



Original research

Prevalence of obesity and overweight in elementary school students and their relationship with parents' weight status in Farsan, Iran

Setareh Mohammadi^a, Hassan Mozaffari-Khosravi^{a,b,*}^a Department of Nutrition, School of Public Health, Shahid Sadoughi University of Medical Sciences, Yazd, Iran^b Yazd Diabetes Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

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ABSTRACT

Introduction: Obesity, as a multifactorial outcome is the result of a complex reaction among genetic talent, environment, and behavioral factors. The aim of this study was to determine the prevalence of obesity and overweight among the elementary school students and their relationship with parents' weight status.

Methods: This descriptive cross-sectional study was conducted on 1189 randomly selected male and female elementary school students and their parents in 2017. The participants' anthropometric measures and their body mass index (BMI) were calculated. Other information such as parents' age, level of education, and occupation were investigated using private and face-to-face interviews. The weight status of parents and students were defined using the BMI classification and BMI percentiles, respectively.

Results: The prevalence of overweight and obesity among male students (9.9% and 8.5%, respectively) was significantly higher than female students (8.6% and 3.4%, respectively). The frequency rates of overweight and obesity were 42.1 and 17.1 percent in fathers, while they were 43 and 25.8 percent in mothers, respectively.

Obesity and overweight in students had a statistically significant relationship with their parental weight status. **Conclusion:** In Farsan city, 14.8 percent of students, 59.2 percent of fathers, and 68.8 percent of mothers were obese or overweight. These results were significantly different from similar areas. Moreover, a large percentage of obese and overweight students had obese or overweight parents. Therefore, educational interventions are recommended to change the lifestyle and diet habits of families with a positive history of obesity.

1. Introduction

In recent years, the prevalence of obesity and overweight has increased greatly among children. The issue is currently considered as a serious problem all over the world (Kautiainen, 2008). The prevalence of overweight and obesity in children in the United States was 22 and 11 percent, respectively (Terrell, 2002). Findings of the studies conducted in the United States showed that the prevalence of obesity in children and adolescents was 16.9 percent in 2009–2010 (Ogden et al., 2012). Furthermore, the overall prevalence of overweight in children in Malaysia was 19.9 percent (Naidu et al., 2013). However, the prevalence of childhood obesity among Chinese children increased dramatically from 1.4 percent in 2000 to 1.8 percent in 2010 (Lo et al., 2015).

A study reported the prevalence of overweight and obesity among children under five years in different parts of Iran; Northern: 11.8 and 15 percent, Southern: 18.8 and 17.7 percent, Eastern: 9.6 and 2.9 percent, center: 8.2 and 11.5 percent, respectively (Salehiniya et al.,

2012). Obesity and overweight in children should be considered as a serious worldwide problem. Iran is also among the countries with high prevalence of childhood obesity (Dorosty et al., 2002; Kelishadi et al., 2003). According to a study, 77 percent of obese children will become obese adults (Jazayeri, 2005).

The increased prevalence of obesity and overweight among children in the developed countries can be attributed to changes in lifestyle. Nowadays, children spend a lot of time watching television and playing computer games, they consume a lot of high-fat foods, and have low physical activity (Veugeliers and Fitzgerald, 2005).

Obesity is a multifactorial disease caused by factors such as inheritance (parental obesity), gender, birth weight, birth rate, parental age, parental education, parental nutritional status, sedentary lifestyle, and many other environmental factors (Moayeri et al., 2006; Piriñci et al., 2010; Strauss and Knight, 1999). Parents' obesity, especially maternal obesity is one of the major factors in obesity and overweight in children (Padez et al., 2005). Therefore, parental obesity should be considered as an important risk factor in prevention programs. In many

* Corresponding author. Department of Nutrition, School of Public Health, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

E-mail address: mozaffari.kh@gmail.com (H. Mozaffari-Khosravi).

studies, obesity of parents, especially mothers had a direct relationship with obesity in children. Moreover, it was considered as the most important factor in obesity of children in some studies (Chen and Kennedy, 2005; Danielzik et al., 2004; Grube et al., 2013; Zurriaga et al., 2011).

Childhood obesity causes a variety of complications in adolescents and adults such as type 2 diabetes, insulin resistance, hypertension, cardiovascular problems, hyperlipidemia, metabolic syndrome, kidney stones, digestive diseases, even cancer, and many other diseases (Langendijk et al., 2003; Sinaiko et al., 2001). Obesity in children has adverse psychological consequences such as low self-esteem, sleep disturbances, anxiety, and depression, which affects their social relationships (Danielzik et al., 2004; Field et al., 2001).

Considering the increase of urbanization in the last two decades in Iran, a dramatic lifestyle change is observed among people, especially children. Since no accurate information is available on the prevalence of obesity, weight, and their related factors in children, the present study was conducted. The aim was to determine the prevalence of obesity and overweight as well as their relationship among the elementary school students and their parents in Farsan city, Iran.

2. Materials and methods

Study type and participants: This descriptive cross-sectional study was carried out with participation of 1189 elementary school students aged 6–12 years and their parents in Farsan city of Chaharmahal and Bakhtiari province, Iran in 2017–2018. At first, the total number of students in each elementary school of Farsan city was received from the Education Organization of Farsan. Then, one school was randomly selected and its students' population was considered to calculate the sample size. In order to select the participants, the number of school classes and the population of each class were determined. Later, the sample size was calculated by considering the statistical formula used in a similar study conducted by Taheri et al. (TAHERI et al., 2014). They reported the prevalence of obesity and overweight with a 95 percent confidence interval and 1 percent accuracy.

Measurements: The height and weight of students and their parents were measured by a trained person. The participants' height was measured in upright standing position, without shoes and with their legs sticking together by a tape measure. The weight of participants was also measured in light clothes, using a digital scale (German-made Scythian). Other demographic information such as parents' age, education, and occupation were investigated and recorded in interviews.

The body mass index (BMI) was calculated by dividing weight (kg) to square height (m). To define the students' weight status, Centers for Disease Control and prevention (CDC) were used. Participants with BMIs of lower than the 5th percentile, in 5–85 percentiles, in 85–95 percentiles, and above the 95th percentile were categorized as underweight, normal, overweight, and obese. For parents, the BMI of less than 18.5 showed underweight, in 18–25 indicated normal weight, in 25–30 represented overweight, and higher than the 30 showed obesity. Children whose parents had diseases such as diabetes, hypothyroidism, and hyperthyroidism, as well as pregnant mothers were excluded from the study.

Ethical considerations: At first, the goals and methods of the study were explained to participants, and an informed consent form was signed by one of the parents' students. This work was approved by the Shahid Sadoughi University of Medical Sciences Ethical Committee.

Data analysis: Statistical analysis was performed using SPSS. Chi-square test was applied to investigate the relationship between the qualitative variables. Pearson correlation coefficient and ANOVA test were run for comparison of groups. P-value of less than 0.05 was considered as the significant level.

Table 1
Mean \pm SD of quantitative variables in students and their parents.

Variables	n	Mean \pm SD
Students' age (years)	1189	8.77 \pm 1.78
Students' height (cm)	1189	133.08 \pm 12.18
Students' Total weight (kg)	1189	29.32 \pm 9.66
Boys' weight (kg)	515	30.94 \pm 10.06
Girls' weight (kg)	674	28.09 \pm 9.16
Boys' BMI (kg/m ²)	515	16.67 \pm 3.19
Girls' BMI (kg/m ²)	674	15.75 \pm 2.81
Fathers' age (years)	1189	40.66 \pm 5.99
Mothers' age (years)	1189	35.73 \pm 5.31
Fathers' height (cm)	1189	174.40 \pm 7.84
Mothers' height (cm)	1189	161.5 \pm 3.01
Fathers' weight (kg)	1189	79.68 \pm 12.63
Mothers' weight (kg)	1189	70.46 \pm 11.91
Fathers' BMI (kg/m ²)	1189	26.20 \pm 3.85
Mothers' BMI (kg/m ²)	1189	27.33 \pm 4.50

3. Results

The findings showed that among 1189 elementary school students, 515 (43.3%) were boys and 674 (56.7%) were girls. The students' mean age was 8.87 \pm 1.78 years. The fathers' mean age was 40.66 \pm 5.99 and the mothers' mean age was 35.5 \pm 73.31 years. The mean of height, weight, and BMI of students and their parents are reported in Table 1.

Table 2 shows the weight status of student in term of various factors. Overweight and obesity in boys were 9.9 and 8.5 percent, while they were 8.6 and 3.4 percent in girls, respectively. The results showed that the prevalence of obesity and overweight were significantly higher in boys than girls ($p < 0.001$). The prevalence of obesity in different educational levels was also significantly different ($p < 0.001$) The findings showed that 19.3 percent of the students were deficient in weight, 9.2 percent were overweight, 5.6 percent had obesity, and 65.9 percent of them had normal weight. The student's weight status was not significantly correlated with the parental status of literacy (Table 2).

A significant relationship was observed between the prevalence of obesity and parental occupation. The highest prevalence of students' obesity (6.5%) and overweight (13%) was related to their fathers' jobs, so that fathers' occupation was significantly correlated with students' obesity ($p = 0.002$). Considering the mothers' occupation, the highest prevalence of obesity (7%) and overweight (15.12%) was related to employed mothers, so that a statistically significant relationship was found between maternal employment and students' obesity ($p = 0.03$).

The weight status of students and parents is reported in Table 3. As this table shows, a statistically significant relationship was observed between parents' weight status and students' weight. The prevalence of obesity and overweight was higher in students with obese or overweight parents. We can observe that nearly 25 percent of the families had both obese and overweight parents. Furthermore, a large percentage of obese and overweight students had obese and overweight parents; this relationship was statistically significant.

The mean of weight and BMI of students in terms of parental weight status are reported in Table 4. The mean of these two variables in students were significantly higher in families with obese and overweight parents. The correlation coefficient between mothers' BMI and fathers' BMI with students' BMI were 0.2 ($p < 0.001$) and 0.16 ($p < 0.001$), respectively.

4. Discussion

The findings showed that the prevalence rates of overweight were 9.9 and 8.6 percent in boys and girls, respectively. Moreover, the prevalence rates of obesity were 8.5 and 3.4 percent in boys and girls, respectively. These figures are in the same line with the studies

Table 2
Frequency distribution of students' weight status based on their education level and gender.

Variables	Student Weight				Total N (%)	P
	Underweight N (%)	Normal N (%)	Overweight N (%)	Obese N (%)		
Student education level						
Grade 1	(29.2) 73	(60.4) 151	(8.8) 22	(1.6) 4	(21) 250	< 0.001
Grade 2	(19) 39	(69.8) 143	(7.8) 16	(3.4) 7	(17.2) 205	
Grade 3	(16.8) 30	(69.3) 124	(8.9) 16	(5.0) 9	(15.1) 179	
Grade 4	(17) 39	(65.7) 151	(7.4) 17	(10) 23	(19.3) 230	
Grade 5	(13.2) 22	(66.5) 111	(13.2) 22	(7.2) 12	(14) 167	
Grade 6	(17.1) 27	(65.2) 103	(10.1) 16	(7.6) 12	(13.3) 158	
Student Gender						
Boys	(14.4) 74	(67.2) 346	(9.9) 51	(8.5) 44	(43.3) 515	< 0.001
Girls	(23.1) 156	(64.8) 437	(8.6) 58	(3.4) 23	(56.7) 674	
Fathers' literacy						
Illiterate	11 (37.6)	15 (50.0)	1 (3.3)	3 (10)	30 (2.5)	0.01
Primary school	34 (20.6)	108 (65.5)	17 (10.3)	6 (3.6)	165 (13.9)	
Secondary school	79 (24.5)	209 (64.7)	19 (5.9)	16 (5.0)	323 (27.2)	
Diploma	66 (17)	26(67.0)	36 (9.3)	26 (6.7)	388 (32.6)	
Academic degrees	40 (14.2)	191 (67.4)	36 (12.8)	16 (5.6)	283 (23.8)	
Mothers' literacy						
Illiterate	5 (16.1)	21 (67.7)	4 (12.9)	1 (3.2)	31 (2.6)	0.07
Primary school	43 (22.8)	118 (62.4)	22 (11.6)	6 (3.2)	189 (15.9)	
Secondary school	58 (25.1)	147 (63.6)	15 (6.5)	11 (4.8)	231 (19.4)	
Diploma	77 (17.1)	310 (68.9)	33 (7.3)	33 (6.7)	450 (37.8)	
Academic degrees	19 (20.7)	57 (62.0)	9 (9.8)	7 (7.6)	92 (7.7)	

conducted in Birjand (TAHERI et al., 2014), Shiraz (Ghanbari et al., 2013), Yazd (Mozaffari et al., 2004), and Nishabur (Baygi et al., 2009). Shahkholian in Chaharmahal Bakhtiari province reported that the prevalence of obesity was 9.9 percent among students (Shahgholian et al., 2002). A study in Tehran showed that the prevalence of obesity and overweight were 7.7 and 13.3 percent, respectively (Mozafary and Nabaiee, 2002). In Semnan these rates were also reported as 14.3 and 18.8, respectively (Nabavi et al., 2010). As the statistics show, obesity is a problem in both small and large cities. However, the prevalence of obesity is widely different in different parts of Iran, which can be due to the varieties that exist in lifestyle, socioeconomic, and health status in different regions of the country. In addition, the differences in

nutritional behaviors, physical activity, use of advanced technology, as well as environmental and socioeconomic conditions were mentioned as the effective factors on children's health behaviors (Amnfat, 2004).

The results of this study can be compared with the information collected from some other countries. In the study of Rivas, the prevalence of obesity and overweight of students were 26.2 and 34.5 percent, respectively (Núñez-Rivas et al., 2003). Among the 6-17 year-old Greek children, these rates were 22.2 and 1.4 percent, respectively (Must, 2003). The prevalence of obesity in Australia was 7.4 percent (Lobstein et al., 2004), in Delhi was 1.4 percent (Kaur et al., 2008), and in Great Britain was 4 percent (Jebb et al., 2004).

In the present study, a significant relationship was seen between the

Table 3
Relationship between parental weight status and student weight status.

Status	Student Weight				Total N (%)	p
	Underweight N (%)	Normal N (%)	Overweight N (%)	Obese N (%)		
Fathers' age (year)						
< 40	4(0.7)	234(43.3)	222(41.0)	81(15.0)	541(45.5)	0.041
50 -40	12(2.1)	211(37.5)	236(41.9)	104(18.5)	563(47.4)	
> 50	1(1.2)	24(28.2)	42(49.4)	18(21.2)	85(7.1)	
Mothers' age (year)						
< 40	13(1.4)	296(32.6)	380(41.9)	219(24.1)	908(76.4)	0.006
50-40	2(0.7)	57(21.3)	122(45.7)	86(32.2)	267(22.5)	
> 50	0(0)	3(21.4)	9(64.3)	2(14.3)	2(1.2)	
Fathers' weight status						
Underweight	6 (35.3)	8 (47.1)	1(5.9)	2(11.8)	17(1.4)	< 0.001
Normal	129(27.5)	297(63.3)	24(5.1)	19(4.1)	469(39.4)	
Overweigh	66(13.2)	349(69.8)	57(11.4)	28(5.6)	500(42.1)	
Obese	29(14.3)	129(63.5)	27(13.3)	18(8.9)	203(17.1)	
Mothers' weight status						
Underweight	9 (60)	5 (33.3)	0 (0)	1 (6.7)	15 (1.3)	< 0.001
Normal	96 (27)	226 (63.5)	24 (6.7)	10 (2.8)	356 (29.9)	
Overweigh	90 (17.6)	348 (68.1)	44 (8.6)	29 (5.7)	511 (433)	
Obese	35 (11.4)	204 (66.4)	41 (13.4)	27 (8.8)	307 (25.8)	
Parental weight status						
Both are normal	64 (37)	102 (59.0)	4(2.3)	3(1.7)	173(14.6)	0.001
Both are overweight	32 (13.8)	164(70.7)	22(9.5)	14(6.0)	232(19.5)	
Both are obese	10 (14.9)	41(61.2)	11(16.4)	5(7.5)	67(5.6)	
Others	124 (17.3)	476(66.4)	72(10.0)	45(6.3)	717(60.3)	
Total	230(19.3)	783(65.9)	109(9.2)	67(5.6)	1189(100)	

Table 4
The students' weight mean (\pm SD) and BMI in terms of parental weight status.

	N	Students' weight (kg)	Students' BMI (kg/m ²)
Parental weight status			
Both are normal	173	25.56 \pm 7.50	14.77 \pm 2.31
Both are over weight	232	30.90 \pm 9.41	16.59 \pm 2.88
Both are obese	67	32.54 \pm 11.61	17.23 \pm 3.41
Other items	717	29.83 \pm 14.70	16.48 \pm 7.25
Total	1189	29.57 \pm 12.91	16.30 \pm 5.90
P		< 0.001	0.002
Fathers' weight status			
Underweight	17	29.00 \pm 10.35	15.81 \pm 3.51
Normal	468	27.90 \pm 16.41	15.42 \pm 2.72
Overweight	500	30.49 \pm 9.17	16.53 \pm 2.86
Obese	203	31.22 \pm 11.39	16.93 \pm 3.56
Total	1189	29.57 \pm 12.91	16.15 \pm 3.01
P		0.003	< 0.001
Mather's weight status			
Underweight	15	23.30 \pm 8.14	14.30 \pm 2.89
Normal	356	27.07 \pm 7.80	15.37 \pm 2.46
Overweight	511	29.54 \pm 9.80	16.23 \pm 3.06
Obese	306	32.82 \pm 19.85	17.02 \pm 3.24
Total	1189	29.57 \pm 12.91	16.15 \pm 3.01
P		< 0.001	< 0.001

students' weight status and fathers' level of education, but no significant relationship was found between the mothers' education level and students' weight. In the same vein, Karimi's study did not show any significant correlation between obesity and maternal education level, but the fathers' level of education was significantly correlated with children's obesity (Karimi and Ghorbani, 2015). In the study of Maddah et al. in Zahedan, the prevalence of overweight in children was directly related to their mothers' level of education (Maddah et al. 2010). In Thailand, a study also showed a positive correlation between children's obesity and parental education (Sakamoto et al., 2001). However, Akbari et al. carried out a study in Isfahan and reported that the relationship between childhood obesity and parental education level in both obese and non-obese groups was not significant (akbari et al., 2005). As the results of different studies show, regarding parental literacy have been different results. It seems that in the study area, educate fathers more than mothers have a parenting effect on his family and children.

We found a significant relationship between students' BMI and parental occupation. In the study of Taheri et al. in Birjand, a significant relationship was reported between children's obesity and mothers' occupation, so that the prevalence of obesity was higher among children with employed mothers (Fateme et al., 2012). In the study of Khoja et al. in Pakistan, fathers' occupation was an effective factor in the weight of children (Khuwaja et al., 2005).

In the present study, a significant and positive correlation was observed between students' weight status and parental weight status. Similarly, Taheri et al. in Birjand (TAHERI et al., 2014), Tabatabaei et al. studied the elementary school students in Ahvaz (Tabatabaei et al., 2005) and Dorosty et al. in Tehran indicated that the prevalence of obesity was significantly higher among students with obese parents (Dorosty and Hodjat, 2005). Also, a study in China on children in the age range of 2–6 years reported that the prevalence of overweight was higher in children with obese families (14.1%) than non-obese families (7.5%) (49). In the same line with the results of our study, Neutzing et al. indicated that a parent's overweight or obesity had a direct and significant relationship with their children's childhood overweight or adolescence obesity (Neutzing et al., 2003). Also, In a study on German children, the odds of having childhood obesity in children with both obese parents increased by 7.6 percent in boys and 6.3 percent in girls (Danielzik et al., 2002). A study in the United Kingdom also showed that the risk of obesity in 2–17 year-old children was 2.2, 12, and 22.3 times higher when both parents were overweight, obese, and severely

obese, respectively. In addition, the BMI of mothers had a greater relationship with children's BMI in comparison with fathers' BMI (Whitaker et al., 2010). In this way, a study in the United States on 0–8 year-old children represented that maternal obesity was the most important predictor of obesity in children, which increased the chance of obesity by 62.3 percent (Ishihara et al., 2003). Akbari et al. in Isfahan reported a significant relationship between parents' BMI and obesity in children. Furthermore, they indicated that the parents of obese children had a higher BMI than non-obese children (akbari et al., 2005). Kalantari et al. carried out a research in Shiraz and reported a strong and positive correlation between maternal BMI and overweight or obesity in 7-year-old children. Moreover, they concluded that the risk of overweight and obesity was higher in children whose mothers' BMI was higher than 25 compared with children whose mothers had normal BMI (Kalantari et al., 2010). In a study by Lin et al. a strong and significant correlation was reported between BMI of mothers and their children. In this regard, for each increase in the mothers' BMI unit, the children's BMI increased from 0.13 to 0.15 units (Lin et al., 2004). In a study conducted over Italian children and adolescents, parents' BMIs had a positive and significant correlation with overweight and obesity among children and adolescents.

The main strength of the present study was application of a large sample of participants, who can be appropriate representatives of our community. Therefore, the results of this study can be generalized to the whole population. Considering the limitations of the current research, lack of participants' physical activity measurement can be mentioned as a limitation.

5. Conclusion

We found that 14.8 percent of students, 59.2 percent of fathers, and 68.8 percent of mothers were obese or overweight in Farsan city, which is significantly different from similar areas. Moreover, a large percentage of obese and overweight students had obese or overweight parents. In this regard, the authorities are recommended to conduct educational interventions and train people, especially those with a positive history of obesity to change their lifestyle and diet habits.

Conflicts of interest

There is not any conflict of interest.

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