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Association Between Socioeconomic Factors and Obesity in Iran

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Abstract: The present study was conducted to determine the relationship between socio-economic factors and obesity within a population from Iran. Male and female subjects (n=4977) aged 15-65 years, were recruited from the Great Khorasan province of Iran using a cluster-stratified sampling method. Demographic and socioeconomic data were collected by questionnaire. Of the study population, 29.1% were overweight and 13.8% were obese. Being overweight and obese was significantly more prevalent among women than men and urban- compared to rural-dwellers. A high prevalence of overweight and obesity was seen among individuals who were divorced or widowed and among housewives, or individuals with poor education. Urbanization, age, illiteracy, female gender and divorced, or widowed status were significant predictors of obesity ($p<0.001$). The association of obesity with urban-dwelling which is consistent with previous reports was also found to be the most important determinant of obesity. The prevalence of obesity in urban residents of Iran is high, particularly among poorly educated women. A community-based approach using multiple strategies including appropriate education will be required to address this problem.

Key words: Iran, khorasan province, overweight, obesity, socioeconomic status

Introduction

Socioeconomic status (SES) and demographic factors, such as educational attainment, occupation and place of residence, age, gender and marital status have been reported to be associated with obesity (Wang and Beydoun, 2007). In developing countries this pattern appears to be different, with some studies showing a positive relationship between socioeconomic status and prevalence of obesity. However, more recent surveys have shown that the burden of obesity in developing countries has now tended to shift toward the groups of lower SES (Smith and Goldman, 2007).

Few studies have been performed to study the relationship between socioeconomic status and obesity, particularly in the Middle East (Kelishadi *et al.*, 2003; Hajian-Tilaki and Heidari, 2007). In this present study, we have used a more comprehensive approach than previous studies to clarify the contributions of the different socioeconomic and demographic factors that act on obesity.

Materials and Methods

Subjects were recruited into this study as part of a national survey of non-communicable diseases. Using a multistage sampling method, 4977 subjects (2496 women and 2481 men aged between 15-65 years) were recruited from the Great Khorasan province, in northeastern Iran that has a total population of around 6,200,000. Subjects were selected using the probabilities proportional to their district population; Data on demographic and biochemical measures were completed for 4977 individuals and used for the analyses presented in this work.

The research team included a physician, a nurse and a health care officer, who measured subject's height, weight and waist circumference and blood pressure.

Subjects were classified according to years of education and literacy. Individuals classified as illiterate were unable to read and write. Other educational categories were: Less than 12 years of formal education, completion of high school education and having received tertiary education.

Table 1: Relationship between age, anthropometric, biochemistry measurements and obesity based on BMI and central obesity based on ATP III and IDF definitions in Iranian population. in Iranian population

	General obesity*			Central obesity*			
				IDF		ATP III	
	Normal weight	Overweight	Obese	Yes	No	Yes	No
Number n(%)	2845(57)	1449(29)	686(13.7)	1570(31.3)	3410(68.7)	2421(48.6)	2559(51.4)
Age(year)	36.1±14.8	42.5±13.1	45.8±11.6	45.3±12.4	36.7±14.5	44.1±13	35±14.4
Height(cm)	163.3±9.6	161.5±9.5	158.4±9.7	158.3±9.1	163.9±9.5	159.4±9.3	164.8±9.4
Weight(kg)	56.9±9.1	71.2±8.8	84.1±12.4	73.2±14	61±11.8	70.8±13.9	59.1±11
Waist(cm)	21.2±2.4	27.2±1.4	33.4±3.4	102.1±11.4	80±10.4	97.8±11.7	76.7±9.2
BMI(Kg/m)^2	79.1±10.8	93.5±10	105.9±14.2	29.1±4.6	22.6±3.5	27.8±4.5	21.7±3.2
SBP(mmHg)	119.3±18.1	127±19.9	132.8±21.5	130.6±22	120.2±17.8	128.3±21.6	119±16.9
DBP(mmHg)	75.7±12.6	80.2±13.4	83.2±13.8	81.6±14.3	76.6±12.6	80.3±14.2	76.1±12.1
FBS(mmol/L)	4.78±1.44	4.96±1.6	5.3±1.89	5.25±2.00	4.75±1.27	5.12±1.82	4.70±1.21
T.C(mmol/L)	4.69±0.98	5.09±1.03	5.23±1.00	5.20±1.06	4.74±0.96	5.13±1.05	.4.64±0.91
LDL(mmol/L)	3.08±0.88	3.43±1.32	3.53±0.99	3.49±1.160	3.14±1.02	3.44±1.02	3.06±0.87
HDL(mmol/L)	0.896±0.36	0.80±0.33	0.813±0.31	0.823±0.300	0.82±0.378	0.83±0.318	0.88±0.38
TG(mmol/L)	2.92(2.072-4.428)	4.06(2.74-5.82)	4.24(2.87-6.26)	4.16(2.77-5.95)	3.10 (2.17-4.71)	4.01(2.61-5.82)	2..95(2.07-4.53)

Values expressed as Mean± SD for normal distributed data, and median and inter quartile range for abnormal distributed data such as TG. One way ANOVA test was used *p <0.001 differences between the groups for all groups. BMI=body mass index, SBP = systolic blood pressure, DBP = diastolic blood pressure, FBS = fasting blood sugar, TC = total cholesterol LDL = low density lipoprotein, HDL = high density lipoprotein, TG = triglycerides

Subjects were asked about their occupation and were classified accordingly as: Office or administrative worker, manual worker, house-wife, student, un-employed and those who had retired from an administrative post.

In Iran all individuals classified as being retired (with a pension) have previously held an administrative or governmental post.

Marital status was categorised as one of the following: Married, single (those who had never been married) and others (divorced, widowed). In Iran couples only cohabit if married.

Overweight and obesity were defined as 25 = BMI < 30 and = 30 respectively (Flegal *et al.*, 2002).

Statistical analysis: Statistical analysis was undertaken using SPSS version 11.5 (SPSS Inc, Chicago, IL, USA) with descriptive statistics (mean ± standard deviation (SD) for normally distributed data and median and inter quartile range for non-normal distributed data). ANOVA was used to compare continuous variables and a Chi^2 test was used for statistical analysis of qualitative data. Logistic regression analysis was used to examine the associations between overweight/obesity and the variables, while controlling for age and other confounding factors. All odds ratios were adjusted for confounding factors including age and gender.

Results

Characteristics of the sample populations: Among 4977 subjects aged 15-65 years, 49.8% were men. Clinical and biochemical characteristics of sample are shown in Table 1.

The overall prevalence of obesity was 13.7%, with 19.7% of women being obese; a significantly greater proportion than among men (7.8%, p<0.001). The overall prevalence of overweight was 29%. Again more women were overweight (30.5%) compared to men (27.7%, p=0.02, Table 2).

The prevalence of central obesity, defined by IDF criteria (48.6%) was higher than the prevalence when the ATPIII criteria were applied (31.3%). Women again had higher levels of obesity than men (Table 2). Overall, the frequency of obesity among the group of urban dwellers was higher than for the rural population (16.9% vs. 8.6%). The same pattern was observed for the prevalence of overweight, general obesity (p<0.001, Table 2) and central obesity (p<0.001, Table 2).

Proportionally fewer single individuals who had not been married had weight problems compared to married or divorced subjects. Widowed and divorced subjects had the greatest prevalence of obesity, whilst married people were found to be more likely to be in the overweight category (p<0.001, Table 2). Similar findings were observed for central obesity. After adjustment for age and gender, a significant difference between the groups remained for central obesity although the differences were no longer significant for differences in prevalence of general obesity. An inverse relationship was found between level of educational attainment and prevalence of central and general obesity (p < 0.001; Table 2). As educational attainment increased, the prevalence of obesity decreased. After adjustment for age and gender, a significant difference remained for general obesity, though not for central obesity. Within the six occupational groups, the prevalence of obesity was highest amongst housewives and lowest in the student group (22.6% vs.1.9%, Table 2). A similar pattern was observed for the prevalence of central obesity (p<0.001, Table 2). However after adjustment for age and gender, no significant difference remained between occupation subgroups for general and central obesity. The prevalence of overweight and obesity rose with

Table 2: Relationship between socioeconomic condition and obesity in Iranian population

		General Obesity			Central Obesity			
					IDF*		ATP III*	
		Normal	Overweight	Obese	No	Yes	No	Yes
	Number n (%)	2845(57)	1446(29)	686(13.7)	3410(68.7)	1570(31.3)	2559(51.4)	2421(48.6)
Gender	Male n (%)	1603(64.5)	684(27.7)[3c]	194(7.8)***[,3]	2206(88.3)	391(11.7)	1826(72.9)	683(27.1)
	Female n (%)	1242(49.8)	762(30.5)	492(19.7)	1204(48.7)	1269(51.3)	733(29.5)	1738(70.5)
Location	Urban n (%)	1580(50.9)	1003(32.3)[3b]	524(16.9)***[3]	2020(65.2)	1089(34.8)	1444(46.4)	1665(53.6)
	Rural n (%)	1262(67.5)	446(23.8)	162(8.6)	1390(74.3)	482(25.7)	1120(59.6)	756(40.4)
Marital Status	Married n (%)	1977(51.6)	1248(32.6)[3]	609(15.9)***[3]	2439(64.2)	1371(35.8)	1735(45.5)	2080(54.5)
	Single n (%)	772(81.5)	141(14.9)	34(3.6)	868(91.1)	89(8.9)	765(79.4)	198(20.6)
	W& D n (%)	91(47.2)	60(31.1)	42(21.8)	96(45.9)	110(54.1)	59(28.4)	143(71.6)
Educational	Illiterate n (%)	630(54.3)	330(28.4)[c,3]	200(17.2)***[3]	638(54.8)	527(45.2)	451(38.6)	715(61.4)
attainment	Less than 12 years n (%)	1543(58.1)	747(28.1)	368(13.8)	1853(70.3)	790(29.7)	1420(53.5)	1235(46.5)
	Up to 12 years n (%)	417(57.8)	221(30.6)	84(11.6)	553(76.4)	176(23.6)	419(58.2)	302(41.8)
	More than 12 years n (%)	247(57.4)	150(34.9)	33(7.7)	361(82.5)	76(17.5)	269(60.8)	169(39.2)
Occupational	Administrative worker n(%)	187(51.1)	147(40.2)	32(8.7)***	298(80.9)	69(19.1)	223(59.7)	149(40.3)
Status	Manual worker n (%)	1177(64.1)	494(26.9)	164(8.9)	1583(86)	259(14)	1299(70.2)	547(29.8)
	Housewife n(%)	866(44.5)	638(32.8)	440(22.6)	793(41.4)	1129(58.6)	433(22.5)	1490(77.5)
	Student n (%)	312(85)	48(13.1)	7(1.9)	349(93.4)	29(6.6)	309(83.8)	59(16.2)
	Retired n (%)	69(39)	76(42.9)	32(18.1)	129(68.9)	56(31.1)	73(39.9)	112(60.5)
	Unemployed n (%)	228(81.1)	44(15.7)	9(3.2)	258(91.1)	26(8.9)	222(78.3)	64(21.7)
	<20 n (%)	463(85)	71(13)3	11((2)***[3,c]	510(92.6)	40(7.4)	453(82.6)	99(17.4)
Age groups	20-29 n (%)	693(71.2)	218(22.4)	62(6.4)	789(82.6)	164(17.4)	649(67.9)	308(32.1)
	30-39 n (%)	541(56.6)	286(29.9)	128(13.4)	669(71)	279(29)	498(52.8)	455(47.2)
	40-49 n (%)	493(45.3)	387(35.6)	208(19.1)	659(60.7)	430(39.3)	459(41.8)	628(58.2)
	50-59 n (%)	396(44.9)	304(34.7)	179(20.3)	483(54.3)	413(45.7)	313(35.0)	578(65.0)
	>60 n (%)	259(48.1)	180(33.6)	98(18.2)	299(55.4)	244(44.6)	187(34.6)	353(65.4)

Values expressed as number (percent), ANOVA and Post hoc test is used for general obesity groups. ***p<0.001 between groups and [1]p<0.05, [2]p<0.01 and [3]p<0.001 between normal and overweight and obese groups and [a]p<0.05, [b]p<0.01 and [c]p<0.001 between obese and overweight people. Chi square test was used for central obesity. *p value is <0.001 for all groups of central obesity. W and D=widow and divorced ATP III = Adult Treatment Panel 3, IDF= International Diabetic Federation.

increasing age (Table 2) with the highest prevalence in the age category 50-59 year-old and then prevalence declined up to 65 years. As would be expected, significant differences were found among normal, overweight and obese with regards to levels of serum triglycerides, fasting blood glucose, diastolic blood pressure, systolic blood pressure, total serum cholesterol, LDL-C and HDL-C (Table 1).

Multifactorial analysis: After correction for possible confounding factors including demographic and socioeconomic factors in a binary regression model, urban-dwelling remained the major determinant of general obesity (p<0.001, Odds Ratio (OR) = 2.62 with 95% confidence interval CI (3.32-3.92)). Marital status also remained an important determinant of central obesity, with married individuals being more prone to obesity [p=0.01, OR=1.72 with 95%CI (1.1-2.69)]. Female gender was also associated with obesity.

Discussion

The prevalence of obesity is increasing worldwide and this is likely to be associated with an increasing prevalence of diabetes mellitus and cardiovascular disease (Poirier and Despres, 2003). Changes in lifestyle, in particular a reduction in physical activity and increasing consumption of foods of high energy density are likely to account for these change. (Hajian-Tilaki and Heidari, 2007b; Meshkani *et al.*, 2006). In this current study we have investigated the relationship between the prevalence of obesity and socioeconomic factors within a representative sample from North-east Iran. Obesity rates in Iran have been reported to vary from rural (21%) to urban (31%) populations, rising to 30% among women (Hajian-Tilaki and Heidari, 2007). The prevalence of obesity in Iran has increased rapidly during the recent past and this has been attributed to changes in lifestyle (Hajian-Tilaki and Heidari, 2007; Kelishadi *et al.*, 2003). But this has not been formally tested in a large population sample. The gender difference in the prevalence of obesity and overweight was found to be highly significant in our population and there are similar reports from other regions of the country (Hajian-Tilaki and Heidari, 2007; Mirmiran *et al.*, 2003). There have also been similar reports from other developing countries. A lack of physical activity may be one of the causes of the higher frequency of obesity among women and this is likely to be exacerbated by a low frequency of employment outside the home (Meshkani *et al.*, 2006). Age was strongly associated with obesity, as has been reported previously (Peixoto *et al.*, 2007). This association between obesity and age can be explained, in part, by a decrease in the physical activity with age. Furthermore, for women, BMI increases with parity and the post menopausal state (Tufano *et al.*, 2004). We found a strong association between place of residence and obesity in our study. Obesity was more common among the urban compare to rural sub-population (16.8% vs. 8.6%, p<0.001). In the developing world, obesity is an emerging health problem associated with a transition to a western lifestyle following a period of sustained economic growth.

Poorer health behaviors (energy-dense dietary intake and a sedentary lifestyle), fewer opportunities for physical activity and also the rapid transition from heavy labor activities to more sedentary professions and lifestyles are factors more often described in rural than urban regions that may contribute to this discrepancy (Hajian-Tilaki and Heidari 2007; Meshkani *et al*., 2006). Obesity was inversely associated with the level of educational attainment in our study which remained after adjustment for age and gender (Woo *et al*., 1999). This may be due to a healthier lifestyle in individuals who have been educated to a higher level and is in accord with other recent studies. Although obesity was more prevalent in widowed and divorced individuals, there was no significant difference in the prevalence of obesity with marital status on univariate analysis, although multivariate analysis did show that married individuals were at more risk of obesity. This may be explained by differences in levels of physical activity. Other researches have shown that the prevalence of obesity in married persons is higher than that in single and divorced subjects (Kahn *et al*., 1991; Sobal *et al*., 2003). Housewives were the most obesity prone group in our study and women engaged in domestic duties had a higher frequency of obesity than those who were employed. These results are concordant with the results of previous studies and may be due to levels of physical activity and access to food during the day (Hajian-Tilaki and Heidari, 2007g; Meshkani *et al*., 2006).

A low socio-economic status appears to be associated with an increased proneness to overweight and obesity. It is most likely that this is related to access to information on a healthy lifestyle and medical advice, although further research on the effects of poverty on food choices and obesity is needed (Wang *et al*., 2007). The study provides insights into the relationship between age, gender, marital status, socioeconomic factors (occupation, education) and obesity. Our results show that poorly educated individuals, particularly women, living in an urban setting are particularly prone to obesity. Community-based programs will therefore be required multiple strategies are required to combat the high rates of obesity and its subsequent complications in Northwestern of Iran.

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