

## Socioeconomic Status and Obesity Relationship in Non-Menopause Women Aged 15-49 Years in Tehran, Iran

K Mohammad<sup>1</sup>, \*B Golestan<sup>1</sup>, R Majdzadeh<sup>1</sup>, R Chaman<sup>2</sup>, S Nedjat<sup>1</sup>, M Karimloo<sup>3</sup>

<sup>1</sup>Dept. of Epidemiology and Biostatistics, School of Public Health and Institute of Public Health Research, Tehran University of Medical Sciences, Iran

<sup>2</sup>Dept. of Basic Sciences, School of Medicine, Shahrood University of Medical Sciences, Iran

<sup>3</sup>Dept. of Statistics and Computer, University of Welfare and Rehabilitation Sciences, Iran.

(Received 10 Nov 2008; accepted 7 Jul 2009)

### Abstract

**Background:** To investigate the association between socio-economic status and obesity in non-menopause women aged 15-49 years in Tehran, Iran.

**Methods:** This study was based on Iran National Health Survey conducted in 1999. Obesity is defined as a Body Mass Index over  $\geq 30$ . Constructed area (per-person), educational level and job are considered as factors indicating the socioeconomic status. The results have been adjusted for age and mental health using univariate and multiple logistic regression.

**Results:** A total number of 2859 non-menopause women aged 15-49 yr from urban areas of Tehran have been studied. The prevalence of obesity and overweight were 16.4% and 28.4% respectively. Women aged 30-49 yr had greater risk of obesity (adjusted OR= 2.53, 95%CI: 1.99-3.20). Comparing with students, homemakers and employees were at higher risk of obesity (adjusted OR= 4.33, 95%CI: 2.47-7.76, adjusted OR= 2.82, 95%CI: 1.41-5.63 respectively). Those with  $\geq 12$  years of education had lower risk of obesity compared to illiterate women (adjusted OR=.57, 95%CI: 0.38-0.86).

**Conclusion:** The role of social factors is dominant over economic factor on obesity. This fact should be considered as one of the most important research priorities in future researches.

**Keywords:** Obesity, Socio-economic-status, National health survey, Iran

### Introduction

In the recent decades, obesity and overweight are considered the most common metabolic disorder. Obesity is an underlying cause of many non-communicable diseases such as diabetes, hypertension and atherosclerosis and is responsible for a great proportion of disabilities and disorders (1, 2). In developing countries, the vast expansion of civilization, increasing income, high per capita energy intake along with decrease in physical activities, are the main reasons for obesity. Genetic and environmental factors are among factors affecting obesity. In general, obesity is the result of imbalance between the need and intake of energy. In the recent years, due to a drastic change in the people's life style, Body Mass Index (BMI) is considered as one of the most important health indicators and has a significant increasing trend in de-

veloping countries (1, 2). Analysis of the underlying factors regarding this problem and evaluation of its consequences is an essential challenge in the area of health research. There are in fact three different approaches to the BMI and socio-economic relation. First, BMI could be the result of socio-economic determinants. Second, the reverse could be true. Finally there could both be affected by another factor(s) (3).

One of the most striking facts about obesity is the powerful inverse relation between obesity and socioeconomic status in the developed world, especially among women (4).

In a longitudinal national survey conducted at two times in the US, in 1981 and 1988, during the course of 7 yr overweight women had lower incomes (5). As for developing countries, World Health Organization's report indicated a different relationship

between socio-economic status and obesity. Three main conclusions emerge from the studies reviewed as: (a) Obesity in the developing countries is no longer associated with high socio-economic class, (b) In developing countries, as the country's gross national product (GNP) increases, the burden of obesity tends to shift towards the groups with lower Socio-economic status; (c) Women with low socio-economic class tend towards obesity at earlier stages of economic development comparing with men (6). In Iran studies conducted at provincial level, reported the prevalence of obesity in different sexes (7-9) for example: Heshmat et al. conducted a study in Population Research Lab of Tehran Medical University for evaluation of coronary heart diseases risk factors Using Monica study model of WHO in 2003 and found that 38.3% of women and 18.6% of men were obese (7).

Obesity was found more prevalent in women comparing to men (29.1% versus 14.2%). The highest prevalence observed in 50-59 age groups in both sexes. Low levels of education, being married and low physical activity were significantly associated with obesity (9).

Nevertheless, few among these studies investigated the socioeconomic status of obese women (9). There are also a number of small-unpublished studies performed at different public health schools of Iran, investigating the prevalence of obesity in different age groups and in both sexes.

In this paper with the advantage of having a National Survey data, we attempted to study the relationship of obesity and socio-economic status in non-menopause women in capital of Iran, Tehran. The choice of non-menopause women was due to the considerable effect that this transition period has on obesity.

## Materials and Methods

The data used in this research, were those collected from the Islamic Republic of Iran National Health Survey, conducted by the Ministry of Health and Medical Education in 1999. A sample size of 1/1000 out of the completely household population of the country was investigated

in that national study. In this study, the demographic data, family health facilities, nutrition status, mental health, results of medical examinations and laboratory results were collected.

In the present study, obesity is defined as a BMI  $\geq 30$  while overweight is defined as BMI greater than 25 and less than 30. Constructed area (Per person), educational level and job are considered as factors indicating the socioeconomic status. The constructed area (per person) is categorized as follows:

- a) Less than 20 square meter ( $m^2$ ) per person.
- b) 20 square meter ( $m^2$ ) and more per person.

According to National Health Survey, the level of education was considered as the number of years of education, which in our study has been divided into the following five groups:

- Illiterate
- 1-4 yr of education
- 5-7 yr of education
- 8-11 yr of education
- 12 yr of education and more

Moreover, occupation has been studied within three categories: students (including school or university students), employees and homemakers.

Other factors, such as age and mental health were analyzed and considered as confounding variables. There are quite a number of studies referring to the association of mental status and obesity (10, 11). It should be noted that mental health is considered from 4 aspects using GHQ-28:

- Somatization
- Anxiety
- Social Dysfunction
- Depression

Questions were assigned a score of 0 or 1, whereby 0 indicated healthy and 1 indicated some level of disorder. A total score of 2 and more in each area was considered problematic.

## Statistical analysis

A simple association of the independent variables with obesity along with the crude odds ratio has been given. As for the model building, we first fitted simple logistic regression model for each independent variable separately using the catego-

ries defined above. We then followed the strategy proposed by Hosmer and Lemeshow, considering only the main effects (12). This procedure includes: (a) keeping those independent factors whose inclusion reaches a reasonably liberal significance level such as 0.20, (b) fitting a multiple logistic regression model using all retained independent variables from the univariate analysis, (c) removing one by one those variables that appear to have lost their significance, (d) adding the discarded variables in the first stage one at a time to the multivariate model to check if this adding leads to any significant result, (e) assessing the final model for goodness of fit to the data.

We did also consider the two-way interactions; however, the resulted model although statistically significant, was not practically important since it improved the main effect model only by a small percentage. Therefore, in order to avoid the complexity with interactions, we report the result of the simpler model.

## Results

A total number of 2859 non-menopause women at the age of 15-49 yr from urban areas of Tehran have been studied in this research.

Based on our findings the prevalence of obesity and overweight was 16.4% and 28.4% respectively (Table 1).

The mean age of the study population was 28.8 (SD= 9.55) and about half of the subjects were below 30 yr of age (55%). The percentage of employees was 10.5%; moreover 38.6% had 12 yr of education and higher. Constructed area per person was less than 20 m<sup>2</sup> for 51.7% of the study population. The prevalence of different types of psychological disorders was 24.4% for somatization, 25.4% for anxiety, 13.1% for social dysfunction and 20.6% for depression (Table 2).

The preliminary univariate analysis showed that among demographic, socio-economic and psychological variables, age, job, constructed area per person, level of education, social dysfunction and anxiety had a significant association with obesity at 0.05 (Table 3). The odds of obesity were

almost 2.5 times higher in women in the age group of 30-49 compared to 15-29 yr age group. (95% CI: 1.99-3.20). Homemaker women were at greater risk of obesity than students were (OR= 4.33, 95% CI: 2.47-7.60); moreover the Odds of obesity was 2.80 for employees comparing to students. (95% CI: 1.40-5.60).

With illiterate women as the reference group, there is a mild non significant increase in the risk of obesity in low levels of education up to 11 grade but a significant decrease in 12 grade of education and higher (OR= 0.57, 95% CI: 0.38-0.86). The results of univariate logistic regression analyses for each variable of Table 3 in turn led to the preliminary significant effect of age, education, job, anxiety and social dysfunction. Continuing the procedure gave the final model displayed in Table 4.

The results show that those aged 30-49 yr were at greater risk of obesity (adjusted OR=2.53, 95% CI: 1.99-3.20). Comparing with students, homemakers and employees were at higher risk of obesity (adjusted OR= 4.330, 95% CI: 2.468-7.759 and adjusted OR=2.8, 95% CI: 1.41-5.63 respectively).

As for the levels of education, only those who had 12 yr of education and more were at lower risk of obesity compared to illiterate women (adjusted OR=0.57, 95% CI: 0.38-0.86). The Hosmer-Lemeshow goodness of fit for the final model, indicates the credibility of the above variables for predicting the risk of obesity ( $P= 0.95$ ).

**Table 1:** Frequency of obesity and overweight

BMI Category	Frequency*	Percent	99%CI
normal	1548	55.2	52.8-57.6
overweight	797	28.4	26.2-30.6
obese	460	16.4	14.6-18.2
Total	2805	100.0	

\* Number of missing cases=54

**Table 2:** General characteristics of the study population

	Frequency	Percent
Age group		
15-29	1582	55.3
30+	1277	44.7
Job		
Student	510	17.8
Housewife	2048	71.6
Employee	301	10.5
Education		
Illiterate	191	6.7
1-4	275	9.6
5-7	517	18.1
8-11	773	27.0
12 and higher	1103	38.6
Constructed area per person		
<20 m <sup>2</sup>	1478	51.7
>=20 m <sup>2</sup>	1380	48.3
Somatization		
No	2276	79.6
Yes	583	20.4
Anxiety		
No	2132	74.6
Yes	727	25.4
Social dysfunction		
No	2484	86.9
Yes	375	13.1
Depression		
No	2269	79.4
Yes	590	20.6

**Table 3:** General description of study variables in obese and normal women

Variables		Non- Obese		Obese		Crude OR and 95% CI	
		Frequency	Percent	Frequency	Percent	OR	95% CI
Constructed area per person	<20 m <sup>2</sup> *	1191	82.3	256	17.7		
	>=20 m <sup>2</sup>	1151	85.0	203	15.0	0.81	0.67-1.001
Age group	15-29*	1409	91.5	131	8.5		
	30+	936	74.0	329	26.0	3.78	3.02-4.73
Somatization	No*	1863	83.8	360	16.2		
	Yes	482	82.8	100	17.2	1.07	0.84-1.38
Anxiety	No*	1749	84.1	330	15.9		
	Yes	596	82.1	130	17.9	1.16	0.92-1.45
Social dysfunction	No*	2019	83.1	411	16.9		
	Yes	326	86.9	49	13.1	0.74	0.53-1.03
Depression	No*	1847	83.3	369	16.7		
	Yes	498	84.6	91	15.4	0.91	0.71-1.18
Job	Student*	476	96.9	15	3.1		
	Housewife	1612	79.4	418	20.6	8.23	4.76-14.46
	Employee	257	90.5	27	9.5	3.33	1.67-6.71
	Illiterate*	143	75.7	46	24.3		
Education	1-4	198	72.8	74	27.2	1.16	0.74-1.82
	5-7	385	74.6	131	25.4	1.06	0.71-1.59
	8-11	648	85.6	109	14.4	0.52	0.35-0.79
	12 and higher	971	90.7	100	9.3	0.32	0.21-0.48

\* Reference group

**Table 4:** The final fitted model in multiple logistic regression

Variables	B	SE	Odds ratio	95.0% CI for odds ratio	
				Lower	Upper
AGE 30-49/15-29	.927	.121	2.526	1.992	3.204
JOB					
Housewife/student	1.466	.287	4.330	2.468	7.597
Employee/student	1.035	.354	2.816	1.408	5.633
Education					
1-4 years/illiterate	.254	.220	1.289	.837	1.984
5-7 years/illiterate)	.316	.201	1.371	.924	2.035
8-11 years/illiterate	.109	.208	1.115	.743	1.676
>=12 years/illiterate	-.565	.209	.568	.377	.857
Constant	-3.395	.327	.034		

## Discussion

At first glance, it seems that the prevalence of obesity obtained in this study (16.4%) is somewhat less than the other synchronic studies. For example in the research of Dr. Heshmat et al. on a sample of women in Tehran, the study population consisted of 1573 adults aged 25-64 yr. The results showed a considerable difference in mean body mass index between men and women (26.13 versus 28.86 kg/m<sup>2</sup>); moreover, the prevalence of obesity was 38.3% among women and 18.6% among men (7). This obvious difference may be due to the different age groups in the two studies (Age group in the former study was 24-65 yr old whereas in the present study it is 15-49 yr old). It should also be noted that the menopause women (who are over 50 yr old) are not considered in this research. Therefore, we may have predicted a lower prevalence of obesity in this study. Further, in the Healthy Heart Study in Isfahan conducted in 2000-2001, the prevalence of obesity was reported as 23.4% in women (at all ages) (8), again our study was limited to the age group of 25-49 yr old.

The study of Dr. Azizi et al, conducted on women between 20 to 70 yr old (1999-2001), indicated an obesity prevalence of 29.1% (9) which is much more than the result of the present study. This difference may be justified, considering the clear difference between the age groups in these two studies. It should be noted that we did not find a comparable study regarding the same age group; nev-

ertheless the important point is that the data used in this investigation were obtained from National Health Survey (NHS), which is undoubtedly among one of the best Population-based surveys in terms of sampling. It can thereby be stated that the results can be generalized to a certain extent to the target population.

Different studies on evaluation of the relevance between obesity and the economic status especially in women, which have been conducted in the developing countries, led to different results. Although the index of house area in this study, which is a good criterion for indication of economic status, showed no meaningful relation with obesity, the prevalence of obesity has a reverse relation with promotion of this index. This finding conforms to the WHO review report (6). In the study of Gortmarker et al., a reverse relation has been observed between the family income and overweight of women (5). Whereas in present study, the index of house area which according to the National Health Survey (NHS) has been an indicator of the family economic status, showed a reverse linear relation with the women's obesity although it was not statistically significant. It should be mentioned that if we had access to the data on family income, nutrition status and food basket, we could have evaluated the relation between obesity and economic factors more comprehensively. No significant relations have been observed between obesity and psychological disorders, in this study.

The results of this research on the relation between obesity and aging confirm to other studies explicitly indicating that women over 30 yr of age are more susceptible to obesity.

As per the findings of this study, women with a higher educational level (high school diploma and academic degrees) are at lesser risk of obesity comparing to illiterate ones. Further, working women are more susceptible to obesity than the high school and university students are. The most important mentionable restriction in these conclusions is that the physical activity index has not been taken into account in NHS mainly because it has not been generalized by the time of the survey and as a result, it was impossible to investigate its confounding role with respect to the relation between obesity and educational level as well as the occupational status. Our findings also put more credit on socio factors than on economic.

Considering the results of this research and by virtue of the results of other similar researches, it seems that the study on the role of socioeconomic factors on obesity, especially on women in developing countries, is considered as one of the most important research priorities, which shall be taken into account by most of the researchers.

## Acknowledgments

The authors wish to thank Dr Ahmad Reza Shamshiri for his kind cooperation in reviewing the draft of the manuscript. The authors declare that they have no conflicts of interest.

## References

1. Wisse BE (2004). The Inflammatory Syndrome: The Role of Adipose Tissue Cytokines in Metabolic Disorders Linked to Obesity. *J Am Soc Nephrol*, 15: 2792-800.
2. Masuzaki H, Paterson J, Shinyama H, Morton NM, Mullins JJ, Seckl JR, Flier JS (2001). A Transgenic Model of Visceral Obesity and the Metabolic Syndrome. *Science*, 294(5549): 2166-70.
3. Stunkard AJ, Sorensen T (1993). Obesity and Socioeconomic Status: A Complex Relation. *NEJM*, 329: 1036-37.
4. Sobal J, Stunkard AJ (1989). Socioeconomic Status and obesity: a review of the literature. *Psychol Bull*, 105: 260-75.
5. Gortmaker SL, Must A, Perrin JM, Sobol AM, Dietz WH (1993). Social and economic consequences of overweight in adolescence and young adulthood. *N Engl J Med*, 329: 1008-12.
6. Monteiro CA, Moura EC, Conde WL, Popkin BM (2004). Socioeconomic status and obesity in adult populations of developing countries: a review, *Bulletin of WHO*, 82: 891-970.
7. Heshmat R, Fakhr Zadeh H, Pour Ebrahim R, Nouri M, Pajouhi M (2003). Evaluation of obesity status and overweight and the pattern of their changes in a population at the age of 26-64 years old, residing at the Population Research Center of Tehran University of Medical Science. *Iran Lipid and Diabetes*; 3: 71-80.
8. Akhavan Tabib A, Kalishadi R, Sadri Gh, Sabet B, Tolouei H, Baghaei A (2003). Healthy Heart Plan: Obesity outbreak in Central Regions of Iran. *Ghazvin University of Medical Sciences J*, 7: 15-18.
9. Azizi F, Azadbakht L, Mirmiran P (2003). Investigation on the outbreak of obesity and risk factors related to obesity of the Adults from Tehran: Study of Tehran Glucose and Lipid. *Iran Endocrine Glands and Metabolism Journal*, 5: 387-79.
10. Stunkard AJ, Faith MS, Allison KC (2003). Depression and obesity. *Biol Psychiatry*, 1: 54(3): 330-37.
11. Rooke SE, Thorsteinsson EB (2008). Examining the temporal relationship between depression and obesity: meta-analyses of prospective research. *Health Psychology review*, 2(1): 94-109.
12. Hosmer DW, Lemeshow S (2002). *Applied logistic regression*. Second Edition. New York, John Wiley & Sons.