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The Relationship between Demographic and Social Factors Associated with BMI among 25-60 Years Old Couples of Babol

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ABSTRACT

Objectives: Overweight and obesity is one of the major problems that can cause diseases physical, mental and social in people. Several factors may affect higher BMI (Body Mass Index). This study aimed to identify factors influencing BMI among 25-60 years old couples of Babol.

Methods: This cross-sectional study was performed in in spring 2014. The study population includes 25-60 year old couples who were selected by random cluster. Data collected through a researcher-made questionnaire containing 20 questions about demographic and social variables and 3 questions about for dependent variable. Validity and reliability of the questionnaire were approved. BMI was calculated and analyzed by SPSS18 software.

Results: The mean age and BMI male were 42.6±6.3 year and 26.5±4.3 and female 39.6±5.8 year and 29.8±6.2. Out of 439 male, 195 (44.4) were overweight and 77 (17.5) were obese and out of 470 female, 186 (39.6) were overweight and 203 (42.2) were obese. BMI of male was significantly associated with personal car, education, diabetes and hypothyroid, smoking, watching TV and consumption of soft drinks ($p<0.05$). BMI of female was significantly associated with personal cars and motorcycles, education, job, watching TV, sports and abortion ($p<0.05$).

Conclusion: The results of this study showed that some of demographic and social factors is effective in couples' BMI and relation other factors with BMI of male and female is different. It is recommended to design and implement some intervention programs for men and women based on the influence.

Keywords: BMI of couples, Overweight, Obesity, behavioral factors, Social factors.

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Introduction: Due to the high prevalence and significance of overweight and obesity as major health issues worldwide, their prevention and treatment strategies are of the highest priority in public health [1]. The prevalence of obesity among 12-19 year's old adolescents has tripled (from 5% to 18%) over the past three decades [2]. In 2010, the World Health Organization (WHO) estimated 1.3 billion adults around the world to be overweight/obese [3] and thus considered obesity as one of the top 18 targets of interventional programs [4].

Obesity and overweight elevate lipid levels and blood pressure [5, 6], increase the risk of type 2 diabetes, cancers, osteoarthritis, and cardiovascular, liver, gallbladder, and respiratory diseases in adulthood, and ultimately pose the risk of premature death [7-9]. They also multiply the risk of gynecological problems, such as infertility, and breast cancer in women [10].

The vast literature on the prevalence of overweight and obesity in different regions of Iran has mainly focused on children and adolescents. A previous study suggested about 60% of urban Iranian adults to be overweight or obese [11]. Mohammadi et al. evaluated the body mass index (BMI) of 6083 men and 7960 women over 20 years of age and found both overweight and obesity to be significantly more prevalent in women than in men (respectively 34.3% and 26.7% in women vs. 30% and 9.9% in men). They also detected a significant inverse relationship between weight gain and education level in women [12]. In district 13 of Tehran (capital of Iran), Azad Bakht et al. reported the mean BMI as 25.8 ± 4.1 kg/m2 in men and 27.3 ± 5.4 kg/m2 in women. Moreover, 14.2% of men and 29.1% of women were obese and there were significant relations between obesity and education level, marital status, and physical activity [13]. Mirmiran et al. evaluated the adult residents of district 13 of Tehran and noticed a relation between adopting the Western pattern diet and increased BMI. This relationship was stronger among overweight and obese people [14].

Previous studies have suggested the prevalence of overweight and obesity in Iran to be different from that in other populations [15]. Conflicting results have, in fact, been obtained on the effects of personal and socioeconomic factors on these problems [16, 17]. Due to the above-mentioned facts and the role of obesity in the development of various physical limitations and diseases, the design and implementation of appropriate and effective interventions based on the specific environmental conditions of each area requires the exact identification of the prevalence and determinants of obesity among its population. Therefore, this study aimed to determine the personal and behavioral factors affecting the BMI of 25-60 year's old couples in Babol (a city in northern Iran).

Material and Methods: This descriptive analytical cross-sectional study was conducted in spring 2014. The research population was 25-60 year's old couples residing in Babol. The sample size was determined as 504 couples using the sample size estimation formula (d = 4%, P = 0.3, Z = 95%). Given the broad range of the statistical population, cluster-sampling method was applied, i.e. 50 clusters were randomly selected considering the socioeconomic and

geographical conditions of Babol and its urban/rural population distribution. Houses in each cluster were visited and 10 couples (age: 25-60 year's old) who were living together at the time of study were selected.

A two-part researcher-made questionnaire containing both open- and closed-ended questions was used to collect data. The first part involved demographic variables such as gender, age, education level, occupation, job mobility, number of children, place of residence (urban or rural; apartment or otherwise), and owing a car, motorcycle, or bicycle. It also included items on behavioral patterns such as frequency of taking fast food, carbonated drinks, and tea, exercising and hiking (frequency and place over a week), and hours per day spent working with a computer, watching TV, and studying while sitting. The second part covered a number of dependent variables (e.g. weight, height, and BMI). The face validity of and reliability of the questionnaire were confirmed by five nutrition experts [18, 19] and a Cronbach's alpha of 0.91.

A non-elastic measuring tape (Seca, Japan) with an accuracy of 0.5 cm was used to measure height. Before the measurements, the participants were asked to take off their shoes, hats, and scarves, assume an upright position, and look straight ahead with their head, shoulders, buttocks, and heels touching the stadiometer. Each person's height was then measured by fitting a plastic set square perpendicular to the stadiometer and touching the subject's head. A Beurer scale (Germany) with an accuracy of 0.5 kg was used to measure weight. The subjects' weight was recorded while they stood still and had minimal clothing (without chadors, hats, coats, jackets, and shoes). Before the first measurement, the scale was set in an appropriate place and calibrated with a 2 kg control weight. The calibration was repeated after every five measurements. The participants' BMI was calculated by dividing their weight (in kg) by their height (in m) squared. In order to ensure accurate calculations, each person's BMI was compared with the value calculated by Microsoft Excel. According to the WHO, individuals with BMI < 18.5, 18.5 - 24.99, 25.0 - 29.99, and $\geq$ 30 kg/m^2 were categorized as underweight, normal-weight, overweight, and obese, respectively [20].

Answers to open- and closed-ended questions were entered into Microsoft Excel as discrete/continuous quantitative values and allocated codes, respectively. The data were analyzed in SPSS 18.0 (SPSS Inc., Chicago, IL, USA). Pearson's and Kendall's correlation coefficients were performed to determine the correlation between ordinal variables. Student's t-tests and analysis of variance (ANOVA) were carried out to compare the mean values. Chi-square tests were also applied for the analysis of qualitative variables. All analyses were conducted at a significance level of $\alpha < 0.05$.

Results: A total of 472 women (mean age: 39.6 ± 5.8 years; range: 25-55 years) and 439 men (mean age: 42.6 ± 6.3 years; range: 30-60 years) were recruited in this study. The mean BMIs of men and women were 26.5 ± 4.3 and 29.8 ± 6.2 kg/m2, respectively. The calculated BMIs showed five (1.1%), 162 (36.9%), 195 (44.4%), and 77 (17.5%) men to be respectively underweight, normal-weight, overweight, and obese. The corresponding frequencies in women were one (0.2%), 80 (0.17%), 186 (39.6%), and 203 (43.2%). Table 1 shows the couples' BMI.

Table 1. The studied couples' body mass index (BMI), Babol, Iran

Men's BMI	Women's BMI			Total
	Normal	**Overweight**	**Obese**	
Normal	44 (38.8)	63 (38.4)	57 (34.8)	164 (100)
Overweight	21 (11.0)	84 (44.0)	86 (45.0)	191 (100)
Obese	9 (11.7)	27 (35.1)	41 (53.2)	77 (100)
Total	74 (17.1)	174 (40.3)	184 (42.6)	432 (100)

Table 2. The relationship between having a personal/family car and men and women's body mass index among couples living in Babol, Iran

Owing a car	Men				Women			
	Normal	**Overweight**	**Obese**	**Total**	**Normal**	**Overweight**	**Obese**	**Total**
Yes	64 (28.8)	111 (48.8)	49 (21.9)	224	25 (11.2)	86 (38.7)	111 (50.0)	222
No	103 (48.6)	72 (38.7)	27 (12.7)	212	50 (23.7)	87 (41.2)	74 (35.1)	211
Total	167 (30.3)	193 (44.3)	76 (17.4)	436	75 (17.3)	173 (40.0)	185 (42.7)	433

Table 3. Frequency of levels of education among normal-weight, overweight, and obese men and women (based on body mass index) in Babol, Iran

Education	**Men**				**Women**			
	Normal	**Overweight**	**Obese**	**Total**	**Normal**	**Overweight**	**Obese**	**Total**
Illiterate	16 (69.8)	1 (4.3)	6 (26.1)	23	17 (30.9)	21 (38.2)	17 (30.9)	55
Literate/elementary school	57 (39.9)	58 (40.6)	28 (19.8)	143	30 (17.8)	55 (32.5)	84 (49.7)	169
Junior high school	48 (36.9)	62 (47.7)	20 (15.4)	130	15 (13.6)	53 (48.2)	42 (38.2)	110
High school and diploma	33 (33.7)	49 (50.0)	16 (16.3)	98	16 (13.8)	46 (39.7)	54 (46.6)	116
University degree	9 (23.7)	23 (60.5)	6 (15.8)	38	3 (18.8)	9 (56.3)	4 (25.0)	16
Total	163 (37.7)	193 (44.7)	76 (17.6)	432	81 (17.4)	184 (39.5)	201 (43.1)	466

Chi-square test revealed a significant relationship between men and women's BMI ($P < 0.001$). Kendall's correlation coefficient also suggested a significant direct relationship between BMI grouping in men and women ($P < 0.001$; $r = +0.180$).

From a total of 439 couples, 222 couples (50.6%) owned a car, 100 couples (22.8%) had motorcycles, and 129 couples (29.4%) had personal or family bicycles. While having a family motorcycle was significantly related with women's BMI ($P = 0.038$), it had no significant relationship with men's BMI ($P = 0.290$). Neither women's, nor men's BMI was significantly related with having a bicycle ($P = 0.718$ and 0.227, respectively). As seen in Table 2, there was a significant relationship between having a personal/family car and both men and women's BMI ($P = 0.002$ and 0.003, respectively).

While most men and women had elementary school level of education, illiteracy and university degrees had the least frequency among men and women, respectively (Table 3).

According to chi-square tests, there was a significant relationship between level of education and both men and women's BMI (P = 0.012 and 0.017, respectively).

As Table 4 shows, chi-square tests indicated significant relationships between men's BMI and history of diabetes and hypothyroidism, smoking cigarette, carbonated drinks intakes, and number of hours spent in front of TV. Women's BMI was significantly related with their occupation, exercise activities, and number of hours spent watching TV. Overall, 470 women had a history of pregnancy and at least one child. Among the variables related to reproductive behavior, there was only a significant direct relationship between the number of abortions and women's BMI (P = 0.019; r = +0.109).

Table 4: The relationship between sociodemographic variables and body mass index (BMI) of couples living in Babol, Iran

Sociodemographic factors		Men				Women			
		Frequency		BMI	P	Frequency		BMI	P
		n	%			n	%		
Type of home	Apartment	71	16.7	27.6 ± 5.5	0.231	71	16.7	29.3 ± 4.2	0.628
	Other	354	83.3	26.2 ± 4.0		354	83.3	29.9 ± 4.6	
Occupation	Employee	41	9.3	27.8 ± 3.6	0.331	16	3.4	28.6 ± 5.0	0.033
	Worker and farmer	135	30.5	26.1 ± 3.8		10	2.1	26.2 ± 3.5	
	Self-employed and other	267	6.3	24.4 ± 4.6		21	4.4	29.6 ± 3.4	
	Housewife					427	90.1	29.9 ± 6.4	
Job physical mobility	Low	70	15.9	27.4 ± 4.8	0.093	81	17.0	29.3 ± 4.6	0.244
	Medium	229	51.9	26.0 ± 3.7		295	62.3	30.3 ± 7.1	
	High	142	32.2	25.5 ± 4.0		98	20.7	25.6 ± 3.8	
History of cardiovascular diseases	Yes	23	5.2	26.7 ± 4.7	0.322	38	8.0	29.8 ± 5.2	0.199
	No	421	64.8	26.4 ± 4.3		439	92.0	29.8 ± 6.3	
History of diabetes	Yes	22	5.0	28.8 ± 4.5	0.004	23	4.8	33.1 ± 7.4	0.238
	No	422	95.0	26.3 ± 4.3		454	95.2	29.6 ± 6.1	
A first-degree relative with type 1 diabetes	Yes	132	30.0	26.9 ± 3.9	0.170	170	35.8	30.4 ± 5.3	0.218
	No	308	70.0	26.3 ± 4.5		305	64.2	29.5 ± 6.7	
History of hypothyroidism	Yes	13	2.9	29.3 ± 4.6	0.010	28	5.9	26.6 ± 5.7	0.658
	No	431	97.1	26.4 ± 4.3		446	94.1	29.9 ± 6.2	
History of mental illness	Yes	33	7.4	26.4 ± 3.8	0.367	62	13.1	28.8 ± 4.6	0.564
	No	410	92.6	26.5 ± 4.4		413	86.9	29.9 ± 6.4	
Frequency of smoking (cigarettes or pipes)	Never	334	75.5	26.9 ± 4.4	0.004	473	99.2	29.9 ± 6.2	0.397
	Sometimes	29	6.5	26.2 ± 3.2		4	0.8	25.6 ± 3.6	
	Once a day and more	81	18.2	24.9 ± 4.0		-	-	-	
Frequency of smoking hookah	Never	404	91.2	26.4 ± 4.3	0.827	476	100	29.8 ± 6.2	-
	Sometimes	29	6.5	27.1 ± 4.2		-	-	-	
	Once a week and more	10	2.3	26.8 ± 4.0		-	-	-	
Frequency of fast-food consumption (per week)	Never/occasionally	398	89.8	26.5 ± 4.4	0.817	447	93.7	29.8 ± 6.2	0.838
	1-2 times	42	9.5	36.1 ± 3.8		29	6.1	30.3 ± 5.9	

	3 times and more	3	0.7	25.3 ± 2.7		1	0.2	26.4 ± 0	
Frequency of carbonated drinks intake (per week)	Never/occasionally	384	79.1	26.7 ± 4.5	0.025	414	86.8	29.8 ± 6.3	0.974
	One to two times	73	16.5	25.5 ± 3.4		53	11.1	30.0 ± 5.7	
	Three times and more	19	4.4	26.0 ± 4.9		10	2.1	30.3 ± 4.4	
Tea consumption	With sugar	386	87.9	26.3 ± 3.9	0.189	427	89.7	29.8 ± 6.3	0.204
	Without sugar	37	8.4	27.7 ± 7.0		35	7.4	31.2 ± 5.8	
	No tea	16	3.6	28.2 ± 4.4		14	2.9	28.3 ± 3.5	
Frequency of scheduled, uninterrupted hiking for at least 30 minutes (per week)	Never/occasionally	302	68.3	26.8 ± 4.6	0.485	338	70.9	29.6 ± 6.6	0.982
	1-2 times	65	14.7	26.1 ± 3.8		68	14.3	29.9 ± 5.3	
	3-4 times	29	6.6	25.1 ± 3.7		29	6.1	30.1 ± 5.1	
	5 times and more	46	10.4	25.4 ± 3.6		42	8.8	30.0 ± 5.2	
Frequency of scheduled, uninterrupted exercise for at least 30 minutes (per week)	Never/occasionally	347	75.5	26.3 ± 4.1	0.111	442	92.9	29.8 ± 6.3	0.019
	1-2 times	72	16.3	27.3 ± 5.4		15	3.2	30.7 ± 5.7	
	3 times and more	23	5.2	27.0 ± 3.4		19	5.1	29.2 ± 4.8	
Number of hours per day spent working with computers, laptops, and tablets	Never/occasionally	398	90.7	26.5 ± 4.4	0.779	464	97.7	29.8 ± 6.3	0.888
	< 1	15	3.4	26.7 ± 4.0		7	1.5	30.9 ± 3.2	
	≥ 1	26	5.9	26.9 ± 3.2		4	0.8	29.6 ± 6.1	
Number of hours per day spent watching TV	Never/occasionally	21	4.8	25.8 ± 3.7	0.039	27	5.7	29.4 ± 4.2	0.021
	< 1	70	16.1	26.3 ± 4.7		71	15.0	28.6 ± 6.3	
	1-2	161	37.0	26.0 ± 3.7		154	32.5	29.4 ± 5.1	
	2-3	110	25.3	26.6 ± 3.8		115	24.3	30.4 ± 5.6	
	> 3	73	16.8	27.8 ± 5.8		107	22.6	30.7 ± 8.8	
Number of hours per day spent studying while sitting	Never/occasionally	344	78.2	26.3 ± 5.8	0.280	330	69.8	29.7 ± 8.8	0.288
	< 1	61	13.9	27.0 ± 5.9		91	19.2	29.8 ± 9.0	
	1-2	24	5.5	27.9 ± 3.4		41	8.7	30.7 ± 4.8	
	> 2	11	2.5	27.4 ± 3.1		11	2.3	30.3 ± 3.0	

Discussion and Conclusion: Over 60% of men and 80% of women in the present study were overweight or obese. The higher rates in this study compared to reported by previous studies in Iran can be justified by several reasons. First, we only recruited married people among whom higher BMI, as well as higher frequency of overweight and obesity, is expected [21, 23]. Moreover, obesity and overweight are believed to have higher frequency in northern provinces of Iran, especially Mazandaran, where people enjoy relative economic prosperity, have access to a variety of foods, and live a sedentary lifestyle due to the mechanization of agricultural tasks [24]. The date of this study might have also been responsible for the mentioned difference, i.e. later studies generally show higher rates of overweight and obesity. This is of course alarming as it reflects a rising trend in the incidence of overweight and obesity [24].

Similar to previous research [25, 28], we found overweight and obesity to be more common in women than in men. Serahati et al. reported the rate of obesity as 31.7% in women and 18.9% in men [21]. Less physical activity, lower employment rates, pregnancies, and depression are considered as major causes of higher frequency of obesity in women [29, 31].

An interesting finding of the current study was the significant relationship between the husband and wife's BMI. While no similar study has confirmed or rejected such a relationship, it seems logical due to the couples' similar lifestyle. In fact, after several years of living together, the couples are influenced by mutual and collective behaviors and thus share their family behaviors. Hence, if large servings of high-calorie foods are served in a house, both the husband and the wife will receive excessive calories and thus gain weight following their consumption.

According to our findings, owning a car was significantly related with the couple's BMI. This relationship can be suggestive of economic and behavioral conditions. More precisely speaking, owning a car can reflect a more favorable economic status which can in turn lead to more food intake and less physical activity and indirectly cause weight gain and obesity [32]. In addition, having a personal car will minimize a person's physical activity (walking in particular), i.e. people tend to park their cars in places where they need to take the fewest steps to get to their destinations. This can contribute to weight gain and obesity both directly and indirectly, i.e. the individual gradually gets used to inactivity or very low physical activity and does not burn his/her received calories.

Our findings indicated a significant relationship between education level and both men and women's BMI. Other researchers have also confirmed an association between higher rates of obesity and lower education [21, 33, 35]. A significant inverse relationship was also found between parents' education and students' BMI in Turkey [36] and Syria [37]. Higher education and greater knowledge about correct dietary habits and factors preventing obesity and its physical and psychological complications can, in fact, contribute to the lower BMI of couples and their children.

Surprisingly, we failed to establish a significant relationship between BMI and the frequency of exercise activities and hiking. In contrast, Momenan et al. reported an inverse relationship between physical activity and BMI [39]. Studies in other countries have also inroduced leisure time physical activity as a protective factor against obesity [40,41]. Furthermore, obesity was more strongly associated with leisure time physical activity than with physical activity at work [42]. The absence of a significant relationship between physical activity and BMI in the present study can be justified by the low level of physical activity among our participants (only about 30% of the couples were physically active). Momenan et al. reported 49.9% of men and 56.5% of women to be involved in regular leisure time physical activity [39].

Similar to previous research on students [18, 19, 43], we found no significant relationship between the couples' BMI and the frequency of fast food consumption. However, a number of studies in Iran have reported a direct relationship between dietary fat intake and the frequency of obesity. Moreover, in

comparison to Mediterranean and traditional Iranian diet, Western pattern diet has been suggested to be associated with significantly higher frequency of overweight [44, 45]. The absence of a significant relation between fast food consumption and obesity (in the present study and similar research) may indicate that the frequency of fast food consumption in Iran, especially in small cities, has not reached harmful levels and cannot hence be regarded as an independent risk factor for overweight and obesity. Therefore, further evaluations of the number of meals, intake of various food items, and received calories would be necessary to determine the relationship between nutrition and BMI.

Our assessments revealed that among various leisure time activities, such as working with computers, watching TV, and studying, only the number of hours spent watching TV was significantly related with the participants' BMI. Likewise, Maffis et al. [46] and Berkey and Rocket [47] reported a significant direct relationship between the number of hours spent in front of TV and BMI. The low frequency of individuals who worked with computers or studied in the present research might have been responsible for the absence of significant relationships between these two variables and BMI. In fact, more than 97% of women and 90% of men did not work with computers every day. Furthermore, merely 30% of women and 12% of men studied (mainly less than an hour a day).

Another finding of the current study was the significant relationship between smoking cigarettes and BMI in men. Consistent with our findings, Serahati et al. detected significantly lower frequency of obesity in smokers than in non-smokers [21]. Other researchers have also indicated an inverse relationship between cigarette smoking and obesity in both men and women [48,49]. However, due to the low number of female smokers in our study, we could not establish a relationship between cigarette smoking and BMI in women.

Lack of access to a number of the selected individuals in urban areas was a limitation of the present study. In fact, despite at least three times of follow-up, 20% of men and 10% of women in urban areas did not participate in the study due to their absence or lack of consent. Since residents of urban areas generally enjoy higher socioeconomic conditions, the mentioned limitation might have affected the results of the study.

Considering the alarming frequency of overweight and obesity among the studied population, serious and effective interventions are warranted. The following recommendations can be made based on our findings:

1. Educational programs targeting large groups of the population, especially the less educated groups, need to be designed and implemented in cooperation with mass media.

2. Recreational activities, such as hiking and exercise, should be encouraged as socially acceptable behaviors by providing the required facilities in collaboration with local institutions including the Physical Education Organization, Municipality, and County Seat.

3. Practical measures have to be taken to discourage the use of private cars by modifying public behaviors and cultural beliefs.

4. Educational programs for overweight and obesity prevention in adults need to focus more on individuals with a family history of diabetes.

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