Original Article

Rising trends in BMI of Saudi adolescents: evidence from three national cross sectional studies

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Objective: To examine the trends in body mass index (BMI) of Saudi male adolescents between 1988 and 1996.
Methods: The data set came from three major population-based cross sectional studies. They all involve nationally representative samples and were conducted between 1988 and 1996. BMI was calculated from body height and mass and plotted at the 50th and 90th percentiles.
Results: BMI of Saudi adolescents progressively increased at both 50th and 90th percentiles between 1988 and 1996. The increases in BMI during the eight-year period ranged from 9.6 to 10.8% at the 50th percentiles and from 10.9 to 13.9% at the 90th percentiles. At ages 15-18 years, the yearly increase in median BMI from 1988 to 1996 averaged 0.246 kg/m^2.
Conclusion: The rising trends in BMI between 1988 and 1996 are indication of increasing obesity among Saudi male adolescents. More attention to the promotion of healthy nutrition and physical activity throughout childhood and adolescence is required.

Key Words: body mass index, obesity, overweight, childhood, adolescence, Saudi Arabia

INTRODUCTION

The prevalence of obesity in childhood and adolescence is increasing rapidly and has reach an epidemic proportion worldwide.[1,2] During the past three decades, overweight children in the United States has more than doubled.[3] In Canada, body mass index (BMI) of children 7-13 years has increased since 1981 at a rate of nearly 0.1 kg/m^2 per year. The prevalence of overweight among Canadian boys increased from 15% during 1981 to 28% during 1996, while obesity prevalence has increased during the same period from 5% to 13.5%.[4] The mean BMI and the prevalence of overweight and obesity among Swedish children aged 10 to 16 years were all increased substantially during the periods from 1987 to 2001.[5] Studies from Australia [6] and Japan [7] have all indicated rising trends in obesity among school children over the past two decades.

The increasing prevalence of obesity in young people worldwide is a major global health concern.[1] Obesity in childhood and adolescence has both immediate and future health consequences.[8,9] Sixty percent of overweight children already suffer from hypertension, hyperlipidemia, and/or hyperinsulinemia.[10] Childhood obesity was shown to be directly linked to abnormalities in blood pressure, lipid, lipoprotein and insulin levels in adults.[11] Moreover, increased obesity in childhood and adolescence is most often associated with type 2 diabetes mellitus.[12] Impaired glucose tolerance was shown to be quite high in both obese children (25%) and obese adolescents (21%).[13] In addition, overweight children and adolescents are at greater risk of adult obesity. [8,14]

During the past three decades, the Kingdom of Saudi Arabia has undergone tremendous changes in lifestyle, including physical activity patterns and eating habits. Such dramatic lifestyle changes are thought to have contributed immensely to the increase in obesity prevalence among Saudi children and youth.[15-18] Despite the availability of many studies documenting the prevalence of pediatric obesity in Saudi Arabia, there are limited reports about the trends in the prevalence of obesity among Saudi children and adolescents.[19,20] These reports, however, are limited to data drawn from selected areas of Saudi Arabia. Therefore, the present study examines the trends in BMI of Saudi adolescents over an eight-year period using body weight and height data from three national cross sectional studies conducted from 1988 to 1996.

MATERIALS AND METHODS

The data set for the present paper came from three large population-based cross sectional studies.[21-23] All of the three studies had used nationally representative samples, and were conducted between 1988 and 1996. In all of these studies, multistage stratified sampling techniques were employed. Body weight and height data for selected age groups were obtained from each study and BMI was calculated for each age category. Detailed description of each of these studies is beyond the scope and aims of this paper, however, a brief description of these studies will follow.

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The first study was part of a national physical fitness project, involving 3991 healthy Saudi males between the ages of 15 and 25 years.[21] Data for the ages between 15 and 20 years were used in the current analysis. The second study that was included in the present analysis is a growth study involving 47810 school boys and girls from a nationally representative sample.[22] The 50th and 90th percentiles of body weight and height were interpolated from the published graphs for boys 10 to 18 years of age. Finally, the third study in our analysis involved 9061 school boys from 6 to 18 years of age.[23] The 50th and 90th percentiles of body weight and height were interpolated from the published graphs for boys 10 to 18 years of age. The analysis in the present paper is obviously limited to Saudi boys. The reason is that two of the analyzed studies included boys only. [21,23]

RESULTS

Figures 1 and 2 show values of BMI for Saudi boys from 10 to 20 years of age at the 50th and 90th percentiles. As can be clearly seen from both figures, BMI at each percentiles line progressively increased from the year 1988 to the year 1996, at all age categories, indicating rising trends in BMI among Saudi boys during the eight-year period.

To further illustrate the incremental increases in BMI values of the Saudi boys during the studies period, we plotted the four common age categories in all of the three surveys, as shown in figures 3 and 4, for the 50th and the 90th percentiles, respectively. Again, the rising trends for BMI data were quite clear in both percentiles lines, though more pronounced in the 90th percentiles. The increases in BMI at the 50th percentiles ranged from 9.6% to 10.8%, while the rise in BMI at the 90th percentiles ranged from 10.9% to 13.9% during the eighty-year period. The yearly increase in median BMI from 1988 to 1996 averaged 0.246 kg/m^2.

DISCUSSION

The findings of the present paper provide compelling evidences that there were progressive increases in both the 50th and the 90th percentiles of BMI among Saudi adolescents from 1988 to 1996. Such findings were previously observed in a cross sectional analysis involving children and adolescents 10-20 years of age from Jeddah city, where marked increases in BMI were seen between 1994 and 2000.[19] The present findings were also in line with the results of an international comparison study showing that the prevalence of overweight in children and adolescents increased in Brazil (from 4.1% to 13.9%), in China (from 6.4% to 7.7%), and in the United States (from 15.4% to 25.6%), but decreased in Russia (from 15.6 to 9.0%).[24] Moreover, similar upward trends in childhood obesity were seen in many developed countries

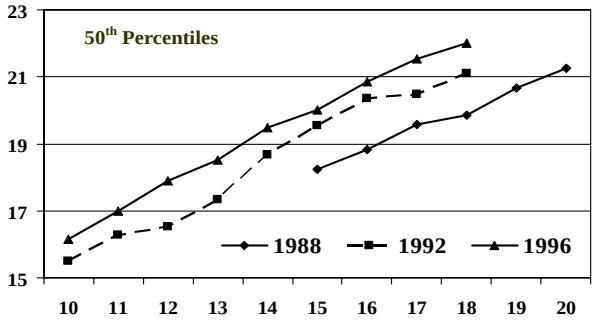

Figure 1. BMI at the 50th percentiles for Saudi adolescents from 10-20 years of age. Data for year 1988 from reference 21, year 1992 from reference 22, and year 1996 from reference 23.

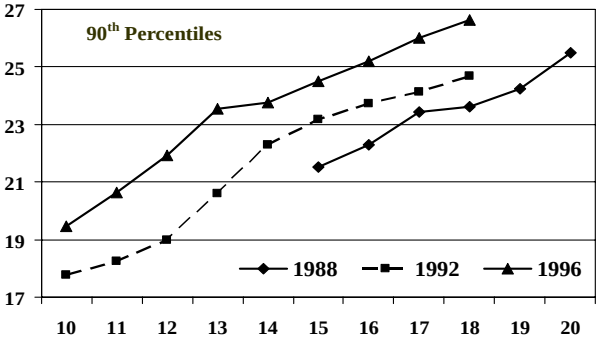

Figure 2. BMI at the 90th percentiles for Saudi adolescents from 10-20 years of age. Data for year 1988 from reference 21, year 1992 from reference 22, and year 1996 from reference 23.

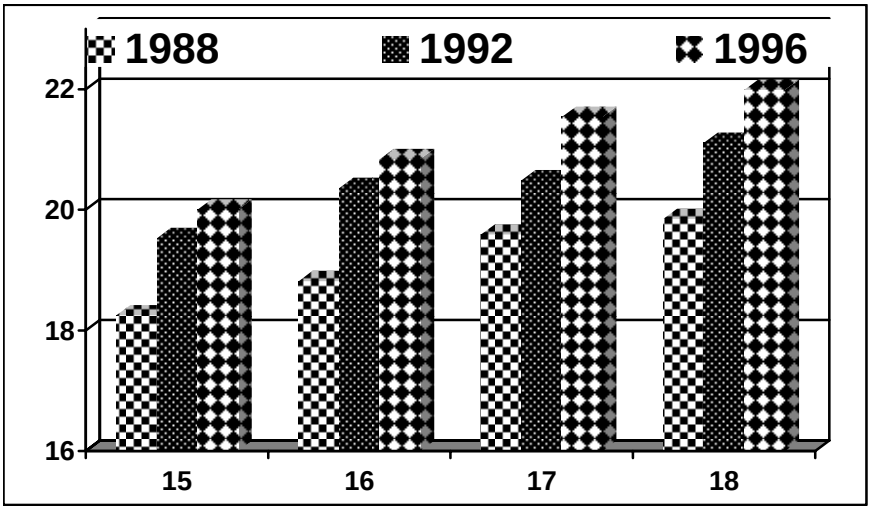

Figure 3. BMI at the 50th percentiles for Saudi adolescents from 15-18 years of age. Data for year 1988 from reference 21, year 1992 from reference 22, and year 1996 from reference 23.

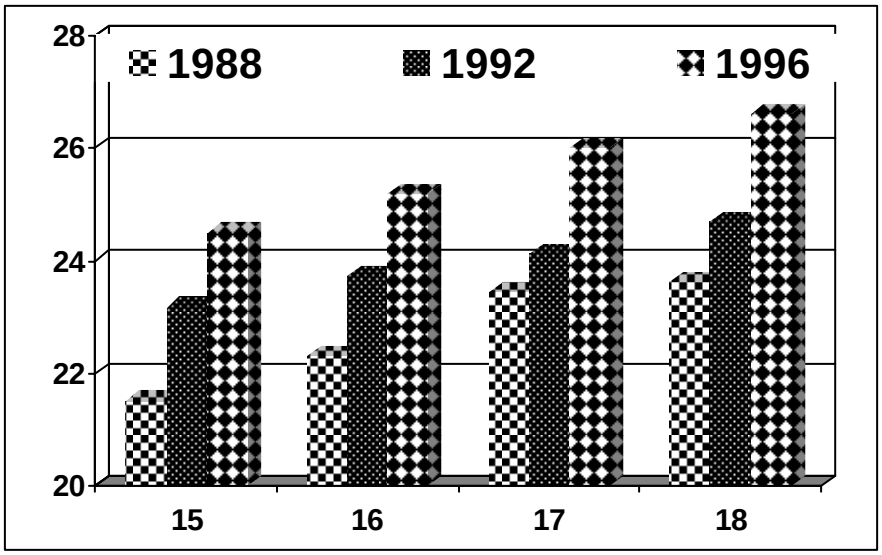

Figure 4. BMI at the 90th percentiles for Saudi adolescents from 15-18 years of age. Data for year 1988 from reference 21, year 1992 from reference 22, and year 1996 from reference 23.

including Canada,[4] Sweden,[5] and Australia.[6] However, the average yearly increase in BMI seen in the present analysis (+ 0.245 kg/m^2 per year) is much higher than what was observed in Canadian boys (+ 0.1 kg/m^2 per year) [4] or in Japanese boys (+ 0.042 kg/m^2 per year).[7]

The rising trends in BMI seen over the eight-year period in the present paper are indication of increased overweight and obesity rates among Saudi adolescents. Such increases reflect a population shift toward positive energy balance. Caloric intake and physical activity constitute the two modifying factors in the energy balance equation. Caloric dense foods are increasingly becoming accessible for Saudi children and adolescents. In addition, sedentary lifestyle is extremely prevalent in the Saudi society.[25,26] Saudi children and adolescents are now transported to and from school, especially in urban areas of the Kingdom. The available physical activity data indicate that 60% of Saudi children and 71% of Saudi youth do not engage in physical activity of sufficient duration and frequency.[16,20,25,26] Television viewing, videos, and computer games are also contributing immensely to the inactivity epidemic. Indeed, longitudinal assessment of a group of Saudi youth from childhood to early adulthood showed that while physical activity levels were drastically reduced, television-viewing time was substantially increased.[20] Therefore, more attention to the promotion of healthy nutrition and physical activity throughout childhood and adolescence is required.

Elsewhere, insufficient vigorous physical activity was shown to be a risk factor for higher BMI for adolescent boys and girls.[27] Furthermore, physical activity was found to be negatively associated with, while television watching and video game use was shown to be positively linked to being overweight in Canadian children.[28] Recent research suggests that efforts to decrease time spent in sedentary activities resulted in weight loss among obese children.[29] Such intervention approach should be pursued in addition to other strategies aimed specifically to promote physical activity levels among children and adolescents.

The present study may have some limitations. First, methodological differences between the three surveys must be taken into consideration when making inferences from these comparisons. Although all the three studies used nationally representative samples with well-established sampling procedures, the effect of sampling on the BMI trends is unknown. However, the possible differences in methodological procedures between the three studies would be small enough to underestimate the increasing trends in BMI over the eight-year period. Second, the use of BMI as an indication of overweight or obesity has its limitations. It was shown that although BMI has a high sensitivity in detecting obesity, it has poor specificity.[30] Further, BMI is more a measure of overweight than obesity. Using growth data from about 1200 Saudi boys 6-14 years of age, it was well demonstrated that while BMI was increasing from 11 to 13 years of age, body fat content (as measured by skinfolds thickness) was not.[31] BMI in childhood and adolescence was also shown to be dependent on height, sex, and pubertal status.[32] A recent study found that high BMI-for-age is a good indicator of excess fat mass, however, BMI differences among thinner children can be largely due to fat-free mass.[33]

In conclusion, evidences from three major national cross-sectional studies indicate that there were progressive increases in BMI of Saudi adolescents from 1988 to 1996. Obesity among children and youth is a crisis facing Saudi Arabia, and action to control it must begin now. Given the current trends in pediatric overweight and obesity, it is very critical that preventive strategies must be implemented throughout schools and community-based programs involving both education and intervention.

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Original Article

Rising trends in BMI of Saudi adolescents: evidence from three national cross sectional studies

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沙烏地青少年 BMI 升高的趨勢：三個全國橫斷性研究的證據

目的：評估 1988 至 1996 年的沙烏地青少年的身體質量指數(BMI)之趨勢。
方法：數據來源為三個大型族群性橫斷性研究。它們均為全國代表性樣本，在 1988 至 1996 年間進行。BMI 由身高及體重計算而來，以第 50 及 90 百分位繪圖。
結果：在 1988 至 1996 年間，沙烏地青少年的 BMI 第 50 及 90 百分位逐漸上升。第 50 百分位在這 8 年期間，BMI 增加的範圍為 9.6 至 10.8%，第 90 百分位為 10.9 至 13.9%。年齡為 15-18 歲，BMI 中位數從 1988 至 1996 年，每年平均增加 0.246 kg/m^2。
結論：由 1988 至 1996 年間 BMI 增加的趨勢，是沙烏地青少年肥胖增加的證明。需要多關注整個兒童到青少年期間的健康的營養及體能活動之促進。

關鍵字：身體質量指數、肥胖、過重、兒童、青少年、沙烏地阿拉伯。