

PREVALENCE OF OVERWEIGHT AND OBESITY AMONG SAUDI PRIMARY SCHOOL STUDENTS IN TABUK, SAUDI ARABIA

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DOI: 10.5455/ijmsph.2014.080620141

Received Date: 23.05.2014

Accepted Date: 08.06.2014

ABSTRACT

Background: Childhood obesity is one of the most serious public health challenges of the 21st century. The problem is global and the prevalence is increasing at an alarming rate.

Aims & Objective: To determine the prevalence of overweight and obesity as well as to analyze some factors that could be related to them among primary school students (6-12 years old) in ALAbnaa primary schools in Tabuk, Saudi Arabia.

Materials and Methods: A cross-sectional study was conducted among primary schools students in ALAbnaa Schools in Tabuk, Saudi Arabia. Sampling frame included all boys and girls studying in ALAbnaa primary Schools in Tabuk. 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. The data was collected through a self-administered validated questionnaire. Height and weight of each selected student were measured and BMI was calculated. Recently published 2007 WHO growth charts - which depended on data from widely different ethnic backgrounds and cultural settings were used for defining obesity and overweight among students.

Results: Of 350 self-administered questionnaires distributed to the students, 331 questionnaires were returned, giving a response rate of 94.6%. Their age ranged between 6 and 13 Years (Mean=9.7 years) and (SD=2.1 years). Slightly more than half of them were males (53.8%). The prevalence of overweight and obesity among male primary school students were 7.3% and 17.4% respectively while their prevalence among female students were 12.4% and 20.9% respectively. Overall, the prevalence of overweight among primary school students in Tabuk was 9.7% and that of obesity was 19%. The prevalence of overweight and obesity were more significant among students living with both parents, of highly educated parents, of history of maternal obesity, of working mothers and of smaller family size.

Conclusion: The results of the current study provide alarming evidence-based data on the considerable prevalence of childhood overweight and obesity among primary school children in Tabuk, Saudi Arabia.

Key Words: Prevalence; Obesity; Overweight; Students; Saudi Arabia

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), dyslipidaemia, gall bladder disease, sleep apnoea, osteoarthritis, increase in all causes of mortality, emotional distress, discrimination and social stigmatization.^[13]

Type 2 diabetes has increasingly been reported in children and adolescents, so much so that in some parts of the world type 2 diabetes has become the main type of

diabetes in children. The global rise of childhood obesity and physical inactivity is widely speculated to play a crucial role.^[14,15] Obese children are also at high risk of developing orthopaedic problems like genu valgum, slipped capital femoral epiphysis and tibia vara.^[16]

Childhood is a critical period for the initiation of obesity and associated morbidity. Obesity at any age will increase the risk of persistence of obesity at subsequent ages; in at least 2 studies half of all obese children remained obese as adults.^[17,18]

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.^[19]

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.^[20]

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.^[21,22] 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)^[26-28], it is also the preferred method of expressing body fat percentile from clinical measurements^[29]. In this study, BMI was used as the measure of adiposity.

Materials and Methods

A cross-sectional study was conducted among primary schools students in ALAbnaa schools in Tabuk, Saudi Arabia. Sampling frame included all boys and girls studying in ALAbnaa primary Schools in Tabuk was prepared. There were 9 primary schools for boys with 4000 students and 8 primary schools for girls with 3500 students in Tabuk.

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 was calculated by Statcalc of Epi- info software using the following criteria: population size: 7500 students, expected frequency (combined prevalence of childhood overweight and obesity from previous local study): 28.9%^[9], least acceptable: 24% and confidence level: 95%. The estimated sample size was 315 students. I was increased to 350 students in order to compensate for drop-out.

Permission from The Educational authorities in Tabuk was obtained with the help of the school health department in Tabuk military hospital. The data was collected through a self-administered questionnaire. It was validated by three consultants of family physicians.

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 weighting 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. It was filled by his/her parent, and returned 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)^[30] 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.

Statistical analysis was performed using the Statistical Package for Social Science (SPSS), version 19. Chi-square test was utilized to test for the difference and/or association between categorical variables BMI and associated factors). A p-value less than 0.05 was considered statistically significant.

Results

Of 350 self-administered questionnaires distributed to the students, 331 questionnaires were returned, giving a response rate of 94.6%. Table 1 presents the socio-demographic characteristics of the participants. Their age ranged between 6 and 13 Years (Mean = 9.7 years) and (SD = 2.1 years). Slightly more than half of them were males (53.8%). The majority of them (94.6%) live with both parents. In more than half of them (50.5%), the father` education was bachelor or above while in 40.2% of them the mother`s education was bachelor or above. In more than half of the participants (57.4%), the family size was more than 6 persons. In most of them (73.7%), the fathers were military persons. Maternal working was reported among almost one-third of them (31.1%). 42.6% of the students reported history of paternal fatness while maternal fatness was reported among 18.4% of them.

As obvious from figure 1, two hundred students (60.4%) reported watching television, using computer or playing

video games for more than 4 hours per day. From figure 2, 12.4% of the students reported sleeping for more than eight hours per day.

Prevalence of Overweight and Obesity

Figure 3 shows that the prevalence of overweight and obesity among male primary school students were 7.3% and 17.4% respectively while their prevalence among female students were 12.4% and 20.9% respectively. Overall, the prevalence of overweight among primary school students in Tabuk was 9.7% and that of obesity was 19%.

Table-1: Socio-demographic characteristics of primary school students, Tabuk (n=331)

Characteristics	N	%
Age (years)	6-9	46
	10-11	22
	≥ 12	32
	Range	6-13
	Mean ± SD	9.7 ± 2.1
Gender	Male	54
	Female	46
Living status	With both parents	95
	With either father or mother	5.4
Father's education	Secondary school or lower	50
	Bachelor or above	51
Mother's education	Secondary school or lower	60
	Bachelor or above	40
Family size	≤6	43
	>6	57
Father's job	Military	74
	Civilian	10

Table-2: Factors affecting with Body Mass Index of primary school children according to their socio-demographic characteristics

Factors affecting with Body Mass Index	Body Mass Index				χ ² -value (p-value)	
	Underweight (n=41)	Normal (n=195)	Overweight (n=32)	Obese (n=63)		
	No. (%)	No. (%)	No. (%)	No. (%)		
Age (years)	6-9 (153)	21 (13.7)	86 (56.2)	18 (11.8)	28 (18.3)	4.08 (0.666)
	10-11 (73)	9 (12.3)	46 (63.0)	7 (9.6)	11 (15.1)	
	≥12 (105)	11 (10.5)	63 (60.0)	7 (6.7)	24 (22.9)	
Gender	Male (178)	20 (11.2)	114 (64.0)	13 (7.3)	31 (17.4)	4.89 (0.180)
	Female (153)	21 (13.7)	81 (52.9)	19 (12.4)	32 (20.9)	
Father's education	Secondary school or lower(164)	15 (9.1)	109 (66.5)	18 (11.0)	22 (13.4)	11.87 (0.008)
	Bachelor or above (167)	26 (15.6)	86 (51.5)	14 (8.4)	41 (24.6)	
Mother's education	Secondary school or lower(198)	17 (8.6)	129 (65.2)	18 (9.1)	34 (17.2)	10.07 (0.018)
	Bachelor or above (133)	24 (18.0)	66 (49.6)	14 (10.5)	29 (21.8)	
Father's job status	Military (244)	30 (12.3)	145 (59.4)	25 (10.2)	44 (18.0)	0.86 (-0.836)
	Civilian (87)	11 (12.6)	50 (57.5)	7 (8.0)	19 (21.8)	
Mother's job status	House wife (228)	23 (10.1)	146 (64.0)	22 (9.6)	37 (16.2)	9.42 (0.024)
	Working (103)	18 (17.5)	49 (47.6)	10 (9.7)	26 (25.2)	
Family size	≤6 (141)	10 (7.1)	83 (58.9)	11 (7.8)	37 (26.2)	13.47 (-0.004)
	>6 (190)	31 (16.3)	112 (58.9)	21 (11.1)	26 (13.7)	
Living status	With both parents (313)	41 (13.1)	180 (57.5)	29 (9.3)	63 (20.1)	8.87 (-0.031)
	Either mother or father (18)	0 (0.0)	15 (83.3)	3 (16.7)	0 (0.0)	
Paternal fatness	No (244)	22 (11.6)	111 (58.4)	16 (8.4)	41 (21.6)	2.49 (-0.477)
	Yes (87)	19 (13.5)	84 (59.6)	16 (11.3)	22 (15.6)	
Maternal fatness	No (228)	25 (9.3)	170 (63.2)	26 (9.7)	48 (17.8)	16.63 (0.001)
	Yes (103)	16 (25.8)	25 (40.3)	6 (9.7)	15 (24.2)	
Time of watching TV, using computer or playing video games per day	≤4 hours (131)	18 (13.7)	74 (56.5)	10 (7.6)	29 (22.1)	2.56 (-0.464)
	>4 hours (200)	23 (11.5)	121 (60.5)	22 (11.0)	34 (17.0)	
Duration of sleeping per day	≤8 hours (290)	34 (11.7)	171 (59.0)	29 (10.0)	56 (19.3)	1.19 (-0.755)
	>8 hours (41)	7 (17.1)	24 (58.5)	3 (7.3)	7 (17.1)	

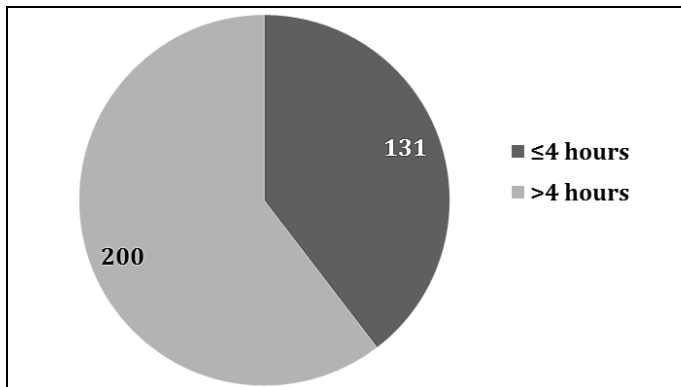


Figure-1: Time spent by students in watching television, using computer or playing video games per day

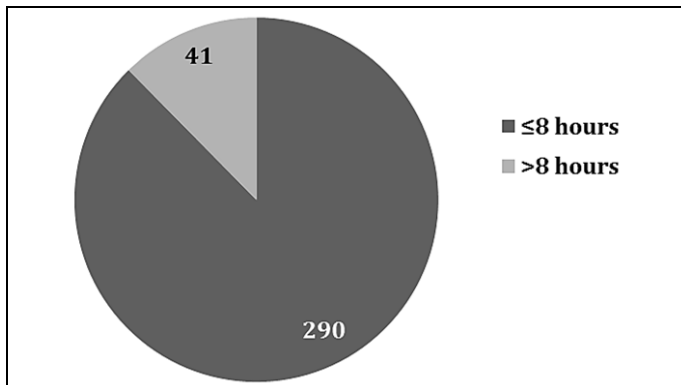


Figure-2: Average sleeping time per day among primary school students

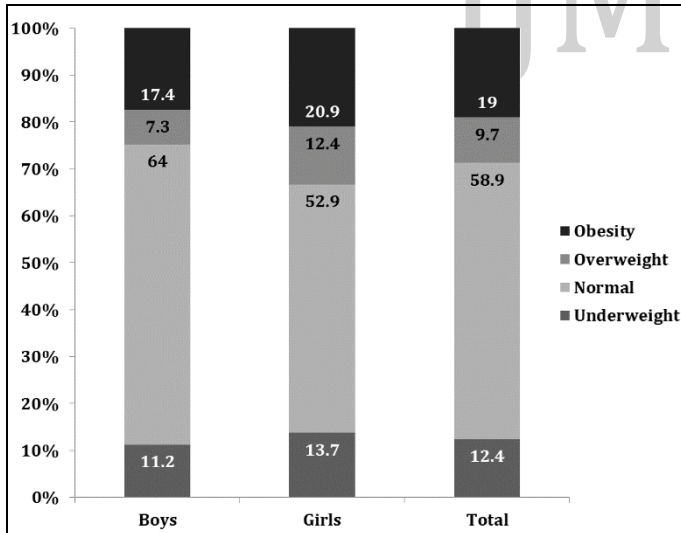


Figure-3: Prevalence of overweight and obesity among primary school students, Tabuk

Factors Associated with Body Mass Index

Age: As seen in table 2, the prevalence of overweight and obesity among students aged between 6 and 9 years were 11.8% and 18.3% compared to 6.6% and 22.9% among students aged 12 or more, respectively. However, this difference was not statistically significant, $p=0.666$.

Gender: Table 2 shows that the prevalence of overweight

and obesity among male students were 7.3% and 17.4% compared to 12.4% and 20.9% among female students, respectively. However, this difference was not statistically significant, $p=0.180$.

Parental Education: Table 2 shows that the prevalence of overweight and obesity among students of low educated fathers (secondary schools or lower) were 11.0% and 13.4% compared to 8.4% and 24.6% among students of high educated fathers (Bachelor or above), respectively. This difference was statistically significant, $p=0.008$. Regarding maternal education level, the prevalence of overweight and obesity among students of low educated mothers (secondary schools or lower) were 9.1% and 17.2% compared to 10.5% and 21.8% among students of high educated mothers (Bachelor or above), respectively. This difference was statistically significant, $p=0.018$.

Parental Job Status: Table 2 displays that the prevalence of overweight and obesity among students of military fathers were 10.2% and 18.0% compared to 8.0% and 21.8% among students of civilian fathers, respectively. This difference was not statistically significant, $p=0.836$. Regarding maternal job status, the prevalence of overweight and obesity among students of housewives mothers were 9.6% and 16.2% compared to 9.7% and 25.2% among students of working mothers, respectively. This difference was statistically significant, $p=0.024$.

Family Size: Table 2 displays that the prevalence of overweight and obesity among students of family size of 6 or less were 7.8% and 26.2% compared to 11.1% and 13.7% among those of large family size (more than 6), respectively. This difference was statistically significant, $p=0.004$.

Living Status: Table 2 shows that the prevalence of overweight and obesity among students living with both parents were 9.3% and 20.1% compared to 16.7% and 0.0% among those living with either father or mother, respectively. This difference was statistically significant, $p=0.031$.

Parental Fatness: Table 2 shows that the prevalence of overweight and obesity among students of fatty mothers were 9.7% and 24.2% compared to 9.7% and 17.8% among students of non-fatty mothers, respectively. This difference was statistically significant, $p=0.001$. Regarding paternal fatness, there was no statistically significant association between history of paternal fatness and BMI.

Watching TV, using Computer and Playing Video Games:

Table 2 shows that the prevalence of overweight and obesity among students who watched TV, used computer or played video games 4 hours per day were 7.6% and 22.1% compared to 11.0% and 17.0% among those who watched TV, used computer or played video games more than 4 hours per day, respectively. This difference was not statistically significant, $p=0.464$.

Duration of Sleep/Day: Table 2 among students who slept more than 8 hours per day were 7.3% and 17.1% compared to 10.0% and 19.3% among those who slept 8 hours or less per day, respectively. This difference was not statistically significant, $p=0.755$.

Discussion

In developing countries, the rapid progress of urbanization and demographic trends is associated with a cluster of non-communicable diseases and unhealthy lifestyles described as the "lifestyle syndrome" or the "New World syndrome." This is suggested as the most important etiology for the very high rates of obesity and its consequent morbidity and mortality in developing nations. In addition, in such communities, childhood obesity is still considered a sign of healthiness and high social class.^[31]

Most of previous local studies about childhood overweight and obesity depended on growth charts which were designed for western nations (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.^[30]

A recent review by Wang and Lobstein confirmed that children in lower- and middle-income countries, especially those growing up in urban environments and following a Western lifestyle, are facing a significant and rapidly growing epidemic of childhood obesity.^[32]

In the last few decades, an "epidemic" of obesity has been reported in many developed countries of the world.^[33] The term "epidemic" of obesity implies that obesity is a characteristic of the populations not only of individuals. A recent paper reviewed the increase in the population

prevalence of overweight and obesity in several countries. Finland, New Zealand, the United Kingdom, the United States and Western Samoa showed a large increase in prevalence, whereas some other countries showed only a slight increase.^[34] Several studies have reported prevalence of overweight or/and obesity in school children with ages ranging from 7-14 years, applying the 85th percentile and 95th percentile as cut-off points for overweight and obesity, respectively, with rates generally ranging from 6%-30%.^[33-36] The results of the current study goes with these previous findings as the prevalence of overweight among male school children 6-12 years was 7.3% while that of obesity was 17.4%. This prevalence rate is higher than that reported previously in Saudi Arabia since more than 10 years by El-Hazmi and Warsy, who conducted a cross-sectional national epidemiological household survey in different areas of Saudi Arabia from 1994 to 1998.^[37] Their study group included 12071 children (boys 6281; girls 6420), with ages ranging from 1-18 years. The prevalence of overweight among boys aged 6-12 years was 8.65% while prevalence of obesity was 4.96%. This apparent increase in the prevalence of overweight and obesity could reflect more deterioration in the situation in Saudi Arabia regarding childhood obesity which necessitate a need for rapid and effective action to decrease this problem burden.

AL-Hazaa in his 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.^[38]

Overweight and obesity were more common in girls (although not significant); prevalence of overweight among primary school girls was 12.4%, while that of obesity was 20.9%. This could be attributed to the fact that girls have less physical activity at schools and at home in comparison to boys. The local studies included 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.^[39] Recent study conducted in Riyadh showed that prevalence of obesity among primary school girls was 14.9%.^[40]

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. In the present study, time spent in watching TV, playing videogames or using computers as well as duration of sleeping were not significantly associated with obesity. A further detailed study concentrated on those factors is highly recommended.

In the present study, a significant association between students' obesity and high paternal education, working mothers and lower family size is evident confirming the relationship between high socioeconomic level and childhood obesity. Internationally, the results in this regard were conflicting. Studies from Germany and France showed that the risk of childhood obesity was significantly lower in children with higher parental occupational and educational level.^[41,42] On the other hand, studies from Turkey and Italy found no association between childhood obesity and parental occupational and educational level.^[43,44]

In agreement with our results, based on 2004 CCHS data, there was an inconsistent association between childhood obesity and household education.^[45] A clearer association was found between the highest level of education attained by household members and the likelihood of children from that household being overweight or obese. Children and youth from households where the highest level of education was a high school diploma (or less) were significantly more likely to be overweight or obese (31%) than those living in households where the highest level of education was post-secondary graduation (25%).

The risk of childhood obesity increased with history of parental obesity, this association was found to be statistically significant with only maternal obesity in the current study. Our finding was in agreement with a case control study done on 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 3.58 times in those children with maternal obesity.^[46] 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.

Students who used to sleep more than 8 hours daily had a lower risk of obesity; this association was significant in recently published meta-analysis in 2008 which showed that pooled odds ratio for short duration of sleep and

childhood obesity is 1.89.^[47] 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 recommended that children's total media time should be limited to no more than 2 hours per day.^[48] 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. However, our study failed to confirm such association. In contrast to previous international studies which confirmed a significant association between children total media time and childhood obesity.^[24,49,50] The lack of significant association in our study could be related to the sample size which was relatively small and/or recall bias. 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.

Among limitations of the current study, ignoring some important risk factors for overweight and obesity such as physical activity and dietary factors. However, the main objective of the present study is estimation of the prevalence of obesity and overweight among primary school children in Tabuk, KSA.

Conclusion

Conclusively, the results of the current study provide alarming evidence-based data on the considerable prevalence of childhood overweight and obesity among primary school children in Tabuk. It highlights the higher prevalence among girls (although not significant), those of higher socio-economic standard, living with both parents and with history of maternal obesity.

ACKNOWLEDGEMENTS

I would express my sincere gratitude and great appreciation to Dr. Salem Khalil Aldahi for his sustainment help and providing expert advice during this study. Special thanks go to the statistical advisor Prof. Moataz Abdel-Fattah for his continuous support and advice during study design and statistical analysis.

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Cite this article as: Al-Enazy WH, Al-Enazy FS, Al-Enazy FA, Al-Qahtani MA. Prevalence of overweight and obesity among Saudi primary school students in Tabuk, Saudi Arabia. *Int J Med Sci Public Health* 2014;3:993-999.

Source of Support: Nil

Conflict of interest: None declared