Obesity in Saudi children: a dangerous reality

S.S. Al-Dossary,[1] P.E. Sarkis,[1] A. Hassan,[2] M. Ezz El Regal[3] and A.E. Fouda[3]

السِّمنة في الأطفال السعوديين: حقيقة خطيرة

سحر الدوسري، بيرو سركيس، أمل حسن، محمد عز الرجال، أشرف فوده

الخلاصة: تثير السِّمنة في الأطفال قلقاً متزايداً. وهذه الدراسة العرضية التي نحن بصددها والتي أجريت عام 2006 تحدد معدل الانتشار والخصائص الديموغرافية لفرط الوزن والسِّمنة في أطفال المنطقة الشرقية في المملكة العربية السعودية. وقد اختير 7056 طفلاً (تتـراوح أعمارهم بين 2 و18 سنة) من المدارس ومن العيادة الخارجية في إحدى المستشفيات. وقد بلغ إجمالي معدل انتشار فرط الوزن 19.0٪ والبدانة 23.3٪. وكان الوزن في أكثر من 50٪ من الأطفال الذين تتـراوح أعمارهم بين 14 و18 سنة أعلى من الشريحة المئوية الخامسة والثمانين. وكانت السِمْنة بين الذكور أكثر منها بين الإناث في الفتـرة العمرية 14–18 سنة (35.6٪ مقابل 19.2٪). وكان مَنْسَب كتلة الجسم متساوياً بين السعوديين وغير السعوديين. وتدلُّ الدراسة على الحاجة إلى تدخلات لتشجيع أنماط الحياة الصحية في الأطفال على الصعيد الوطني.

ABSTRACT Obesity among children is an increasing concern. This cross-sectional study in 2006 determined the prevalence and demographic characteristics of overweight and obesity in children in the Eastern province of Saudi Arabia. A total of 7056 children (aged 2–18 years) were selected from schools and the outpatient department of a hospital. The overall prevalence of overweight was 19.0% and of obesity was 23.3%. More than 50% of children between 14 and 18 years had weight above the 85th percentile. More males than females were obese by ages 14–18 years (35.6% versus 19.2%). Saudi and non-Saudi nationalities had the same distribution of body mass index. Interventions to encourage healthier lifestyles for children are needed at the national level.

Obésité chez les enfants saoudiens : une réalité dangereuse

RÉSUMÉ L'obésité chez les enfants suscite de plus en plus d'inquiétudes. Cette étude transversale réalisée en 2006 visait à déterminer la prévalence et les caractéristiques démographiques du surpoids et de l'obésité chez les enfants de la province orientale d'Arabie saoudite. Au total, 7056 enfants (âgés de 2 à 18 ans) ont été sélectionnés dans des établissements scolaires ou au service de consultation externe d'un hôpital. La prévalence globale du surpoids était de 19 % et celle de l'obésité de 23,3 %. Plus de 50 % des enfants âgés de 14 à 18 ans avaient un poids supérieur au 85e percentile. Entre 14 et 18 ans, le nombre de garçons obèses était supérieur à celui des filles (35,6 % contre 19,2 %). La répartition de l'indice de masse corporelle était identique pour les Saoudiens et les non Saoudiens. Il est nécessaire de mettre en place au niveau national des interventions visant à encourager des modes de vie plus sains.

[1]Department of Paediatrics, Saad Specialist Hospital, Al-Khobar, Saudi Arabia.
[2]Department of Bone Marrow Transplant/Immunology, Great Ormond Street Hospital, London, United Kingdom.
[3]Department of Paediatrics, Faculty of Medicine, University of Mansoura, Mansoura, Egypt (Correspondence to A.E. Fouda: Ashraf_foda@mans.edu.eg).

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Introduction

Towards the end of the 20th century, obesity was identified as a worldwide health care problem affecting the well-being of populations. Previously identified only as a problem of adult health, obesity among children is increasingly becoming a concern [1]. The Gulf region is not exempt. Surveys in a number of different areas and provinces have reported a high prevalence of overweight and obesity in Saudi children in all age groups [2,3]. Government and local authorities have implemented educational programmes to help weight reduction or prevention of obesity. Abnormal weight in children is still considered by experts to be caused by an imbalance between diet and habit, although a hormonal etiology is a diagnosis that needs to be excluded in children.

In order to add valid information about the weight status of children in our region, this study was conducted in the Eastern province of Saudi Arabia to determine the prevalence of overweight and obesity in children from the Eastern province of Saudi Arabia and to compare these prevalences with those of non-Saudi children living in Saudi Arabia.

Methods

This was a cross-sectional study conducted in Al-Khobar city, in the Eastern province of Saudi Arabia. Data collection started on January 2006 and continued for 6 months.

Sample

Our sample included 7056 children aged 2–18 years of Saudi or non-Saudi nationality enrolled from a school and from the outpatient department of a hospital.

Saad specialist hospital is a tertiary centre in the Eastern province. It is a private institution with a capacity of 600 beds, admitting patients from all socioeconomic classes. All paediatric consultations done during the period of study in the outpatients department (n = 9249) were collected from the electronic database. After excluding follow-up consultations and incomplete files, a total of 6237 files were evaluated and after excluding those aged < 2 years (n = 441 cases), 5796 children were enrolled.

Saad schools for boys and girls are private institutions in the Al-Khobar region, Dammam, in the Eastern province. All 1260 students aged 6–17 years enrolled in the schools were included in the study, which is 10% of the total number of students in the private educational sector and 3% of the total (public and private) students of the Al-Khobar–Dammam region [4].

Prior to enrolment a consent form was signed by the child's parent after an explanation of the aims and methods of the study.

Data collection

The internal validity of the study was ensured by the data collectors in both Saad schools and Saad specialist hospital. These were nurses who received training prior to data collection with special emphasis on standardizing the methods of measurement. Body weight and height of children were measured using a digital scanner. The instruments used were calibrated daily.

A data collection form was designed to gather data on: age, sex and nationality as well as measures of body weight and height. Body mass index (BMI) was calculated for each child according to the formula adopted internationally: BMI = weight (kg)/height $(m)^2$ [5]. We used the Centers for Disease Control and Prevention (CDC) 2000 growth charts [6]. The children were classified into 3 weight categories: normal weight (BMI < 85th percentile for age and sex), overweight (BMI between 85th–95th percentiles) and obese (BMI > 95th percentile) [7,8]. Then percentile weight categories among the sample were studied by nationality, sex and age groups (2–4, 5–9, 10–13 and 14–18 years).

To ensure better generalization of the results, the data from patients presenting to the outpatients department of the hospital were compared with the data from school students to confirm that the distribution by age, sex and nationality was similar before pooling the data.

Statistical analysis

Data analysis was done using *SPSS* software, version 12, and the chi-squared test, Student t-test and analysis of variance (ANOVA). Statistical significance was set at $P < 0.05$.

Results

The sample included 7056 children, mean age 8.7 (standard deviation 4.9) years. Males were 55.7% of the study children and females were 44.3%. Most of the children were of Saudi nationality (79.4%) while 20.6% were various non-Saudi nationalities.

Classification of the enrolled children according to BMI revealed that only 57.7% of them had normal weight for age and sex, while 19.0% were overweight and 23.3% obese (none of the children were underweight).

The rates of overweight and obesity increased progressively with age. The overall rate of obesity was significantly higher than the rate of overweight in all age groups ($P < 0.05$). A progressive rise in the rates of obesity and overweight were found with age from ages 5–9 years to 14–18 years, peaking at age 10–13 years (20.2% and 28.0% for obesity and overweight respectively) (Table 2). At age 2–4 years the proportions of children who were normal weight, overweight and obese were 62.7%, 18.1% and 19.2% respectively. By age 14–18 years the proportions were 53.0%, 20.0% and 27.0%.

Table 1 Distribution of body mass index (BMI) categories by sex, age and nationality

Categories	Normal weight (BMI < 85%)		Overweight (BMI 85%–95%)		Obese (BMI > 95%)		Total		*P*-value
	No.	%	No.	%	No.	%	No.	% in category	
Sex									
Male	2185	55.6	708	18.0	1040	26.4*	3933	55.7	*$P < 0.05$
Female	1886	60.4	633	20.3	604	19.3	3123	44.3	
Age (years)									
2–4	1164	62.7	337	18.1	356	19.2	1857	26.3	*$P < 0.05$
5–9	1346	60.6	406	18.3	469	21.1	2221	31.5	
10–13	709	51.8	276	20.2	384	28.0*	1369	19.4	
14–18	852	53.0	322	20.0	435	27.0*	1609	22.8	
Nationality									
Saudi	3222	57.5	1048	18.7	1329	23.7	5599	79.4	NS
Non-Saudi	849	58.3	293	20.1	315	21.6	1457	20.6	
Total	4071	57.7	1341	19.0	1644	23.3	7056	100.0	

NS = not significant.

Regarding distribution of weight categories by sex, our study showed that the overall rate of obesity among males was significantly higher than that among females (26.4% versus 19.3% respectively) ($P < 0.05$). We also found that the percentage of obese males was significantly higher than that of overweight ones (26.4% versus 18.0% respectively). The percentage of overweight females was significantly higher than the percentage of obese females (20.3% versus 19.3% respectively).

Comparison of the 3 weight categories by nationality showed no statistically significant difference in the rates of normal weight, overweight and obesity between Saudi and non-Saudi children.

Studying the distribution of weight categories among the children by age groups and sex revealed that more males than females were overweight in the age group 2–4 years (19.6% versus 16.3% respectively). This was reversed in the age group 14–18 years, by which age the proportion of overweight females was higher than overweight males (23% versus 16.7% respectively) (Figure 1).

The percentage of obese males was significantly higher than that among females in all age groups ($P < 0.05$). Obesity in males showed a steady increase with age from 20% at ages 2–4 years up to 35.6% at 14–18 years, while in females the rate of obesity rose from 18.1% ages 2–4 and peaked at ages 10–13 years at 22.7% before declining at ages 14–18 years to 19.2% (Figure 2). Thus by ages 14–18 years 35.6% of males were obese versus 19.2% of females ($P < 0.05$).

Discussion

Obesity is one of the main concerns for health care worldwide. In 2001, the World Health Organization (WHO) announced that 10% of the world's children were obese and that the rate was rising in developing countries: 155 million children at school age were overweight, while 22 million under 5 years were overweight [9]. According to 2002 WHO statistics, there has been a broad shift in disease burden with the majority of deaths worldwide now being related to noncommunicable diseases, many of which can be linked to imbalances of nutrition, diet and physical activity [10].

In Saudi Arabia, many studies have been done to evaluate the magnitude of overweight and obesity among Saudi children (Table 3) [2,3,11–21]. It was found that overweight and obesity occurs in all provinces [21]. A recent study found that the Eastern province has the highest rates and the Southern province the lowest rates [3].

According to our study about 50% of Saudi children in this Eastern province sample have a BMI above the 85% percentile. It was evident that Saudi children started developing overweight when they are 5–9 years of age—by which age 21% of children were overweight and 21% obese—and their weight continued to increase into the adolescent years. This could be attributed to the fact that children start going to school at that age, and hence, there is a less control on their eating habits and nutrition at this stage. Moreover, children in our country have become less active; few or none walk to school, spending more time in sedentary entertainment activities, such as viewing TV, computer and video games. On average, a child in Saudi Arabia spends 6 hours per day in front of screens [22]. Recent studies have found that a 2% increase in the prevalence of obesity has been documented for each extra hour per day

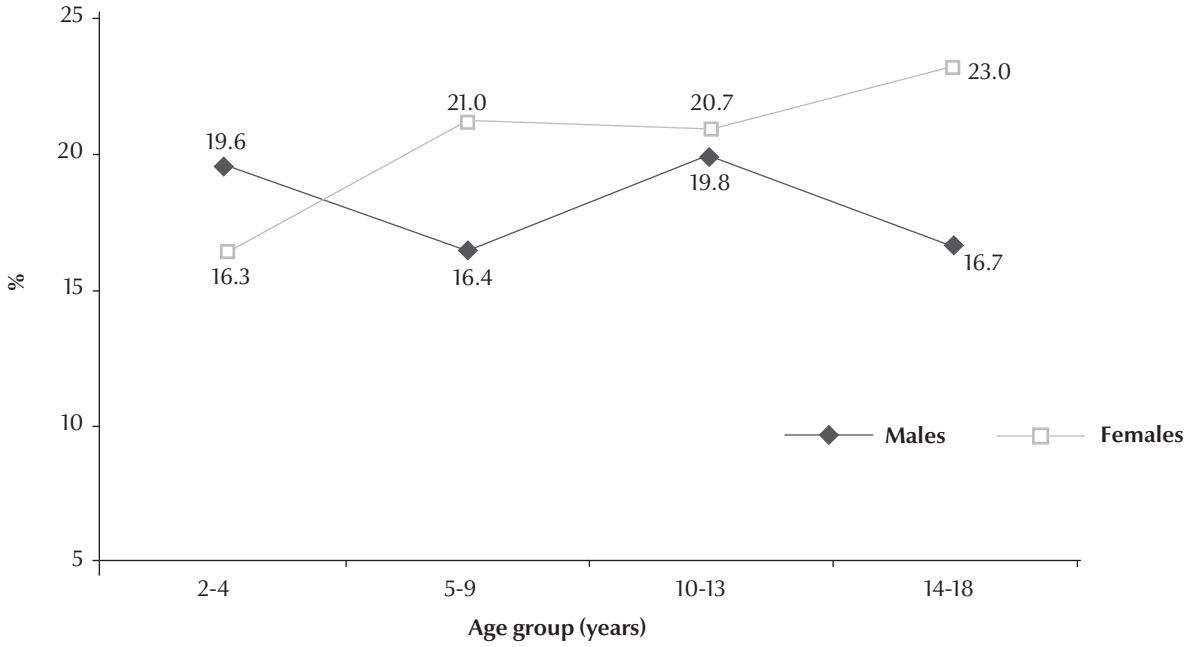

Figure 1 **Distribution of overweight by age group and sex**

of screen viewing by those aged 12–17 years [22].

Our results agree with a previously published study in the country that obesity in both sexes is low among preschool children (31%) and highest among adolescents (50%–76%) [2,20,21]. In our sample, the peak of obesity was at age 10–13 years (28.0%) and stayed at the same high rate until age 14–18 years. Studies have shown that 80% of obese adolescents become obese adults [8]. Adolescence has been described as the "critical period for the development for adult obesity" [23]. Hence, intervention before this age or is vital for both future health and the ability to sustain long-term weight control [22].

In our study, males showed a higher prevalence of obesity in all age groups, with a sharp rise at age 14–18 years. Females in this age group may be more self-conscious about their weight and avoid progressing into the obesity range. This is in accordance with a recent study conducted in Saudi Arabia which found that obesity was more common among

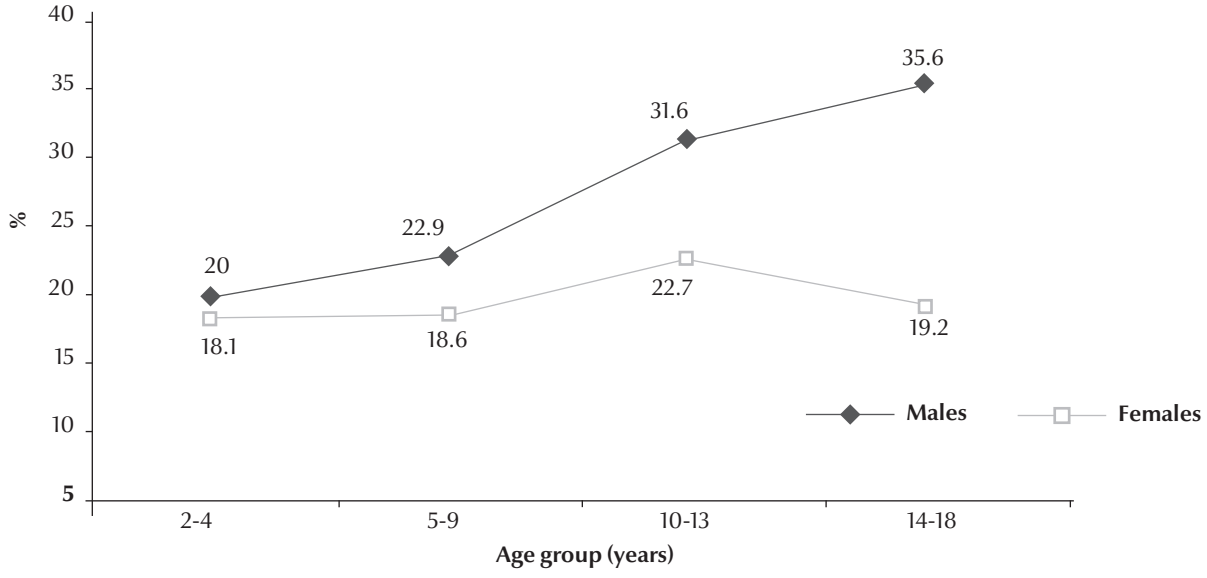

Figure 2 **Distribution of obesity by age group and sex**

Table 2 Review of studies from Saudi Arabia evaluating the prevalence of overweight and obesity among children

Reference	Region	Target children	No.	Ages (years)	Sex	Overweight prevalence (%)	Obesity prevalence (%)
Present study	Eastern province	Schoolchildren, Private hospital	7056	2–18	M,F	19	23.3
Alam, 2008 [11]	West Riyadh	Elementary school	1072	8–12	F	*n/d*	14.9
Amin, 2008 [12]	Al Hassa	Primary schools	1139	10–14	M	14.2	9.7
Al-Hazzaa, 2007 [13]	Riyadh	Primary schools	1082 (1988) 702 (2005)	6–14	M		3.4 (1988) 24.5 (2005)
Al Turki, 2007 [14]	Riyadh	Primary care clinics	267	12–20	*n/d*	18.7	21.0
Mahfouz, 2007 [15]	Abha city	Schools	2696	11–19	M	11	5.0
Farghal, 2007 [16]	Abha city	Schools	767	7–20	M,F	11	15.9
Al-Almaie, 2005 [17]	Al-Khobar	Intermediate and all 3 grades of secondary school	1766	14–19	M,F	19.3 (M) 11.8 (F)	17.2 (M) 10.2 (F)
Al-Rukban, 2003 [2]	Riyadh	Intermediate and secondary schools	894	12–20	M	13.8	20.5
Al-Saeed, 2003 [18]	Different provinces	Primary and preparatory schools	2239	6–17	F	20	11.0
El-Hazmi & Warsy, 2002 [3]	Different provinces	Household screening programme	12 701	1–18	M,F	23.4	12.7
El-Hazmi, 2002 [19]	Different provinces	National epidemiological household survey	12 071	1–18	M,F	10.7 (M) 12.7 (F)	6.0 (M) 6.7 (F)
Abahussain, 1999 [20]	Al-Khobar city	Adolescent girls	676	12–19	F	28 (overweight or obese)	
Al-Nuaim, 1996 [21]	Different provinces	Schoolchildren	9061	6–18	M	11.7	15.8

M = male; F = female; n/d = not determined.

adolescent boys than was overweight. This was attributed to the lack of physical activity [2,21] and to their ability to drive in our country which gives males easy access to unhealthy diets (e.g. fast foods that contain 40%–45% fat and soda drinks instead of water) and less time to eat at home where meals would be more nutritional [9,20]. With more mothers employed outside the home, traditional foods are replaced by fast foods and typically one-third of meals are eaten outside of the home environment, often at fast-food restaurants [22]. Studies have shown that the average consumption of sugar-sweetened beverages and fruit juices increased from 13 g/week in 1950 to 446 g/week in 1992/3 [24]. As recently as 1989–1991 to 1994–1995, the consumption rose by 65% [22].

There was no significant difference in the prevalence of obesity among Saudi and non-Saudi children in our study, which draws attention towards the role of the environment, lifestyle and lack of physical activity as contributing factors over genetic factors in influencing the pattern of obesity [21]. A study of Saudi children in the Eastern province found that they were not engaged in sporting activities as much as their American counterparts [21,25]. Daily participation in physical education in highschool in the United States dropped from 42% in 1991 to 21% in 1999. Furthermore, 60%–70% of urban inhabitants were living sedentary lives [22].

It is difficult to reduce excessive weight once it becomes established. Prevention of obesity in children should therefore start from birth by putting more emphasis on exclusive breastfeeding for the first 6 months of life. It is becoming a priority to establish preschool, school and adolescent health programmes, with the emphasis on increasing physical education hours and consumption of healthy food, by incorporating health messages into the school curricula [26].

Conclusions

In our sample 50% of children in the Eastern province of Saudi Arabia were overweight or obese (BMI > 85th percentile). Our study showed that obesity started early in life (ages 10–14 years) and continued throughout the adolescent ages. The prevalence of obesity was higher among males than females, who had a tendency to be overweight rather than obese. Environmental factors may have more of an influence on the prevalence of obesity than do genetic factors. Interventions to encourage healthier lifestyles for children are needed at the national level.

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