The Prevalence of Obesity in School Children of Zahedan-Iran; Double Burden of Weight Disorders

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Fahimeh Soheilipour [1]; Atefeh Ghanbari Jolfaie [1]; Zeinab Pourzahabi [2]; Maryam Lotfi [2]; Maziar Moradi Lakeh [3,*]

[1]Minimally Invasive Surgery Research Center, Iran University of Medical Sciences, Tehran, IR Iran
[2]Tehran University of Medical Sciences, Tehran, IR Iran
[3]Gastro-intestinal and Liver Disease Research Center, Firoozgar Hospital, Tehran University of Medical Sciences, Tehran, IR Iran

Corresponding author: Maziar Moradi Lakeh, Gastro-Intestinal and Liver Disease Research Center, Firoozgar hospital, Tehran University of Medical Sciences, Tehran, IR Iran.
Tel: +98-2188602225, Fax: +98-2144244500, E-mail: m_moradi@tums.ac.ir

Background: Obesity has a permanent effect on childrens' health and acts as a major risk factor for chronic diseases. Therefore considering children BMI is a vital parameter at each visit.

Objectives: This study was performed to assess the prevalence of obesity and its determinants in school children of Zahedan in Iran. Zahedan is the capital of Sistan-and-Balouchestan province known to have the highest prevalence of underweight in Iranian children.

Patients and Methods: This cross-sectional study was performed on 3582 school children, among which 1786 were girls and 1796 boys in 2012. The students aged 6 to 13 years old and selected based on a stratified random method. The body mass index (BMI) was measured for each student and being overweight/obesity was determined based on CDC 2000 definitions. Prevalence proportions were estimated by weighing the sample. The study was performed at primary and guidance schools of Zahedan. Samples were stratified from two geographic regions of Zahedan (Zone 1 and 2).

Results: In the sample, 78.9% were under 85th percentile, 11.8% were overweight (85th - 95th percentile) and 9.3% were obese (> 95th percentile). Weighted estimate for the prevalence of obesity/overweight in girls, boys and all 6 - 13 years old students were 16.2%, 18.4% and 17.4%, respectively. Presence of overweight/obesity was related to school type (private to public schools OR = 2.13, 1.80 - 2.52) and increasing age (OR = 1.12, 1.04 - 1.20).

Conclusions: A high prevalence of obesity was found in Zahedan students. Concurrent high prevalence of obesity/overweight and underweight demonstrates amplitude of weight problems in school children. There is an urgent need for special health programs to conduct proper diagnosis and management of obesity in Zahedan.

Keywords: Overweight; Obesity; Prevalence; Iran

1. Background

The prevalence of obesity in children and adolescents is increasing worldwide (1-3). Obesity in children and adolescents is gradually becoming a major public health problem in many developing countries, including Iran (4, 5). Approximately a half (42 to 63%) of obese school children become obese adults (6, 7). However, whether overweight persists until adulthood is a matter of concern; overweightness appears to increase the risk of subsequent morbidity (8-10). Overweight and obesity are major risk factors of a number of chronic diseases, such as diabetes, cardiovascular diseases and cancer (11-13). Comparison of cross-sectional data from the United States and 13 European countries has shown that the prevalence of overweight, based on BMI above the 85th percentile and below 95th percentile varied between 5.2% and 28.9% for boys and 8.1% and 31.0% for girls; and the prevalence of obesity, based on BMI above 95th percentile varied between 1.9% and 13.9% for boys and 1.1% and 15.1% for girls among adolescents (14). The prevalence of overweight and obesity (excess of the 85th and 95th percentiles) has been 21.1% and 7.8% among Iranian adolescents (15). Zahedan is the center of Sistan and Baluchestan province in south-east of Iran.

2. Objectives

Based on Iranian deputy for health studies, this province has the highest prevalence of underweight students (15%) among other provinces of Iran and also the lowest prevalence of overweight students (6%) (16, 17).

These statistics led us to examine this issue in Zahedan city, the capital of Sistan and Baluchestan to assess the prevalence of overweight and obesity based on BMI in 6 to 13-year-old children in Zahedan in 2012.

3. Patients and Methods

The study was performed at the primary and guidance schools of Zahedan in 2012. We assessed a sample of 3582 school children (1786 girls and 1796 boys) aged 6 - 13 years in a cross-sectional study.

Subjects were selected through stratified sampling from two geographic regions of Zahedan (Zone 1 and 2). According to grade, sex and educational class, 16 strata were obtained. In Iran, for usual students, grades 1 to 5 of primary schools are normally equivalent to ages 6 to 10 years and grades 1 to 3 of guidance school are equivalent to ages 11 to 13. Each stratum contained 220 students. In each stratum, schools were selected with cluster random method separately from public and private schools. Students with known cardiac, renal and thyroidal diseases were excluded from the study because of their known relationship with weight.

3.1. Instruments

Weight and height were measured to calculate body mass index (BMI). Measurements were performed by trained health teachers of schools. Body weight and height were measured and rounded to the nearest 0.1 kg and 0.5 cm using digital scales (Seca, Germany) and a non-stretch tape fixed to a flat vertical wall, respectively. BMI values were calculated based on the following Equation.

$$(1) \qquad \text{BMI} = \text{weight}\,(\text{kg}) / [\text{height}\,(\text{m})]^2$$

kg stands for kilogram and m stands for meter.

Overweight was defined using age and sex specific charts for BMI released by the center for disease control (CDC) [18, 19]. BMI between the 85 - 95th percentile was considered as overweight and a BMI greater than the 95th percentile as obesity [20, 21]. Measurements were performed in the morning (10 - 12 AM) in all schools. Digital scales were checked before the measurements with the standard device.

3.2. Data analysis

The data was analyzed using SPSS software version 16 for windows (Inc. Chicago, IL). For reporting and analysis purposes, we used real ages of students instead of their grades. After determining the prevalence of obesity and overweight in each age-sex stratum, the prevalence of obesity and overweigh was estimated by weighting each stratum based on the size of the same stratum in student population of Zahedan.

We also performed a logistic regression analysis to assess the effect of gender, age and type of school on obesity and overweight as a dependent variable.

4. Results

Weight and height of children were recorded. From all 3582 children, 78.9% were under 85th percentile, 11.8% were overweight (85th - 95th percentile of BMI) and 9.3% (95th percentile of BMI) were obese.

In our sample, 7.7% of girls and 10.9% of boys were obese, while 12.8% of girls and 10.8% of boys were overweight. Table 1 shows the weighted prevalence of obesity/overweight in each sex-age stratum. Weighted estimate for prevalence of obesity/overweight in girls, boys and all 6 - 13 years old students were 16.2%, 18.4% and 17.4%, respectively.

Table 1 shows the prevalence of obesity and overweight in different age-sex-school type strata and also weighted prevalence of overweight/obesity in age-sex strata. The prevalence of overweight/obesity was obviously higher in guidance schools (11 - 13 years) compared with 6 - 10 years old children of elementary schools (Table 1).

Table 1. Prevalence of Obesity and Overweight in 6 - 13 Years Old Students of Zahedan (2012)

Age, y	Number (City)	Number of Sample	Obesity Prevalence		Overweight Prevalence		Prevalence of Obesity/ Overweight
			Public	Private	Public	Private	(Weighted for School Type)
Girls							
6	6166	220	5.3	11.4	3.0	13.6	10.8
7	5603	216	3.0	11.1	9.6	4.9	13.0
8	5321	232	5.6	6.5	6.4	7.5	12.2
9	5290	214	1.8	7.7	10.0	17.3	13.4
10	5004	216	2.0	12.2	5.9	17.4	10.7
11	4600	217	7.6	13.9	19.3	15.3	27.1
12	4078	223	7.6	8.1	14.7	19.4	22.8
13	3497	239	13.3	8.5	12.8	28.8	27.2
Boys							
6	6773	212	3.3	10.9	3.3	14.1	9.5
7	6054	226	4.0	12.0	5.3	9.3	11.2
8	6025	224	6.9	13.9	7.6	10.1	16.0
9	5767	223	9.3	19.3	7.9	13.3	19.3
10	5510	210	8.3	14.0	10.0	9.0	19.0
11	5948	217	14.8	11.1	12.9	19.0	28.1
12	5151	223	6.3	23.8	9.8	25.0	21.0
13	4571	214	14.3	21.6	7.9	28.4	26.7

Logistic regression analysis was performed on obesity/overweight as the dependent variable and covariates of age, gender and type and level of school with different models. Age and school type were significantly related to overweight/obesity in Model 1. In Model 2, school level had a significant association with overweight/obesity independent to age (Table 2). We performed subgroup analysis for private and public schools; while age was similarly related to obesity/overweight in both public and private schools, sex was related just in private schools.

Figure 1. An Increasing Trend of Obesity/Overweight With Age in Both Sexes and Both School Types
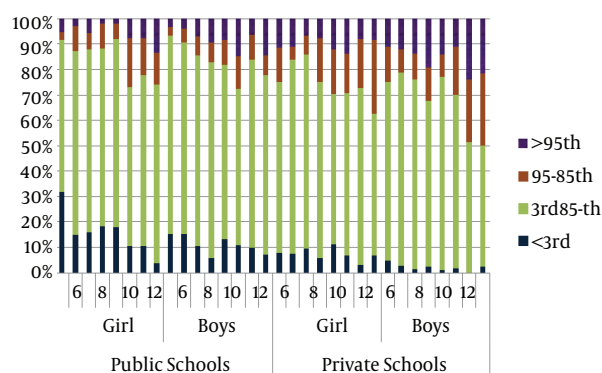
A concurrent decrease is also observed in the prevalence of underweight (BMI < 3rd percentile).

5. Discussion

In the current study, the prevalence of obesity was higher in private schools than public schools and in older students than younger ones. Regarding the fact that Zahedan has had the lowest human development index (HDI) in Iran in the recent studies (22) and is known for its highest rates of stunting and underweight among Iran provinces (16, 23), obesity seems a common problem in students, especially around the puberty age in Zahedan. The prevalence of obesity and overweight in Zahedan children is similar to many other places of Iran as shown in Table 3.

Maddah et al. studied a random sample of 1079 students in Zahedan and reported overweight and obesity in 8.9% of boys and 10.3% of girls in 2010 (33). Another study by Mortazavi et al reported 12.9% overweight, similar to our study and 1.3% obesity (39.5% of female and 3.1% of male students with central obesity) in 720 students in Zahedan in 2004 (23). In our sample, 9.3% of the students were obese, which can be due to increased obesity rate in the recent decades (20). As far as we are concerned, there has been no recent study in Zahedan with similar sample size. Therefore, the results of these studies might not be statistically comparable.

Relationship of socio-economic level of school and overweight/obesity, independent of age, found in our study, needs more exploration, which can be due to unfair dropout of children at the end of primary school and entrance to a more special group of students to guidance school.

Table 2. Factors Related to Overweight/Obesity in Primary and Guidance Schools of Zahedan, Iran (2012)

Model 1 (All Schools)	B	S.E.	Wald	P Value	Odds Ratio	95.0% C.I Lower	95.0% C.I Upper
School type (Private to Public)	0.733	0.085	74.7	0.000	2.081	1.763	2.457
Sex (M to F)	0.139	0.084	2.7	0.099	1.149	0.974	1.355
Age, y	0.176	0.019	87.0	0.000	1.192	1.149	1.237
Constant	-3.422	0.206	276.6	0.000	0.033		
Model 2 (All schools)							
School type (Private to Public)	0.756	0.086	77.9	0.000	2.129	1.800	2.518
Level (Guidance to Elementary)	0.340	0.165	4.2	0.040	1.404	1.016	1.941
Sex (M to F)	0.139	0.084	2.7	0.100	1.149	0.974	1.355
Age, y	0.112	0.036	9.6	0.002	1.119	1.042	1.201
Constant	-2.952	0.304	94.1	0.000	0.052		
Model 3 (Public schools)							
Sex (M to F)	0.006	0.115	0.003	0.958	1.006	0.803	1.261
Age, y	0.184	0.025	52.9	0.000	1.202	1.144	1.262
Constant	-3.431	0.275	155.2	0.000	0.032		
Model 4 (Private schools)							
Sex (M to F)	0.306	0.125	6.0	0.014	1.358	1.064	1.734
Age, y	0.159	0.029	30.5	0.000	1.172	1.108	1.240
Constant	-2.606	0.289	81.3	0.000	0.074		

Table 3. The Prevalence of Obesity and Overweight in Zahedan Children Compared to Other Places of Iran

Authors	City	Year	Sex	Sample Size	Age	Prevalence of Obesity, [a]	Prevalence of Overweight, [a]
Sohailifar and Sadri (24)	Hamedan	1998	Girls/Boys	2000	7 - 11	2.5	-
Asar and Asghari (25)	Ahwaz	2001	Girls/Boys	4793	7 - 14	2.2	6.0
Karajibani et al. (26)	Zahedan	2002	Girls/Boys	2067	7 - 11	1.4	1.5
Gheibi et al. (27)	Orumiyeh	2002	Girls	458	11 - 14	4.0	10.4
Mozafari and Nabaei (28)	Tehran	2002	Girls	1800	6 - 10	7.7	13.3
Beigi et al. (29)	Neyshabour	2005	Girls/Boys	1471	6 - 12	4.6	-
Taheri et al. (30)	Birjand	2005-6	Girls/Boys	6093	7 - 18	1.8	4.8
Haeri Behbahani et al. (31)	Sabzevar	2008	Girls/Boys	1800	6 - 11	4.8	7.9
Nabavi et al. (32)	Semnan	2010	Girls/Boys	400	7 - 12	14.3	18.8

[a] Data are presented as %.

Higher prevalence of obesity in students of private schools might be correlated with better socio-economic levels of their families. In developing countries, lifestyle risk factors such as overweight and obesity are usually higher in people with higher socioeconomic status, while in more developed countries, such risk factors are mainly the problem of poor people (34).

In this cross-sectional study, we were not able to discriminate the effect of age with respect to cohort and time period (35).

Considering the association between childhood and adult overweight and deleterious consequences of overweight on health, special attentions should be made regarding prevention and management of childhood obesity.

Acknowledgements

The authors acknowledge research council of medical school of Tehran university of medical sciences for approving the study. This paper is part of the thesis for professional doctorate of medicine of ZP and ML under supervision of FS and MML. Authors are thankful from those teachers of Zahedan who participated in data collection.

Authors' Contributions

Study concept and design: Fahimeh Soheilipour, Maziar Moradi-Lakeh, Zeinab Pourzahabi, Maryam Lotfi; Acquisition of data: Zeinab Pourzahabi, Maryam Lotfi; Analysis and interpretation of data: Zeinab Pourzahabi, Maryam Lotfi; Drafting of the manuscript: Zeinab Pourzahabi, Maryam Lotfi; Critical revision of the manuscript for important intellectual content: Fahimeh Soheilipour, Maziar Moradi-Lakeh, Atefeh Ghanbari Jolfaie; Statistical analysis: Zeinab Pourzahabi, Maryam Lotfi; Administrative, technical and material support: Fahimeh Soheilipour, Maziar Moradi-Lakeh, Atefeh Ghanbari Jolfaie; Study supervision: Fahimeh Soheilipour, Maziar Moradi-Lakeh, Atefeh Ghanbari Jolfaie.

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