

Prevalence of overweight and obesity among Saudi primary school students in Riyadh, Saudi Arabia

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Abstract

Objectives: to determine the prevalence of overweight and obesity among primary school students (6-12 years old) in Alabnaa primary schools in Riyadh, Saudi Arabia. And identify factors that could be associated with childhood overweight and obesity.

Methods: A cross-sectional study conducted among primary schools students in Alabnaa Schools in Riyadh, Saudi Arabia. A sample of four primary schools- two primary school for boys and two for girls – had been selected by simple random technique. First class of each grade of a selected school was treated as stratum; the sample from each stratum was equally selected by systematic random technique from students list. Height and weight were measured and BMI was calculated for every student. Recently published WHO growth charts have been used. The sample size was 312, but only 292 students completed a short self-administered questionnaire.

Results: In boys, the prevalence of overweight was 16%, while prevalence of obesity was 11%; the problem seemed to be worse in girls, where the prevalence of overweight and obesity were 20% and 17%, respectively. There was a significant association between childhood obesity and maternal obesity, the combined prevalence of students overweight and obesity was 58.1% in

those with maternal history of obesity in comparison to 32% in those with no history of maternal obesity ($p=0.005$). The prevalence of childhood overweight and obesity was higher in those older than 9 years, with family member more than 6, short sleep duration and those spending more than 2 hours on TV viewing or playing video games, but the associations were statistically insignificant. No association was found between childhood obesity and parental occupational or educational level.

Conclusions: the findings indicated rising trend of childhood overweight and obesity among the primary school students especially female. This study supported the notion that obesity could run in families due to genetic causes or possibly influenced unhealthy eating habits. The high prevalence of childhood overweight and obesity calls for a national prevention programs based on dietary and physical education at home and schools to prevent obesity related morbidity.

Keywords: Overweight; Obesity; Schoolchildren; Cross-sectional; Saudi Arabia

Running title: Overweight and obesity among Saudi primary school students

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Introduction

Childhood obesity is one of the most serious public health challenges of the 21st century. The problem is global and affects many low and middle income countries. The prevalence is

increasing at an alarming rate. In 2007, an estimated 22 million children under the age of 5 years were overweight throughout the world.⁽¹⁾

In USA data from NHANES surveys (1976-1980 and 2003-2004) showed that the prevalence of overweight is increasing: for children age 2-5 years, the prevalence increased from 5% to 18.8%.⁽²⁾ The prevalence of overweight among Canadian boys increased from 15% in 1981 to 28% in 1996 while the prevalence of obesity has increased during the same period from 5% to 13.5%.⁽³⁾ Studies from Australia,⁽⁴⁾ Japan,⁽⁵⁾ Spain,⁽⁶⁾ England⁽⁷⁾ and Bahrain⁽⁸⁾ have all indicated rising trends in obesity among school children over the past 2 decades.

In Saudi Arabia, a study on 48,000 children (6-18 years old) in 1991 found that the prevalence of overweight among Saudi boys was 17.6% and obesity 11.3%.⁽⁹⁾ Another study done in 1996 on Saudi male student showed that the prevalence of overweight and obesity was 11.7% and 15.8% respectively.⁽¹⁰⁾ A recent study concluded that obesity prevalence among Saudi school boys (6-12 years old) increased from 3.4% in 1988 to 24.5% in 2005.⁽¹¹⁾

Obesity is not a single disease but is instead a syndrome with multifactorial etiology that includes metabolic, genetic, environmental, social and cultural interaction.⁽¹²⁾

Obesity is a complex condition in which excess of body fat may put the person at risk of hypertension, diabetes, metabolic syndrome, stroke, certain types of cancer (endometrial, breast, prostate and colon), dyslipidemia, gall bladder disease, sleep apnea, osteoarthritis, increase in all causes of mortality, emotional distress, discrimination and social stigmatization.⁽¹³⁾

The family and home environment are often implicated in the development of childhood obesity. A number of studies highlighted the association between environmental factors, mainly

factors related to sedentary lifestyle (like eating unhealthy food or physical inactivity), and childhood obesity.⁽¹⁴⁾

Low level of physical activity in children is also influenced by the amount of physical activity undertaken by parents. Children with active parents were six times more likely to be active compared with parents who are not active.⁽¹⁵⁾

Time spent on watching TV or computer screens and video games appears to be an important index of sedentariness which could increase the risk of obesity. Television viewing is cross-sectionally and prospectively related to obesity in children.^(16, 17) Reducing television viewing and computer use may have an important role in preventing obesity and in lowering BMI in young children.⁽²³⁾ Recent studies also showed that short sleep duration may be a risk factor for obesity in children.^(24, 25)

BMI is the most frequently used measure of weight in relation to height. BMI is cheap and has a good specificity. It exclude subjects who are not overweight or obese, but it misses some who are obese (i.e. less sensitive)⁽²⁸⁾, it is also the preferred method of expressing body fat percentile from clinical measurements.⁽²⁹⁾ In this study, BMI will be used as the measure of adiposity .

As there is no recent data with respect to Saudi Arabia in general and Riyadh in particular, this study is intended to determine the prevalence of overweight and obesity among primary school students (6-12 years old) in Alabnaa primary schools in Riyadh, Saudi Arabia as well as to analyze some factors that could be related to overweight and obesity in childhood.

Methods

A cross-sectional study was conducted among primary schools students in Alabnaa Schools in Riyadh, Saudi Arabia. Riyadh is the capital of Saudi Arabia, with a population of 5.8 million, expected to grow to 7.2 million by year 2024.

Sampling frame included all boys and girls studying in Alabnaa primary Schools in Riyadh. There were eight primary schools for boys with 3500 students and 6 primary schools for girls with 2500 students in Riyadh.

Multistage sampling technique was adopted. In the first stage, a sample of four primary schools had been selected by simple random technique-two primary school for boys and two for girls. In the second stage, stratified sampling had been used. First class of each grade of a selected school was treated as stratum; the sample from each stratum was equally selected by systematic random technique from students list i.e. by selecting the odd numbers from the students list.

The sample size which was 312, had been calculated using statcalc of Epi info software using the following criteria; population size: 6000 students, expected frequency (combined prevalence of childhood overweight and obesity from previous local study) was 28.9%, least acceptable was 24% and confidence level was 95%.

Permission from The Educational authorities in Riyadh was obtained with the help of the school health department in RMH. A Pilot study on 30 primary care students was conducted before the main study. The questionnaire was pre tested by students' parents and it was clear and understandable.

An appointment with school directors was arranged, schools were visited on separate days. Height and weight of each selected student were measured. Height was measured, without shoes, back straight, with heels together and arms at the side; the reading was measured in cm to the nearest 0.5 cm. The students then stood on weighing scale – Seca weighing scale (made in Germany) - without shoes and with light clothing, the weight was measured to the nearest 0.1 kg.

After finishing the measurement of height and weight, each student received a self-administered questionnaire, which was expected to be filled by his/her parent, and to be returned it back next day.

The body mass index (BMI) was calculated. Recently published 2007 WHO growth charts – which depended on data from widely different ethnic backgrounds and cultural settings (Brazil, Ghana, India, Norway, Oman and the USA)²³ – were used. Student with BMI below -2 SD (from the mean) for age and sex were defined as underweight. Student with BMI between -2 SD and +1 SD were defined as normal. Student with BMI between +1 SD and +2 SD were defined as overweight. Student with BMI above +2 SD (from the mean) were defined as obese. A statistical analysis was performed using the statistical package for social science (SPSS).

Results

Here hundreds and twelve self-administered questionnaires were distributed to the students. 292 questionnaires were returned, giving a response rate of 93.58%.

In boys, our study showed that the prevalence of overweight was 16%, while prevalence of obesity was 11%; the problem seems to be worse in girls, where the prevalence of overweight and obesity was 20% and 17%, respectively (Figure 1).

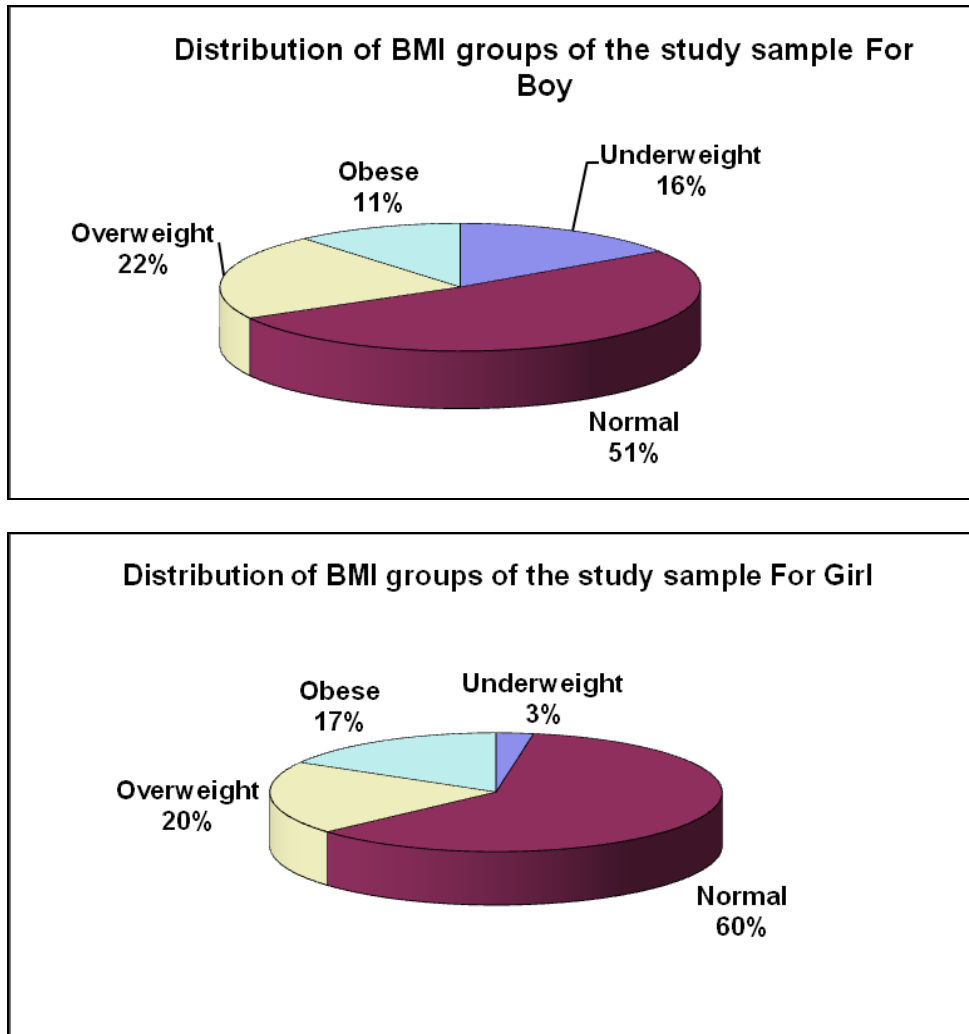


Figure 1: Prevalence of childhood overweight and obesity in relation to gender.

Table 1 shows the demographic characteristics of the participants. While table 2 shows the association of different factors with schoolchildren obesity.

Table 1. Demographic characteristics of participating students

Characteristics	Distribution of the sample	
	Frequency(n=292)	%
Age group(in year)		
6-9	157	53.8
>9	135	46.2
Sex		
Male	142	48.6
Female	150	51.4
Family size		
≤6	110	37.7
>6	182	62.3
Father's occupation		
Military officer	118	40.5
Military Non officer	96	33.0
Civilian	61	21.0
Retired	15	5.2
Died	1	0.3
Mother's Job		
Employed	216	74.0
Housewife	75	25.7
BMI Group		
Severe thin	8	2.7
Thin	18	6.2
Normal	164	56.2
Overweight	61	20.9
Obese	41	14.0
Father's Education		
University & above	167	57.4
Secondary	71	24.4
Intermediate	29	10.0
Primary	20	6.9
Illiterate	4	1.4
Mother's Education		
University & above	118	40.5
Secondary	80	27.4
Intermediate	46	15.8
Primary	34	11.6
Illiterate	13	4.5
Father obesity		
Yes	39	13.4
No	253	86.6
Mother obesity		
Yes	31	10.6
No	261	89.4
Daily sleeping hours		

≥8	254	87.9
<8	35	12.1
Duration of watching TV, using computer or playing video games		
≤2 hours	137	46.9
>2 hours	155	53.1

Overweight and obesity were found to be more in those above 9 years in our study but the association was statistically insignificant (Figure 2).

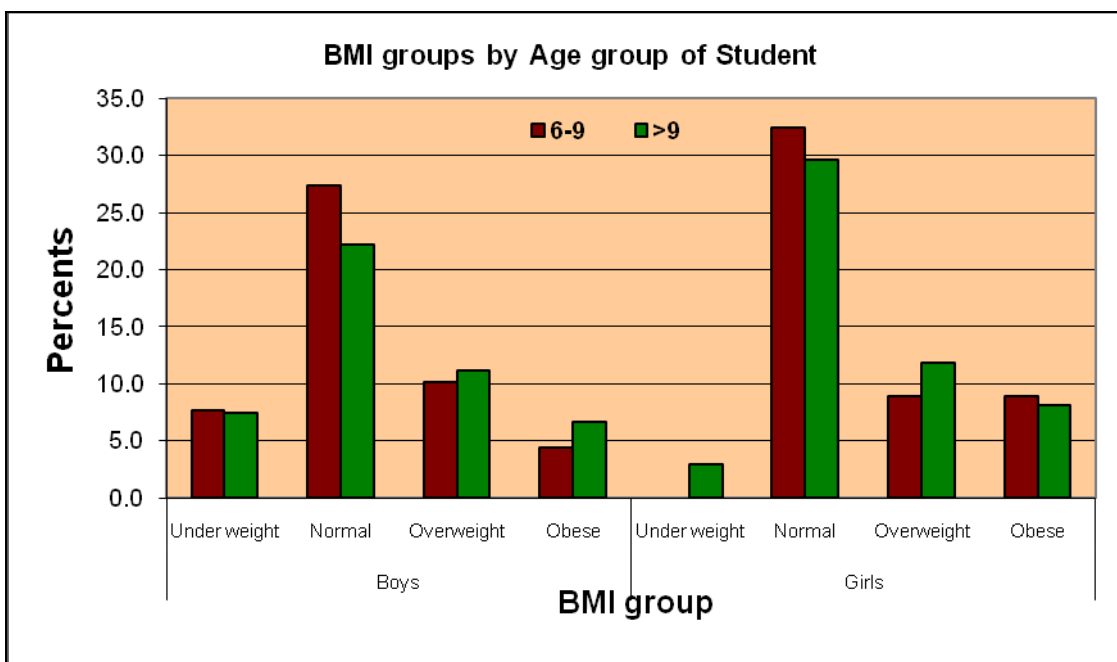


Figure 2: Overweight and obesity in different childhood age group.

Overweight was more prevalent in large families (more than 6 members) 22.5% in comparison to 18.2% in smaller families, but obesity prevalence seemed to be similar 14.5% and 13.7 % in small and large family, respectively. But again the association was insignificant (Figure 3).

Characteristics	BMI Group								P-value	
	Under weight		Normal		Overweight		Obese			
	No	%	No	%	No	%	No	%		
Sex										
	Female	4	2.7	91	60.7	30	20.0	25	16.7	0.001
	Male	22	15.5	73	51.4	31	21.8	16	11.3	
Age										
	6-9	12	7.6	94	59.9	30	19.1	21	13.4	0.559
	>9	14	10.4	70	51.9	31	23.0	20	14.8	
Family size										
	≤6	12	10.9	62	56.4	20	18.2	16	14.5	0.693
	>6	14	7.7	102	56.0	41	22.5	25	13.7	
Father's occupation										
	Military officer	15	12.7	61	51.7	25	21.2	17	14.4	0.505
	Military Non officer	4	4.2	55	57.3	21	21.9	16	16.7	
	Civilian	4	6.6	40	65.6	11	18.0	6	9.8	
	Retired/died	2	12.5	8	50.0	4	25.0	2	12.5	
Mother's Job										
	Employed	6	8.0	41	54.7	12	16.0	16	21.3	0.166
	Housewife	20	9.3	122	56.5	49	22.7	25	11.6	
Father's Education										
	University & above	17	10.2	89	53.3	39	23.4	22	13.2	0.737
	Secondary	5	7.0	44	62.0	11	15.5	11	15.5	
	Intermediate	0	0.0	18	62.1	7	24.1	4	13.8	
	Primary	2	10.0	11	55.0	3	15.0	4	20.0	
	Illiterate	1	25.0	2	50.0	1	25.0	0	0.0	
Mother's Education										
	University & above	10	8.5	66	55.9	24	20.3	18	15.3	0.43
	Secondary	9	11.3	42	52.5	20	25.0	9	11.3	
	Intermediate	3	6.5	29	63.0	6	13.0	8	17.4	
	Primary	2	5.9	22	64.7	5	14.7	5	14.7	
	Illiterate	2	15.4	4	30.8	6	46.2	1	7.7	
Father obesity										
	Yes	3	7.7	20	51.3	9	23.1	7	17.9	0.836
	No	23	9.1	144	56.9	52	20.6	34	13.4	
Mother obesity										
	Yes	0	0.0	13	41.9	8	25.8	10	32.3	0.005
	No	26	10.0	151	57.9	53	20.3	31	11.9	
Daily sleeping hours										
	≥8	24	9.4	144	56.7	51	20.1	35	13.8	0.544
	<8	2	5.7	17	48.6	10	28.6	6	17.1	
Duration of watching TV, using computer or playing video games										
	≤2 hours	13	9.5	81	59.1	27	19.7	16	11.7	0.637
	>2 hours	13	8.4	83	53.5	34	21.9	25	16.1	

Table 2. Different factors and their relation to childhood overweight and obesity.

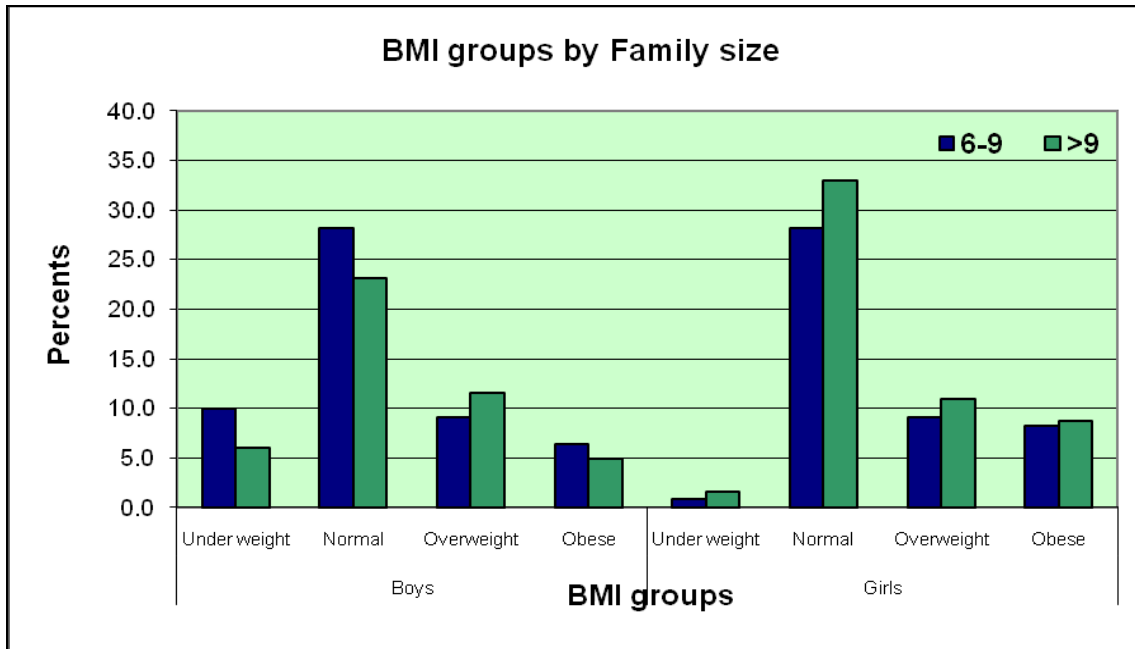


Figure 3: Childhood overweight and obesity in relation to family size.

The combined prevalence of overweight and obesity was found to be higher in children of non-commissioned officers (NCOS), retired and dead father (38.6% and 37.5% respectively). It was also higher in children of employed mother (37.3% in comparison to 34.5% of housewives), these differences were statistically insignificant.

Education level of the students’ parents did not seem to affect the risk of overweight and obesity in their children, the difference between prevalence of childhood obesity in relation to parent education level was statistically insignificant.

Our study indicated that the risk of childhood overweight and obesity was higher in those with parental history of obesity. The combined prevalence of students overweight and obesity was 41% in those with father history of obesity – in comparison to 34% with no father obesity – but this difference was statistically insignificant (Figure 4).

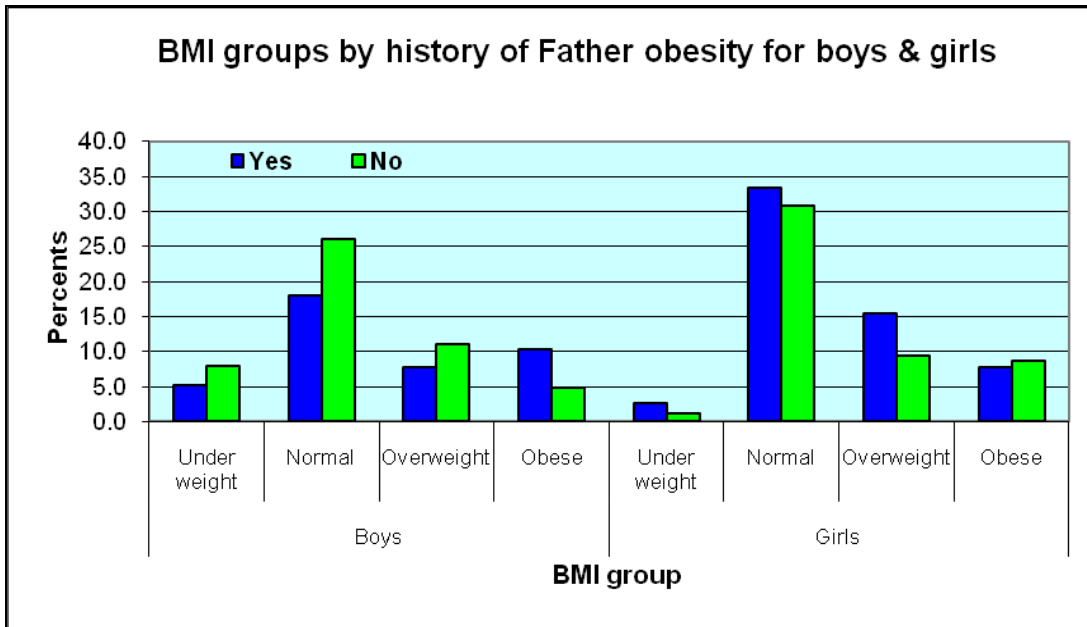


Figure 4: Childhood overweight and obesity in relation to paternal obesity.

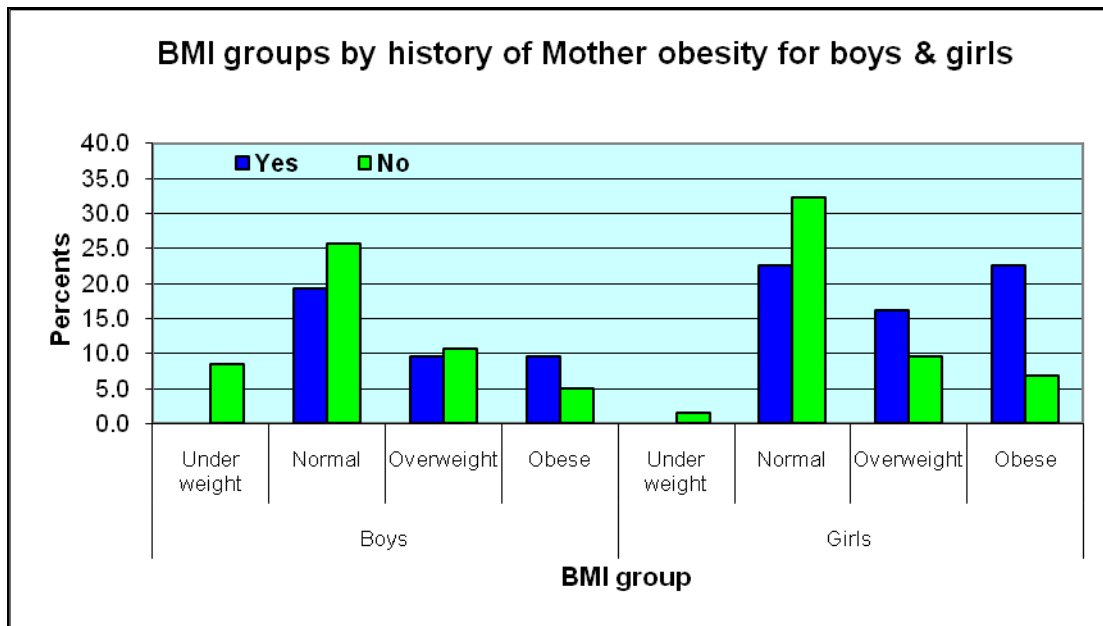


Figure 5: Childhood overweight and obesity in relation to maternal obesity.

This prevalence was also found to be more in those with history of maternal obesity (58.1% in comparison to 32% with no maternal obesity), the difference was statistically significant (Figure 5).

Children who used to sleep 8 hours or more were found to be less overweight or obese (the combined prevalence of overweight and obesity in children sleeping 8 hours or more was 33.9%, while it was 45.7% in those sleeping less), and this difference was statistically insignificant (Figure 6).

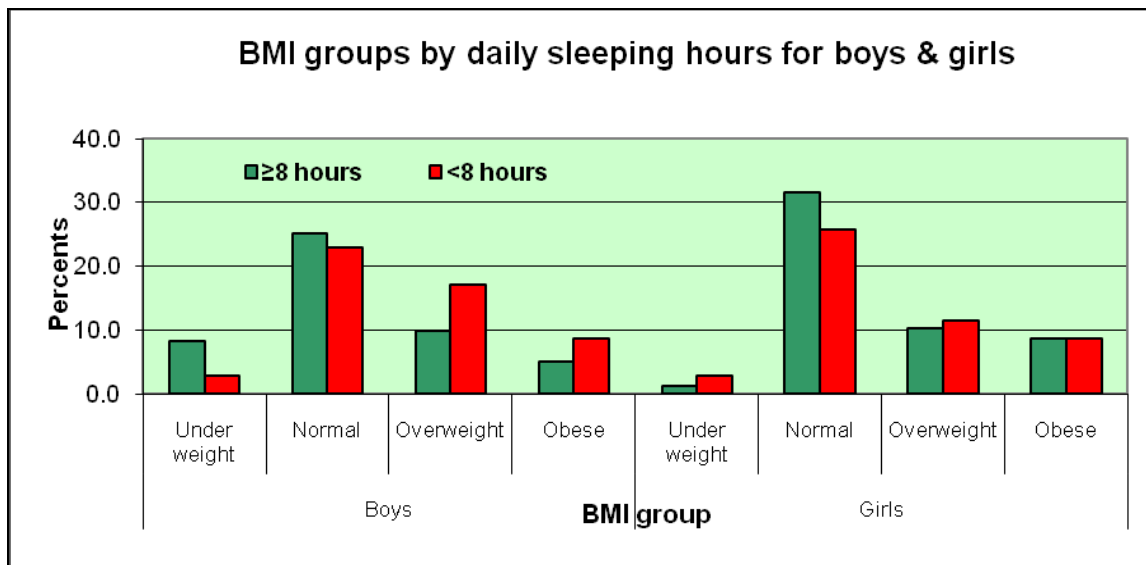


Figure 6: Childhood overweight and obesity in relation to daily sleeping hours.

The risk of childhood overweight and obesity was higher in those watching TV, computer or playing video games more than 2 hours per day (38% in comparison to 31.4% in those with total media time less than 2 hours), this difference was statistically insignificant (Figure 7).

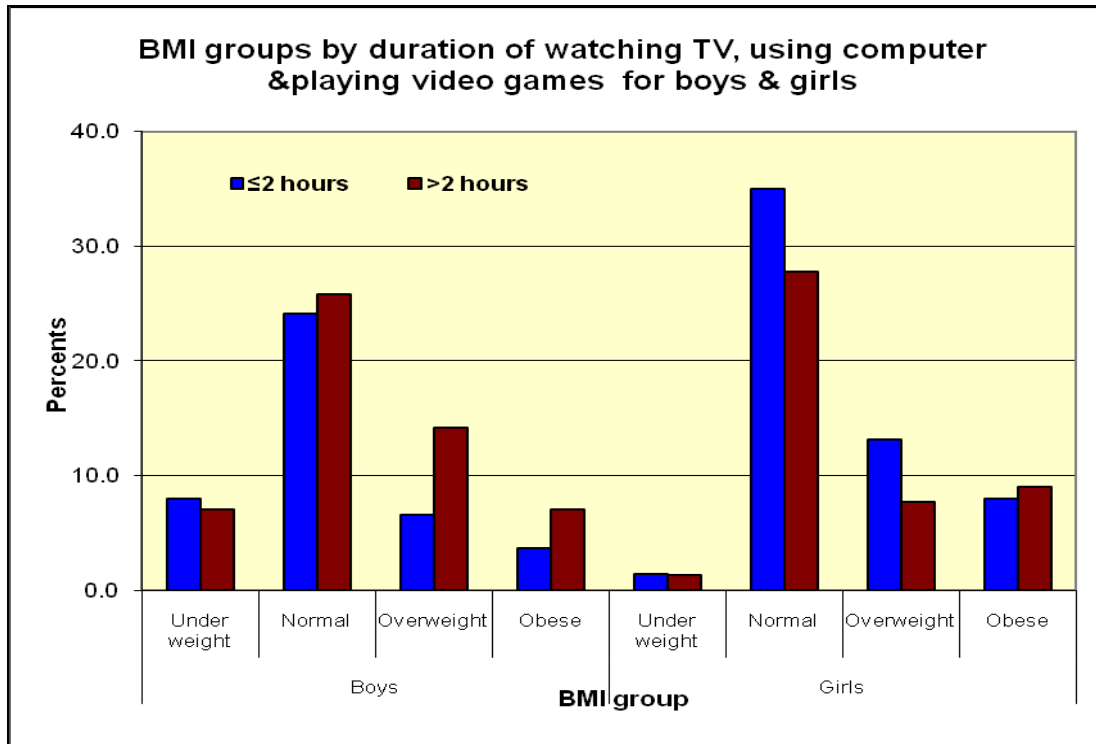


Figure 7: Childhood overweight and obesity in relation to total media time.

Discussion

Most of previous local studies about childhood overweight and obesity depended on growth charts which were designed for western countries (usually CDC growth charts were used). These charts might not be appropriate for our children; they could underestimate the problem of obesity and mistakenly assign a child as normal while he is really overweight or obese. The unique feature of our study was the use of new growth charts which could be more appropriate for our children i.e. recently published 2007 WHO growth charts which were prepared using data from different countries including Oman.

The prevalence of overweight and obesity of school boys in our study was 16% and 11%, respectively. This result is close to results from older local studies. In 1991, the prevalence of overweight among 48000 Saudi boys was 17.6% and obesity was 11.3%⁽⁹⁾, another study done in 1996 showed that the prevalence of overweight and obesity was 11.7 and 15.8 respectively⁽¹⁰⁾. More recent study concluded that obesity prevalence increased among Saudi school boys to 24.5%.⁽¹¹⁾ In 2008, locally published study done in Al-Hassa showed that the prevalence of overweight of primary school boys was 14.2% while that of obesity was 9.7%, but the age range in that study was 10-12 years.⁽²⁴⁾

Overweight and obesity were more common in girls; prevalence of overweight of primary school girls was 20%, while it was 17% for obesity. This could be due to less physical activity at schools and at home in comparison to boys. The local studies which were done on girls to estimate obesity were few. A study done in Alkhobar in 2003 on 2239 primary school girls concluded that the prevalence of overweight and obesity were 20% and 11%, respectively.⁽²⁵⁾

Recent study done in Riyadh and published at 2008 showed that prevalence of obesity in primary school girls was 14.9%.⁽²⁶⁾

There is good evidence that prevalence of childhood overweight and obesity in Saudi Arabia is growing dramatically, this perhaps is a tax of urbanization and sedentary life style, and the problem seemed to be worsening when the children grow older.

This study could not find a significant association between childhood obesity and parental occupational or educational level. These factors were studied 19 On the other hand; studies from Turkey and Italy found no association between childhood obesity and parental

occupational and educational level. In this study the absence of the significant difference could be due to the relatively small sample size.

The risk of childhood obesity increased with history of parental obesity, this association was found to be statistically significant especially with maternal obesity. Our study was in agreement with a case control study done at 2000 in china which showed that the parental obesity is significantly associated with childhood obesity, it was done over 748 boys and 574 girls and showed that odds for childhood obesity significantly increased by 2.3 times in children with paternal history of obesity and increased by 3.58 times in those children with maternal obesity.

(26, 27)

This points to a genetic link, and that obesity is a disease which could run in families. However the contribution of unhealthy eating habits to the development of obesity that also might run in families is not clear.

Children who used to sleep 8 hours or more daily had a lower risk of obesity; this association was significant in recently published metanalysis in 2008 which showed that pooled odds ratio for short duration of sleep and childhood obesity is 1.89.⁽²⁸⁾ The reason for this might not be the sleep duration itself but it could be what children do when they are not sleeping, it could be related to longer TV viewing with junk food consumption.

The American academy of paediatrics recommend that children's total media time should be limited to no more than 2 hours per day.⁽²⁹⁾ Children who used to spend more than 2 hours in watching TV, computer or playing video games were more liable to be overweight or obese but the association was statistically insignificant in our study, in contrast to previous international studies which confirmed a significant association between children total media time and childhood obesity.^(19, 30,31) The lack of significant association in our study could be related to the

sample size which was relatively small. The time spent watching video TV and playing electronic games is enough to increase calories consumption and to reduce metabolic rate, eating while watching TV also is a common practice among our families.

The study has some limitations including that some of the selected variables were estimated subjectively, as it was difficult to be estimated objectively e.g. daily sleeping time in hours, a lot of time was spent to find free periods for each class for weight and height measurement to avoid disturbing the regular students' activities, only one parameter of obesity measurement (BMI) was used due to time and resources limitations and the sample size was relatively small which could explain the discrepancy with some studies.

In the light of our results, we recommended the following involving the parents and teachers in the management of overweight or obese children by encouraging them to participate in more physical activities, promoting health education in community and schools about the risk of childhood obesity, and focus on high risk families or groups, supervision of food quality both at home and school, healthy diet should be advocated, total media time for any child should not exceed 2 hours depending on recommendation from American academy of paediatrics, the content of TV programs and video games should be wisely selected and finally encouraging children to sleep early and to sleep at least 8 hours daily, not only to avoid possible risk of overweight and obesity but also to maintain the child's health and to get maximum concentration during school time.

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