by using the standardized scale for weight and height this procedure was took approximately 25 minutes to complete with each student. Height is measured without shoes by centimeter (cm). Weight is measured by kilogram (kg) in light clothes and without shoes. The Body Mass Index is defined as the body mass divided by the square of the body height which derived from this equation body weight in kilograms divided by height in squared meters as follow: weight (kg) ÷ Height² (m) and it is universally expressed in units [kg/ (m²)] that is calculated for all the study participants. The categories of BMI are underweight, normal weight, overweight and obese. Moreover, BMI ranges include underweight less than 19 (less than the 5th percentile), normal weight from 19 to 25 (between the 5th and 85th), overweight from 25 to 30 (between the 85th and 95th percentile) and obese over than 30 (above the 95th percentile) [16, 17].

Data were entered and analyzed using Statistical Package for Social Sciences (SPSS) version 20 and the prevalence of obesity or overweight were calculated by normal approximation. In addition we analyzed the results by using the test of Chi Square as appropriate. The 95% confidence intervals for the mean age at puberty, so the p-value is less than or equal to 0.05 is considered significant.

RESULTS

The mean age of puberty of schoolgirls in Jeddah is 10 years old with standard deviation 0.80 (Table 1).

The Relationship Between Puberty and BMI: Table (2) illustrates the distribution percentage of pubertal girls according to classify of body mass index which was divided into three categories:

Regarding to pubertal girls, 34.6% were in normal weight, while 60.5% were in overweight category and 5% were in obese.

In table (3) the puberty had a significant relationship with BMI, with values (P = 0.00), (d f = 2) and weak positive correlation (R = 0.26).

DISCUSSION

The aim of current study is to determine the pubertal age among Saudi schoolgirls in the city of Jeddah and to find out the correlation between early puberty and the body mass index.

The finding of the study demonstrated that the average age of puberty among schoolgirls in the city of Jeddah at Saudi Arabia was 10± 0.80 years old, the age was found less as compared to the mean age of puberty in Riyadh;13.05 years old [18].
On the other hand the mean age of puberty in present study is less than that reported from other countries, in Egyptian it was 12.44 years old [19], in Sudanese it was 13.4 years old [20], in Tunisian it was 13.8 year old in Iraqi girls it was 14 years old [21], in Great Britain it was 12.5 years old [22], in America it was 12.5 years old [23] and in Japan it was 12.2 years old [9].

In some research of puberty that defined early puberty as less than 11 years old [18]. In the current study the pubertal girls in the city of Jeddah represented by (16%) of the sample, whereas the participants of study in Kuwait represented by (8.5%) [24] and the percentage (10.8%) was found among Kenyan girls [25], all previous girls had attained early puberty before the age of 11 years that indicates increasing prevalence of puberty before age of 11 years among girls.

The second primary objective of the current study is to find out the relationship between puberty and BMI. Regarding the BMI, the present study denoted that there was a significant relationship and positive correlation between age of puberty and obesity or overweight. Overweight and obesity were defined as more than or equal to 25 BMI (85th percentile) and 30 BMI (95th percentile) values respectively.

The percentage 60% of the pubertal girls of sample were categorized in overweight, where the biggest percentage were at age 11 years then followed by lower percentage at age 10 years. In addition the girls who had attained puberty at age 8 and 9 years had in obesity and overweight respectively, which indicates that the BMI could be one of the reasons of puberty. This comes in agreement with many researchers, in Saudi Arabia El-Sayed Amr et al. [26] reported a significant association between BMI categories and age of puberty that causes the appearance of secondary sexual characteristics then early puberty and menstrual irregularity, in Kuwait Al-Awadhi et al. [24] found a significant relationship between age at puberty and obesity or overweight that because of the excessively high rates of childhood obesity, in Poland Wronka [27] and in Chile Hernandez et al. [28] stated that the association between age of puberty and BMI occurs regardless of socio-economic status, in United States [14, 29], also in Croatia [30] where demonstrated that early sexual maturation was associated with obesity among girls. Moreover, Pierce et al. [31] reported that pubertal age of British girls reduced with increasing BMI and a significant relationship found in study of Farahmand et al. [32] who reported that age of puberty is influenced by BMI. Also, Wronka [27] indicated the inverse correlation between BMI values and age of puberty which found that the highest BMI value was always observed in girls with early puberty. This was confirming with Wronka et al. [33] who signaled to the frequency of overweight and obese girls in the early puberty group and this was known as risk factors in causing many illnesses.

There are several explanations for the association between age of puberty and obesity, but the specific mechanisms remain unclear. One of the explanations is that bad eating habits among children help them to have more fats and become obese. This can impact on their health and BMI [26]. Another explanation suggests that elevated of BMI lead to increasing in the production of estrogen through different mechanisms, which leads to early puberty [34]. Hence the higher levels of estrogen may increases fat deposition in peripheral adipose tissues [35]. It is also affected by genetic factors [36].

CONCLUSION

In conclusion, the mean age at puberty among Saudi girls in the city of Jeddah is 10 years old which supports the secular trend toward early puberty. Moreover, the BMI (over weight and obesity) affects on the onset of early puberty among girls.

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