

The Prevalence of Overweight and Obesity in Children Under 5 Years in Tehran, Iran, in 2012: A Population-Based Study

Hamid Salehiniya¹; Kamran Yazdani¹; Hamed Barekati²; Mohsen Asadi Lari^{3,*}

¹Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, IR Iran

²Ministry of Health and Medical Education, Tehran, IR Iran

³Department of Epidemiology and Biostatistics, School of Public Health, Iran University of Medical Sciences, Tehran, IR Iran

*Corresponding author: Mohsen Asadi Lari, Department of Epidemiology and Biostatistics, School of Public Health, Iran University of Medical Sciences, Tehran, IR Iran. Tel: +98-9122115440, E-mail: mohsen.asadi@yahoo.com

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Background: Overweight and obesity in children are a serious problem. They are increasingly prevalent and associated with a wide range of health problems in adulthood. Monitoring their status is essential for effective planning in the health system.

Objectives: This study aimed to assess the prevalence of overweight and obesity in children below 5 years in Tehran in 2012.

Patients and Methods: This cross-sectional study employed data provided by the urban health equity assessment in Tehran. The sample comprised a total of 4656 children under 5 years, recruited via multistage sampling. Data were collected through questionnaires and anthropometric measures of height and weight. The WHO child growth standards were used to determine overweight and obesity. Data were analyzed using chi-square tests, with SPSS version 11.5.

Results: The prevalence of overweight and obesity in children were 12% and 23.7% respectively. The prevalence of overweight was significantly higher in girls than boys and the prevalence of obesity was significantly higher in boys than girls ($P = 0.001$). Obesity was more prevalent in children from high economic percentiles, but this finding was not statistically significant.

Conclusions: The prevalence of overweight and obesity in children under 5 years is high. Overweight and obesity should be considered an epidemic and serious health problem in Tehran. They certainly require more attention and intervention.

Keywords: Prevalence; Obesity; Overweight; Children

1. Background

As infectious diseases are decreasing worldwide, non-communicable diseases, including cardiovascular diseases and type 2 diabetes, are increasing (1, 2). In 2010, non-communicable diseases were the main cause of burden of diseases (disability adjusted life years: DALY) in the world, and in the recent two decades, non-communicable diseases are very rapidly replacing communicable diseases as the leading cause of mortality (3). Most of these diseases are affected by childhood obesity and have increased in prevalence after the global obesity epidemic (2).

Overweight and obesity are complex diseases that have not been fully recognized (4). They refer to abnormal or excessive fat accumulation and may have negative effects on health. BMI is the best method used to measure overweight (5). Overweight and obesity in children are defined based on BMIs of 2 and 3 standard deviations respectively above the WHO growth standard median (6).

Nowadays, the increasing prevalence of obesity and overweight in childhood has become a global health concern (7), as it is considered as an epidemic (8-10). Estimates show that 43 million children worldwide are overweight or obese. Of them, 35 million live in developing countries. Furthermore, 92 million children are at risk for overweight (11). In the United States, despite efforts to reach the goal

of having healthy people, 15% of adults and 5% of children were obese (12). In the period 2009 - 2010, 16.9% percent of children and adolescents in the United States were obese (13). In Iran, obesity and overweight in children should be considered a serious problem, and Iran is among the countries with a high childhood obesity prevalence (14, 15).

Childhood overweight and obesity have serious health consequences such as obesity in old age, non-communicable diseases, diabetes, hypertension, and stroke in adulthood (4, 16-19). They are also associated with increased mortality risk and reduced survival among older adults (20).

Genetic and environmental factors are important risk factors that affect the prevalence of overweight and obesity (17), of which environmental factors exert a stronger influence. Obesity has been linked to socioeconomic status in different age groups (21, 22). In industrial and developed countries, lower socioeconomic groups are more likely to be obese than those with higher socioeconomic status; while in developing countries, high socioeconomic groups are more vulnerable to obesity (22).

Because of the short and long-term effects of overweight and obesity on human health and welfare (16), it is necessary to examine the epidemiology and risk factors of overweight and obesity because they can be prevented through lifestyle changes (4). Knowing the factors

associated with obesity in children (23) can shed light on how health care services should be fairly distributed in the community in order to better understand the dimensions of the problem and design strategies to reduce related problems (24, 25).

2. Objectives

This study aims to assess the prevalence of overweight and obesity in children under 5 years of age in Tehran in 2012.

3. Patients and Methods

This analytical cross-sectional study was conducted in 2012 with a sample of 4656 below 5 years in Tehran. The data used were a part of the data from the Urban Health Equity Assessment in Tehran (26), a project conducted by the Tehran municipality in collaboration with the WHO in 2012.

In this project, multi-stage sampling (classification, cluster-systematic, and systemic) was used for data collection in 22 areas and 368 districts of Tehran. In each district, 200 blocks were chosen, and in each block, 8 households were randomly selected for the study. To determine the sample size for each district, a sampling method appropriate for the district was applied.

The sampling framework of this project was a comprehensive map of Tehran in 2012 that differentiated the regions and districts. For sampling at the district level, the

map of each district was placed on the coordinate axes and blocks were selected after grading at the scale of centimeters, using two-dimensional systematic sampling. Then, the houses in each block were numbered and selected in a linear systematic manner. Finally, a total of 4656 children under 5 years were studied. Data were collected through a valid and reliable questionnaire (Cronbach's alpha = 0.87).

Height was measured with a stadiometer with a precision of 1 cm, weight was measured with a digital balance with an accuracy of 0.1 kg, and BMI was calculated dividing weight (kg) by the square of height in meters. Overweight and obesity were determined according to the WHO definition. Overweight was defined as a BMI that was 2 standard deviations above the WHO growth standard median and obesity was defined as a BMI that was 3 standard deviations above the WHO growth standard median (6). The age- and sex-specific prevalences of overweight were calculated using a chi-square test. The relationships between obesity and sex, age, place of residence (north or south Tehran), family income (divided into five percentiles), and home ownership (owner, tenant, etc.) were analyzed using chi-square tests, with SPSS version 11.5.

4. Results

The sample comprised 4656 children under 5 years living in Tehran. Of them, 2364 (50.8%) were boys and 2292 (49.9%) were girls. Table 1 shows the sex and age distribution of the population under survey.

Table 1. Age and Sex-Specific Prevalence of Overweight and Obesity Based on the WHO Criteria ^a

Age, y	Total	Non-Obese and Non-Overweight	Overweight	Obese	P Value
0 - 1					$\chi^2 = 9.12; df = 2; P = 0.01$
Boys	451 (49.6)	296 (65.6)	35 (7.8)	120 (26.6)	
Girls	459 (50.4)	338 (53.3)	37 (8.1)	84 (18.3)	
Total	910 (100)	634 (69.7)	72 (7.9)	204 (22.4)	
1 - 2					$\chi^2 = 3.03; df = 2; P = 0.22$
Boys	421 (51.0)	237 (56.3)	49 (11.6)	135 (32.1)	
Girls	404 (49.0)	241 (59.7)	55 (13.6)	108 (26.7)	
Total	825 (100)	478 (57.9)	104 (12.6)	243 (29.5)	
2 - 3					$\chi^2 = 0.97; df = 2; P = 0.62$
Boys	456 (50.1)	288 (63.2)	57 (12.5)	111 (24.3)	
Girls	454 (49.9)	385 (62.8)	66 (14.5)	103 (22.7)	
Total	910 (100)	573 (63.0)	123 (13.5)	214 (23.5)	
3 - 4					$\chi^2 = 7.12; df = 2; P = 0.02$
Boys	500 (51.3)	322 (64.4)	56 (11.2)	122 (24.4)	
Girls	474 (48.7)	295 (62.2)	80 (16.9)	99 (20.9)	
Total	974 (100)	617 (63.3)	136 (14.0)	221 (22.7)	
4 - 5					$\chi^2 = 13.8; df = 2; P = 0.001$
Boys	536 (51.7)	347 (64.7)	53 (9.9)	136 (25.4)	
Girls	501 (48.3)	343 (68.5)	73 (14.6)	85 (17.0)	
Total	1037 (100)	690 (66.5)	126 (12.2)	221 (21.3)	
Total					$\chi^2 = 24.63; df = 2; P = 0.001$
Boys	2364 (50.8)	1490 (63.0)	250 (10.6)	624 (26.4)	
Girls	2292 (49.9)	1502 (65.5)	311 (13.6)	479 (20.9)	
Total	4656 (100)	2292 (64.3)	561 (12.0)	1031 (23.7)	

^a Data are presented as No. (%).

Table 2. Prevalences of Overweight and Obesity with Regard to Associated Factors^a

Variable	Values	Non-Overweight and non-obese	Overweight	Obese	P value
Area					$\chi^2 = 0.57$; df = 2; P = 0.75
North	1629 (35.0)	1043 (64.0)	191 (11.7)	395 (24.2)	
South	3027 (65.0)	1949 (64.4)	370 (12.2)	708 (23.4)	
Total	4656 (100)	2992 (64.3)	561 (12.0)	1103 (23.7)	
Economic Percentile					$\chi^2 = 11.01$; df = 8; P = 0.201
1 (poorest)	727 (18.1)	461 (63.4)	102 (14.0)	164 (22.6)	
2	879 (21.9)	572 (65.1)	115 (13.1)	192 (21.8)	
3	862 (21.5)	572 (65.0)	115 (13.1)	207 (24.0)	
4	821 (20.5)	544 (66.3)	78 (9.5)	199 (24.2)	
5 (richest)	724 (18.0)	458 (63.3)	89 (12.3)	177 (24.4)	
Total	4013 (100)	2595 (64.7)	479 (11.9)	939 (23.4)	
Ownership of Residence					$\chi^2 = 0.63$; df = 4; P = 0.95
Owner	2034 (43.8)	1315 (64.7)	241 (11.8)	478 (23.5)	
Tenant	2200 (47.4)	1409 (64.0)	267 (12.1)	524 (23.8)	
Other	409 (8.8)	257 (62.8)	53 (13.0)	99 (24.2)	
Total	4643 (100)	2981 (64.2)	561 (12.1)	1101 (23.7)	

^a Data are presented as No. (%).

The prevalences of overweight and obesity in the total population under survey were 12% and 23.7%, respectively. The prevalence of overweight was higher in girls than boys (13.6% vs. 10.6%), while the prevalence of obesity was higher in boys than in girls (26.4% vs. 20.9%). Chi-square tests showed that the prevalence of obesity and overweight significantly differed by gender ($P = 0.001$). The highest prevalence of obesity was observed in 1 - 2-year-old children.

The prevalence of obesity was higher in north Tehran (24.2%) than south Tehran (23.4%), but this difference was not statistically significant.

The prevalence of overweight and obesity was higher in children from high economic percentiles than those from lower economic percentiles. The lowest prevalence of obesity was observed in the weakest economic percentile. Chi-square tests showed that the prevalences of overweight and obesity did not significantly differ by ownership of residence ($P < 0.95$). Table 2 shows the prevalences of overweight and obesity with respect to various factors.

5. Discussion

In the present study, the prevalences of overweight and obesity among children below 5 years were 12% and 23.7%, respectively. Previous studies reported that the prevalences of overweight and obesity in children were 11.8% and 15%, respectively, in north Iran (27); 18.8% and 17.7%, respectively, in south Iran (28); 9.6% and 9.2%, respectively, in east Iran (29); and 8.2% and 11.5%, respectively, in central Iran (25).

In a study in the United States, the prevalences of overweight and obesity in children were 31.7% and 16.9%, respectively (30). Another study found that 25.6% of the children in the United States were obese (31). Other studies have found that 6.42% of the children in India were overweight and 2% were obese (32), and that 17% of the children in Pakistan were overweight and 7.5% were obese (33). These differences may stem from disparities in social and economic status.

The prevalences of overweight and obesity are high in developing countries and countries with poor welfare systems, such as India (34, 35), Pakistan (33), and other South Asian as well as African countries (11) and the United States (11, 31). The prevalence of obesity in these countries has risen sharply since 1990, along with their increasing economic development (11). Along with changes in lifestyle and industrialization (31, 36), childhood obesity and overweight are considerably increasing globally (31, 37). It is predicted that in Europe and Australia, obesity prevalence will continue to grow at the rate of 1% (38).

In the present study, the prevalence of obesity was high. The rate at which the prevalence of childhood obesity and overweight increased was higher than that reported in previous studies (15, 36, 39). The present study also indicates that an epidemic of obesity will occur among children in Tehran. Therefore, the prevalences of overweight and obesity in Tehran are a serious problem (40). Their increasing prevalences may be due to excessive consumption of food, inappropriate diet, excessive feeding, and food insecurity in Iran (41). In this study, the high prevalence of obesity may be due to the industrialization

of Tehran, which was accompanied by changes in lifestyle and food consumption.

In the present study, the prevalence of overweight was higher in girls than boys, and of obesity was higher in boys than girls. In some studies, the prevalence of obesity was higher in girls than boys (28) and vice versa in others (42-44) while yet others (45) found no sex differences. These sex differences may stem from differences in physical activity status as well as physiological, hormonal, behavioral, and sociocultural factors (28). Cultural issues and gender preference can affect the health and nutritional status of children (46).

The present results indicated that the prevalence of obesity was higher in north than south Tehran. The socioeconomic status of north Tehran is comparatively high (47, 48). Therefore, the higher prevalence of obesity in this area may be due to better socioeconomic status because economic development can affect obesity rates (31). In developing countries, economic status is positively associated with obesity (22). Considering that Iran is a developing country, the high prevalence of obesity in children in north Tehran may be due to better economic conditions.

In the present study, obesity and overweight were more prevalent in the top economic percentiles than the lower percentiles, and the lowest prevalence was observed in the weakest economic percentile. Previous studies have reported a relationship between socioeconomic status and obesity (21, 22). The prevalence of obesity in industrialized and developed countries is high among low socioeconomic groups. In contrast, in developing countries, the prevalence of obesity is high among high socioeconomic groups (22). Mendez observed the same situation (49). The prevalence of obesity is higher in lower economic groups in the United States and in higher economic groups in China and Russia (50). Further, in African children, obesity has a higher prevalence among higher economic groups (51).

A review reported an inverse relationship between economic status and obesity in children, while other studies found no relationship between these two variables (52). The present results are similar to findings from developing countries (33). This indicates that an economic transition is taking place in Tehran, which is reflected in the growing obesity epidemic in children.

In the present study, no significant difference was observed between nutritional status and type of residence. If housing and residence are considered indicators of economic status, they can affect nutritional status because economic status has been shown to influence weight in children (22). However, we cannot properly assess household economic status on the basis of only the type of residence (53). Hence, the lack of any association between these factors in the present study is reasonable.

The present results show that childhood obesity in Tehran is a serious problem. Further, it is an epidemic and increasing in rate. Therefore, regional and national policies are essential to reduce the prevalence of obesity (37)

because appropriate interventions have been shown to reduce the prevalence of overweight and obesity (54). Further, it is important to conduct periodic surveys to monitor obesity rates in order to evaluate practical planning.

5.1. Limitations

This study was conducted to assess the prevalence of overweight and obesity in Tehran. Etiology studies can be useful for developing policy measures. Additional research on obesity trends in Tehran are needed.

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