

Overweight and Obesity and Related Factors in Urban Iranian Population Aged Between 20 to 84 Years

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Abstract

Background: Obesity is one of the most common health problems in the world and is assuming epidemic proportions in both developed and developing countries. Aim: The present study aimed to provide population-based data on the prevalence of obesity and estimation the risk of some of demographic factors associated with obesity. **Subjects and Methods:** From May 2007 through December 2008, we conducted a community-based cross-sectional survey on 3,000 males and females (age ≥ 20 years) in Tehran province. Respondents were asked to give their height and weight in the questionnaire. Body mass index (BMI) is recognized as the measure of overall obesity and calculated as body weight divided by the square body height in meters (kg/m^2). **Results:** The overall prevalence of overweight and obesity was 34.1% (924/2708) and 15.4% (417/2708). The combined prevalence of both overweight and obesity was 51.2% (1387/2708) in males and 57.5% (1557/2708) in females. The mean (SD) BMI for the total population studied was 26.14 (4.71) and it was higher in women than in men ($P < 0.001$). The overall prevalence of overweight and obesity was 39.5% (376/952) and 11.7% (111/952) in men and 36.9% (548/1458) and 20.6% (306/1458) in women. The multivariate-adjusted odds ratios of obesity showed that higher ages, females, married and low educated subjects had more chance to being obese. **Conclusion:** This population-based cross-sectional survey indicates that the prevalence of overweight and obesity are moderately high in the general Iranian population and must be considered as a significant public health problem at national level especially among women.

Keywords: Body mass index, Epidemiology, Obesity, Overweight, Population-based study, Prevalence, Risk factors

Introduction

Obesity continues to be an important public health problem worldwide.^[1-5] Its prevalence is increasing in both developed and developing nations with changes in dietary habits and activity levels.^[2-10] Both overall and abdominal obesity are

associated with non-communicable chronic diseases such as cardiovascular and cerebrovascular diseases, digestive disorders, and cancer.^[11] Furthermore, obesity is a major independent risk factor for the development of hypertension, diabetes mellitus, and dyslipidemia. Obesity results not only in medical consequences but it has a strong inverse relationship with social position, as reported from many affluent societies.^[12-14]

The prevalence of obesity in adults is 10% to 25% in most countries of Western Europe and 20% to 25% in some countries in the Americas.^[11,15] In Asian countries such as Iran, Saudi Arabia, Syria, Bahrain, Kuwait, and Jordan, prevalence of obesity is as high as 22.3%,^[16] 39%,^[17] 38.2%,^[18] 35%,^[19]

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47.5%,^[20] and 35%,^[21] respectively. Overweight and obesity is related to a number of variables such as: age, sex, educational levels, marital status, occupation, physical activity, paternal obesity, alcohol consumption, household income, smoking and location.^[10,11,17,22-30]

While, overweight and obesity are important modifiable risk factors for many diseases and associated conditions, and the prevalence of overweight and obesity has been increasing in most developing countries like Iran, the objectives of the present study were to provide population based data on the prevalence of overweight and obesity and to estimate the risk of some demographic factors associated with obesity.

Subjects and Methods

From May 2007 through December 2008, we conducted a community-based cross-sectional survey on 3,000 males and females (age ≥ 20 years) in north, northeast, east and southeast of Tehran province (including Tehran metropolitan, Damavand, Varamin, Firoozkooh and Pakdasht). These samples were selected using a random strategy on the basis of household postal codes. Of total, 2,708 persons gave their consent to be finally interviewed. Then trained health staff from which corresponding local health center referred to each selected house, face-to-face, and asked them to participate in the interview.

Ethics

Informed consent for enrolment was obtained, and patient anonymity was preserved. The research protocol was approved by the Ethics Committee of Gastroenterology and Liver Disease Research Center, Shahid Beheshti University of Medical Science.

Respondents were asked to give their height and weight in the questionnaire. Body mass index (BMI) is recognized as the measure of overall obesity and calculated as body weight divided by the square body height in meters (kg/m^2). The subjects were then categorized into four BMI groups (consistent with the definitions set forth by the World Health Organization (WHO) and the National Heart, Lung, and Blood Institute (NHLBI)): Underweight (BMI < 18.5), normal ($18.5 \leq \text{BMI} < 25$), overweight ($25 \leq \text{BMI} < 30$), and obese (BMI ≥ 30). Some demographic variables such as sex, age, marital status, education and employment status are included in the analysis.

Statistics

All statistical analysis was carried out using SPSS v. 13 software (SPSS, Chicago, IL, USA). The significance of univariate differences was assessed by Pearson's Chi-square and Student's t tests. Multivariate Logistic regression analysis also was performed for estimation of adjusted odds ratio (OR) based on age, sex, marital status, educational level and

employment status. A $P < 0.05$ was considered statistically significant and all reported P values were two sided.

Results

The final total number of individuals included in the study was 2708, comprising 1052 males (mean age (SD):48.8 (16.6) years) and 1656 (mean age (SD): 46.6 (16.0) years) females. The overall prevalence of overweight and obesity was 34.1% (924/2708) and 15.4% (417/2708). The combined prevalence of both overweight and obesity was 51.2% (1387/2708) in males and 57.5% (1557/2708) in females.

Table 1 shows the mean and median BMI in the total sample and separately for men and women in all age groups. The mean (SD) BMI for the total population studied was 26.14 (4.71) and it was higher in women than in men ($P < 0.01$). The overall prevalence of obesity was 11.7% (111/952) in men and 20.6% (306/1458) in women. The overall prevalence of overweight was 39.5% (376/952) in men and 36.9% (548/1458) in women.

The prevalence of obesity was much higher for females comparing to males ($P < 0.01$), but there is no significant differences between males and females regarding to overweight ($P = 0.35$). About 46% (438/952) of males and 39.2% (582/1458) of females had normal weight.

Table 2 shows that the obesity and overweight was more prevalent among participants aged 40-49 and 50-59 years, respectively. Obesity was less common among more highly educated persons. The obese were over-represented among employed persons, but this difference was not significant. The prevalence of obesity was higher among married individuals.

Table 1: Mean and median BMI in males and females under study by age categories**

Age group (year)	Number (n=2708)	Percent	BMI Mean (SD)	BMI (Median)
Male				
20-29	141	13.4	24.7 (4.3)	24.2
30-39	184	17.5	25.8 (4.1)	25.3
40-49	227	21.6	26.0 (4.2)	25.9
50-59	168	16.0	25.6 (4.5)	25.2
>60	239	22.7	25.06 (4.1)	24.9
Total	1052	100	25.5 (4.2*)	25.2
Female				
20-29	290	17.5	23.7 (4.5)	23.0
30-39	307	18.5	27.1 (4.5)	26.5
40-49	319	19.3	27.7 (4.8)	27.3
50-59	285	17.2	27.6 (4.2)	27.3
>60	298	18.0	26.3 (5.2)	25.7
Total	1656	100	26.5 (4.9)	26.0

* $P < 0.001$ compared with BMI in all ages of females, **Lack of corresponding of sum of frequencies of subgroups with sample size was due to the missing data, BMI: Body mass index

Table 2: Prevalence of different category of BMI according to sociodemographic factors in study population**

Variables	Underweight	Normal	Overweight	Obese	Total	P value
Age						
20-29	28 (6.6)	262 (61.6)	96 (22.6)	39 (9.2)	425 (100)	<0.01
30-39	8 (1.6)	194 (40.0)	189 (39.0)	94 (19.4)	485 (100)	
40-49	9 (1.7)	182 (33.5)	236 (43.4)	117 (21.5)	544 (100)	
50-59	7 (1.6)	145 (32.4)	208 (46.4)	88 (19.6)	448 (100)	
>60	24 (4.5)	237 (44.3)	195 (36.4)	79 (14.8)	535 (100)	
Sex						
Male	27 (2.8)	438 (46.0)	376 (39.5)	111 (11.7)	952 (100)	<0.01
Female	49 (3.3)	582 (39.2)	548 (36.9)	306 (20.6)	1458 (100)	
Marital status						
Married	37 (1.9)	759 (39.3)	758 (40.7)	349 (18.1)	1930 (100)	<0.01
Single/Widowed/Divorced	39 (7.9)	253 (51.4)	135 (27.4)	65 (13.2)	492 (100)	
Education level						
Primary or lower	28 (3.9)	290 (40.2)	268 (37.1)	136 (18.8)	722 (100)	<0.01
High school	12 (1.6)	269 (36.9)	294 (40.3)	154 (21.1)	729 (100)	
University	36 (3.7)	449 (46.7)	353 (36.7)	123 (12.8)	961 (100)	
Employment status						
Employed	8 (4.2)	71 (37.0)	71 (37.0)	42 (21.9)	192 (100)	0.19
Unemployed	68 (3.0)	949 (42.3)	853 (38.0)	375 (16.7)	2245 (100)	

**Lack of corresponding of sum of frequencies of subgroups with sample size was due to the missing data, BMI: Body mass index

Table 3: Adjusted odds ratios for the likelihood of being obese, by sociodemographic in the logistic regression analysis

Variables	Odds ratio	P value	CI95%
Age	1.01	0.01	1.00-1.02
Sex			
Male	1		
Female	2.31	<0.01	1.79-2.99
Marital status			
Single/Widowed/Divorced	1		
Married	1.90	<0.01	1.38-2.30
Education level			
University	1		
High school	1.94	<0.01	1.46-2.60
Primary or lower	1.55	0.03	1.16-2.08

The multivariate-adjusted odds ratios of obesity are shown in Table 3. Overall, higher ages, females, married and low educated subjects had more chance to being obese. Females and married participants had a risk of 2.31 and 1.90 for obesity. Individuals with lower education had more chance to being obese. Using university education as the reference group, obesity odds ratios for the high school and primary groups were 1.94 (95% CI: 1.46-2.60) and 1.55 (95% CI: 1.16-2.08), respectively.

Discussion

Our study reports one of the largest population-based studies of obesity ever conducted, in which the prevalence of self-reported overweight and obesity and some related sociodemographic risk factors were analyzed for the first time in Tehran, capital of Iran. A moderately high proportion of the

population was obese (15.4%) or overweight (34.1%), and females were much more affected than males.

Different prevalence of obesity was reported in different areas. A systematic review considering studies from Iran reported the prevalence of obesity ranging from 22 to 40% among adults aged 15-70 years.^[31] Hajian-Tilaki, *et al.*,^[32] demonstrated the prevalence of obesity to be 22.3% among Iranian adults (30.6% in females and 14.2% in males). Another study in the north of Iran reached an estimate of 27.8% in females and 9.9% in males.^[33] Mirzazadeh, *et al.*,^[34] in a meta-analysis on Iranian research works (from the year 1996 to 2006) showed that the prevalence of obesity was between 1.3 to 46.9%, 1.0 to 43.6% in males and 1.3 to 51.7% in females. A Chinese study by Reynolds, *et al.*,^[35] found the prevalence of overweight and obesity were 24.1% and 2.8% in men and 26.1% and 5.0% in women, respectively. According to National Health and Nutrition Examination Survey (NHANES) of the US, the prevalence of obesity in individuals aged 20-74 years was 34% in females and 31.7% in males.^[36]

The higher prevalence of obesity in Iranian females, compared to males, is in agreement with the results from our neighboring countries, including Saudi Arabia (24% in females and 16% in males),^[37] Oman (23.8% in females and 16.7% in males)^[38] and Lebanon (18.8% in females and 14.3% in males).^[39] In Turkey^[40] as well, the prevalence of obesity is higher in females (24.6% vs. 14.4% in males age \geq 20 years).

Some studies^[41,42] found that the prevalence of overweight and obesity (based on BMI) more than doubled between the youngest and oldest age groups in the study (ages 20-29 and 50-59 which is similar to our finding. We also found that the

prevalence was lower in the older age group (> 60 years). Our finding was repeated in Walls, *et al.*,^[41] study.

As mentioned in the results section, women are in higher risk (OR = 2.31) for developing obesity even more than men develop.^[43-46] This difference partly might be attributed to the sedentary life style and work as housewives with less physical activities of the women in Iran. Another explanation for this finding is the sampling bias, which happened in most household surveys. Because the most participants in such studies are those who are working at home during the day and mostly they are housewives.

Obesity was associated positively with marital status in our study.^[47] It is reported that married men and women were more likely to be overweight and obese than never married individuals.^[48] There are two possible reasons for this. First, it is plausible that marriage increases cues and opportunities for eating because married people tend to eat together and thus reinforce each other for increased intake. The second possible explanation relates to the effects of body weight on interpersonal attractiveness.^[49]

In this study, it was observed that obesity tends to be more prevalent among people who are less educated. This finding on negative relationship between education and obesity coupled with the results from other studies.^[48,50] The relative lower prevalence of obesity among better educated may reflect different cultural norms or better social support to maintain ideal body weight for individuals in the higher education groups.

A point that must be stressed when considering estimation of the prevalence of obesity in this study is the fact that our data on weight and height was self-reported. Although many study have been reported the strong correlations between self-reported and measured values for weight and height as well as between self-reported and measured BMI,^[51-59] others found different results. Fonseca, *et al.*,^[60] suggest that BMI based on self-reported weight and height is not accurate for BMI prediction at an individual level, however, self-reported BMI may be used as a simple and valid tool for BMI estimates of overweight and obesity in epidemiological studies. Some studies found that, obese individuals tend to underreport their weight, resulting in a lower prevalence of obesity.^[59,61,62] Wang, *et al.*,^[63] and Elgar, *et al.*,^[61] reported that underreporting weight was more common among overweight and obese adolescents. As most studies have shown that prevalence of overweight and obesity are underestimated based on self-reported weight and height, Giacchi^[64] has even suggested that prevalence estimates should be corrected using a conversion factor that takes this misreporting into account.

Another limitation of the present study is that, this survey was performed in the general population and one of the pitfalls of these studies is low quality of the information and, this must be kept in mind.

A strong point of this study is that because of random selection of samples, study sample characteristics (such as: Age, sex and educational level) are so similar to the whole population of Iran, and therefore our sample is a representative sample. Another strong point of the study is that we conducted multivariate analyses, which allowed us to control the effects of confounder factors in analysis.

Conclusion

This population-based cross-sectional survey indicates that the prevalence of overweight and obesity are moderately high in the general Iranian population and must be considered as a significant public health problem at national level especially among women. However, the limitations as stated before must be considered. It seems that many peoples are still unaware about undesirable health conditions following the obesity. There is a need for an effective public health program and urgent precautions for the control of obesity. So, obesity seems to put a heavy burden on the economy of a developing country like Iran, national burden studies are needed for more accurate estimations for health professionals and policy makers.

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