Perceived underlying causes of obesity among overweight and obese women: An exploratory factor analysis

Zeinab Nikniaz[a], Reza Mahdavi[b,*], Alireza Ostadrahimi[b] and Leila Nikniaz[c]

[a]Student Research Committee, Tabriz University of Medical Sciences, Tabriz, Iran
[b]Nutrition Research Centre, Tabriz University of Medical Sciences, Tabriz, Iran
[c]Tabriz Health Services Management Research Center, Tabriz University of Medical Sciences, Tabriz-Iran

Abstract.

OBJECTIVES: The underlying causes of obesity and their association with Body Mass Index (BMI) and demographic factors among overweight and obese women were identified.

STUDY DESIGN: Cross sectional study, exploratory factor analysis.

METHODS: A questionnaire including 26 possible causes of obesity was completed by 300 overweight and obese women. An exploratory factor analyses and multiple linear regression analyses were performed.

RESULTS: The most important reported causes of obesity were eating rice (80.9%), dinner (77.7%), bread (77.1%) and being physically inactive (77.2%). A factor analysis revealed four factors, accounted for 36.9% of total variance in the original 26 variables. Provisional names were assigned to these 4 factors namely effect of eating large amount of energy dense snacks and fast foods, consuming a lot in main meal and lack of physical activity, family members, non-hunger related eating. In regression model, after adjusting for other covariables, socioeconomic status had significant correlation with two factors including "effect of non-hunger relating eating" (beta = 0.22, p-value = 0.002) and "effect of family members" (beta = 0.17, p-value = 0.01). Being married had a significant positive association with the factor "effect of family members" (beta = 0.15, p-value = 0.04).

CONCLUSION: Considering the importance of dietary and physical activity factors as perceived underlying causes of obesity, for developing effective obesity prevention strategies these factors should be taken in to account.

Keywords: Obesity, overweight, women, perceived causes

1. Introduction

Obesity is the most common nutritional disorder in the developed countries and is assuming to become a health problem in developing countries [1]. According to global estimate by World Health Organization (WHO), there were about 1.5 billion overweight adults aged 20 years and above and among them at least 200 million adults were obese in 2008 [2]. Similarly to many other developing countries, Iran is rapidly moving along lines of epidemiologic, demographic, and nutrition transition. The prevalence of adulthood overweight and obesity were 49.7% and 63.9% in Iranian male and female respectively, suggested the higher prevalence in female population like developed countries [3].

Being overweight and obese is of great concern, since it have been associated with increased morbidity and mortality from various chronic diseases, including coronary heart disease, diabetes, and several cancers [4]. Besides, Obesity also places enormous financial burdens on governments and individual [5].

*Corresponding author: Reza Mahdavi, Golgasht St., Attarneishabouri Ave., nutrition faculty, Tabriz University of Medical Sciences, Tabriz, Iran. Tel.: +984113341113; Fax: +984113340634; E-mail: mahdavirez@hotmail.com.

The underlying causes of obesity are multi-factorial in origin involving a complex interplay of genetic, behavioral, and environmental influences on metabolism, diet, and activity. Genetics undoubtedly plays an important role in the occurrence of obesity but the rapid increase in the prevalence of obesity emphasizes the role of behavioral and environmental factors, because genetic changes could not occur at this rate. Besides, environmental factors may affect the phenotypic expression of these genes [5, 6]. So it seems more plausible that the increasing weight of most populations is an appropriate biological response to an abnormal environmental factors, characterized by easy availability of cheap, energy dense food, growing number of fast food restaurants, coupled with massive decline in physical activity levels in the population.

Considering these environmental and behavioral causes of obesity, many treatment programs have been launched with the aim of changing these factors. Although these programs are important strategies at an individual level, however over the long term, this approach had met limited success at a population level. Thus nowadays, there is more emphasizing on prevention programs for reducing rates of obesity across the population [5].

In order to stop or even reverse the trend toward increasing body weight and also to develop appropriate and effective obesity prevention strategies especially for women as a more susceptible group, the root causes of the problem must be determined. So the aim of this study was to identify the underlying causes of obesity and their association with BMI and demographic factors and also defining relative importance of a range of personal, social and environmental factors as perceived causes of obesity among overweight and obese women.

2. Materials and methods

In the present cross-sectional study a total of 300 overweight and obese volunteered women recruited from an outpatient clinic on primary and referred patients belonging to Tabriz University of Medical Sciences by convenience sampling from March to June 2011. Subjects were included if they had age between 18–65 years, BMI over 25 kg/m^2, not being athletes, pregnant or breastfeeding. The nutrition research center of Tabriz University of medical sciences approves this study and a written informed consent document was obtained.

2.1. Measures

To the best of our knowledge there was no standard questionnaire addressing underlying causes of obesity in overweight and obese women. So in present study, obesity causes were measured using a questionnaire contained 26 Likert statements. It was developed for this study by extensive review of the pertinent literature (identified by a search of the Medline database) and consultation with experts and a sample of overweight and obese women.

In a pilot study, the test-retest reliability of questionnaire was tested in a random sample of 30 women. The generated 26-item scale had intraclass correlation coefficients ranged from 0.41 to 0.73, with a mean of 0.61 ± 0.14.

The questionnaires were administered by a trained professional nutritionist and women were required to rate the degree to which they believe each behavior contributes to their obesity. Scale anchor points ranged from 1 (does not contribute at all) to 4 (contributes the greatest amount). In addition, subjects were asked to indicate their age, marital and socioeconomic status (including employment, educational status and salaries) using a general information questionnaire.

Body-weight was measured to the nearest 0.1 kg on a Seca digital weighing scale, and height was measured to the nearest cm, with bare feet using a stadiometre. Body mass index (BMI) was calculated from body-weight and height (kg/m^2). The WHO definition of overweight as BMI of 25–29.9 kg/m^2 and obesity class I as a BMI of 30–34.99, class II as a BMI of 35–39.99 and class III as BMI of greater than 40 was used.

2.2. Statistical analysis

Participants' characteristics were described using means, standard deviations, and percentages wherever appropriate. An exploratory factor analyses were performed with the 26 items concerning possible causes of obesity, to identify underlying patterns of relationships among individual items, and to reduce and simplify the items in order to facilitate subsequent analyses. Principal components analysis with varimax rotation was used. An eigenvalue of >1 was used for extraction of factors with subsequent varimax rotation. For any cross-loading items (i.e. items that had

loadings of greater than 0.3 on more than one factor), only the higher loading was taken into account when calculating final factor scores. Kaiser's measure of sampling adequacy was used to confirm the appropriateness of factor analysis [7]. Standardized factor scores were computed for each factor, with a large positive score representing more important cause and a large negative score, less important causes. Pearson correlations between standardized factor score, age and BMI and also spearman correlations between Standardized factor score, SES and marital status were calculated. Finally using a multiple linear regression analysis, the association between obesity causes (as a dependent factor) and demographic variables such as marital and SES and also BMI (as an independent factor) was assessed.

3. Results

3.1. Participant characteristics

Table 1 outlines the demographic and anthropometric characteristics of 300 overweight and obese women. Mean age of participants was 34.04 ± 10.67 ranging from 18–52 years. The mean weight of participants was 80.4 ± 13.7 kg and BMI was 32.0 ± 5.4 kg/m^2. Approximately 44% had a college degree, 23.5% were currently employed, and 79% were married.

3.1.1. Perceived causes of obesity

The proportion of women reported each perceived causes of obesity were shown in Table 2. Combining the response categories "high effect" and "severe effect", Eating large amount of rice (80.9%), dinner (77.7%), bread (77.1%) and

Table 1
Anthropometric and demographic characteristics of subjects ($n = 300$)

Continuous variables	Mean	SD
Age (years)	34.04	10.64
Weight (kg)	80.45	13.78
Height (cm)	158.62	5.92
BMI (kg/m^2)	32.0	5.40
Categorical variables	frequency	percentage
BMI categories		
25–29.99	104	34.66
30–34.99	112	37.33
35.39.99	52	17.33
>40	32	10.66
Marrital status		
Single	27	21
married	273	79
Employment status		
Employed	67	22.33
Unemployed	195	65
Student	38	12.66
Education		
High school or low	201	67
BSc degree	90	30
MSc/Ph.D degree	9	3
Socio-economic status		
Low	142	47
Medium	99	33
High	60	20

Table 2
Result of exploratory factor analysis of perceived causes of obesity among overweight/obese women ($n = 300$)

Causes of obesity	Factor loading	No effect (%)	low effect (%)	high effect (%)	Sever effect (%)
Factor 1: eating energy dense snacks and eating out (eigenvalue = 4.13, 14.77% variance)					
EFFECT OF					
Frequently eating large amount of snacks	0.43	34.2	24.5	26	13.3
Frequently eating large amount of junk foods	0.65	33.5	13.7	22.8	29.9
Frequently eating large amount of sweets/cake	0.65	16.7	12.6	32.8	37.9
Frequently eating large amount of nuts	0.59	36.4	20.7	26.8	16.2
Frequently eating Fast foods	0.72	36.9	24.7	23.7	14.6
Frequently eating regular outdoor foods	0.64	42.4	29.8	20.7	7.1
Frequently eating large amount of Fried foods	0.48	18.7	21.2	41.4	18.7
Frequently drinking fizzy/sweetened drinks	0.59	31.3	13.6	26.3	28.8
Eating while cooking	0.46	66.7	8.67	37	6.1
Eating when not hungry	0.50	38.9	10.6	42.4	8.1
Frequently eating a lot in social gathering	0.50	35.4	22.7	30.8	11.1
Eating rapidly	0.32	20.2	6.60	50	23.2
Factor 2: consuming a lot in main meal and lack of Physical activity (eigenvalue = 2.23, 7.97% variance)					
EFFECT OF					
Frequently eating large amount of breakfast	0.59	35.7	25.5	30.6	8.2
Frequently eating large amount of lunch	0.74	13.8	19.9	53.1	12.2
Frequently eating large amount of dinner	0.38	5.1	11.2	33.8	43.9
Frequently eating too much bread	0.54	8.6	6.2	52.9	24.2
Frequently eating too much rice	0.36	3.5	23.6	43.5	37.4
Long Sleep duration	0.44	42.9	8.6 0	37.4	11.1
Being physically inactive	0.41	18.2	4.50	43.9	33.3
Factor 3: family members) (eigenvalue = 2.09, 7.49% variance					
EFFECT OF					
Husband	0.68	64.5	7.6	20.8	6.1
Children	0.69	70.6	12.7	11.2	4.5
Leftovers	0.50	10.3	24.7	38.2	26.8
Lack of information regarding calories of foods	−0.45	38.9	10.6	42.4	8.1
Factor 4: non-hunger related eating (eigenvalue = 1.85, 6.61% variance)					
EFFECT OF					
Eating more when happy	0.63	68.7	11.1	16.7	3.5
Eating more when unhappy/anxious	−0.63	38.9	7.1	31.8	22.2
Frequently eating too much refined sugar	0.40	35.4	24.4	28.3	12

Table 3
Regression coefficient for the association between obesity causes and BMI and demographic factors

Factors	BMI			SES			Being married		
	B(SD)	Beta	*p*-value	B(SD)	Beta	*p*-value	B(SD)	Beta	*p*-value
F1: eating energy dense snacks, fact foods and eating out	0.09(0.01)	0.046	0.511	0.052(0.08)	0.041	0.55	0.235(0.18)	0.09	0.213
F2: consuming a lot in main meal and lack of physical activity	0.02(0.01)	0.11	0.119	−0.11(0.09)	−0.08	0.228	0.09(0.19)	0.04	0.62
F3: family members	0.014(0.01)	0.076	0.296	0.22(0.09)	0.173	0.01	−0.37(0.19)	−0.15	0.04
F4: non hunger relating factors	0.017(0.01)	0.09	0.213	−0.215(0.09)	0.167	0.02	−0.10(0.19)	−0.04	0.604

Regression model was adjusted for age, BMI, SES and marital status. BMI: Body Mass Index. SES: Socio-economic status.

being physically inactive (77.2%) were common perceived causes of obesity reported by women. Less commonly reported causes included effect of short sleep duration, effect of children and sibling and also eating more when happy and while cooking.

3.2. Factor analysis of perceived causes of obesity

A large number of correlations lay above the recommended cut-off of 0.3. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.701 and Bartlett's test of sphericity was significant at the $P < 0.0001$ level. A 4-factor model was found that accounted for 36.9% of total variance in the original 26 variables. Factor loadings for each group were shown in Table 2. Provisional names were assigned to these 4 factors namely effect of eating large amount of energy dense snacks and fast foods, consuming a lot in main meal and lack of physical activity, family members, non-hunger related eating.

3.3. Association between factors of obesity causes and demographic characteristics

The regression models for the association between determined factors and BMI, SES and marital status were shown in Table 3. After adjusting for other covariables, Socioeconomic status had significant correlation with the third and fourth factors namely effect of non-hunger relating eating (beta = 0.22, *p*-value = 0.002) and effect of family members (beta = 0.17, *p*-value = 0.01). Being married had a significant positive association with the factor "effect of family members" (beta = 0.15, *p*-value = 0.04).

4. Discussion

In the present study, the most perceived contributing factors of obesity faced by overweight and obese women were eating a large amount of bread, dinner, and rice and also being physically inactive.

It was reported that approximately 66% of daily energy intake of Iranians derived from carbohydrates [8] and eating too much carbohydrates including rice and bread is the major characteristics of the Iranian traditional dietary pattern. These grains have high glycemic index (GI) [9], so induce hormonal and metabolic changes that lead to overeating in obese subjects [10].

Eating a large amount of dinner is the next most important perceived cause of obesity. Unlike western dietary pattern, Iranian usually eats dinner late. Some previous studies reported that obese individuals have a meal pattern with consumption later in the day compared to non-obese [11, 12]. It has been indicated that satiety ratio shows a marked decline over the course of the day and becomes quite low during the late evening thus during the evening, people become much less satisfied by intake and may be more vulnerable to overeating [13].

Being physically inactive perceived as a fourth important contributing factors to obesity. Some studies have shown the association of physical inactivity and being overweight. Iranian women were reported to be inactive in the earlier study. A national survey had revealed that nearly 33% of Iranian women were not physically active [14].

The present study is unique in providing an insight into the relative importance of a range of factors as perceived underlying causes of obesity. Results of factor analysis showed that one common factor was not sufficient to underlie the cause of obesity and four factors were extracted in the exploratory factor analysis to explain the majority of the variance in the studied obesity causes. Dietary factors including eating large amount of energy dense foods for snack and eating out and eating a large amount of main meal and being physically inactive accounted for the largest proportion of the total variance (approximately 22.74% of total variance) that is in concordance with the results of previous studies which revealed that food choice and other dietary habits were the important underlying causes of a wide-ranging of obesity determinants [15–20]. In study in UK, eating pattern including eating energy dense foods as snack and eating out is one of the major risk factors for obesity [20]. Bertéus Forslund et al illustrated that obese women and men were more frequent snackers than normal weight subjects and women were more frequent snackers than men [16]. Consuming sweets, fatty food groups like fried foods and also junk foods as a snack were contributed considerably to energy intake. Besides, it was shown that Frequency of fast food restaurant use as a main meal or between meals was associated with higher fat and energy intake, greater body weight, more frequent intake of French fries and soft drinks, less restrained eating, and fewer low-fat eating behaviors [17, 18]. "Long sleep duration" and "being physically inactive" were other items perceived to contribute to obesity. A causal link between these variables could operate in either direction. Low levels of exercise could make one feel less energetic, resulting in long sleep and on the other hand, there is evidence suggesting that long sleep duration may cause a person to become less active. In previous studies it was shown that individuals who take part in regular physical activity or exercise, particularly of moderate or greater intensity, are less likely to be overweight or obese [15].

Effect of family members including husband and children on obesity is the next factor in our factor analysis. Some married individuals may eat more as part of a role obligation to their spouse and may be more exposed to snack foods of their children, which would lead to increased parental obesity. As reported by Janghorbani et al, marital status may influence obesity through affecting the amount of energy intake, energy expenditure, and also metabolic changes [19]. It was postulated that some married individuals may eat more as part of a role obligation to their spouse and may be more exposed to snack foods of their children, which would lead to increased parental obesity [19]. Non hunger related eating is another underlying perceived factor of obesity. These results were in accordance with the findings of Chambers and Swanson (2006) and Ozier et al. (2008) who showed that individuals who eat in response to emotion and/or stress are more likely to be overweight or obese [20, 21].

As presented in Tables 3, socioeconomic status had positive correlations with non-hunger relating eating that may explained by the availability of food. In this current society of abundance, food has taken on a meaning way beyond its nutrient value, and as a result, most of people have lost the sensation of what it really means to be hungry. The next substantial relationship was found between the effect of family members on obesity with socio-economic and marital status. Changing of dietary pattern after marriage had shown in a previous study. It was indicated that shared marital status from living in a common household creates responsibilities for eating together and provides social support [19].

A limitation of the present study was the self-report nature of the data which affect the accuracy of the present findings. Future research in this area should consider broadening this or similar questionnaires to include additional causes of obesity as well as testing this questionnaire on other obese individuals with different sex and culture.

In conclusion, studied overweight and obese women mostly perceived eating bread, dinner, rice and being physically inactive as important contributors to obesity. Besides, the factor analysis highlights four factors as underlying causes of obesity, among them dietary factors including eating energy dense foods for snack/eating out, eating a lot in main meal and being physically inactive accounted for the largest proportion of the total variance. So in developing appropriate and effective obesity prevention strategies, these underlying causes of obesity faced by Iranian women especially dietary and physical activity factors should be taken into account.

Competing interest

The author declare no competing interest.

References

[1] Mirzazadeh A, Sadeghirad B, Haghdoost AA, Bahrein F, Rezazadeh Kermani M. The Prevalence of Obesity in Iran in Recent Decade; a Systematic Review and Meta-Analysis Study. Iranian J Publ Health. 2009;38:1-11.

[2] World Health Organization. Obesity and overweight. Available online: http://www.who.int/mediacentre/factsheets/fs311/en/index.html (accessed on sep 25, 2011)

[3] Ayatollahi SM, Ghoreshizadeh Z. Prevalence of obesity and overweight among adults in Iran. Obes Rev. 2010;11(5):335-7.

[4] WHO, Report of a WHO consultation on obesity, Preventing and managing the global epidemic. Geneva: World Health Organization, 1997, 3-5.

[5] Gill T, King L, Caterson I. Obesity prevention: Necessary and possible. A structured approach for effective planning. Proc nutr soc. 2005;64:255-61.

[6] Barsh GS, Farooqi S, O'Rahilly S. Genetics of body-weight regulation. Nature. 2000;404:644-51.

[7] Tabachnick BG, Fidell LS: Using multivariate statistics. New York: HaperCollins College; 1996.

[8] Kimiagar SM, Ghaffarpour M, Houshiar-Rad A, Hormozdyari H, Zellipour L. Food consumption pattern in the Islamic Republic of Iran and its relation to coronary heart disease. East Mediterr Health J. 1998;4:539-47.

[9] Ludwig DS. Dietary glycemic index and obesity. J Nutr. 2000;130(2S Suppl):280S-3S.

[10] Ludwig DS, Majzoub JA, Al-Zahrani A, Dallal GE, Blanco I, Roberts SB.. High glycemic index foods, overeating, and obesity. Pediatrics. 1999;103;e26.

[11] Bertéus Forslund H, Lindroos AK, Sjostrom L, Lissner L. Meal patterns and obesity in Swedish women - a simple instrument describing usual meal types, frequency and temporal distribution. Eur J Clin Nutr. 2002;56,740-47.

[12] Berg C, Lappas G, Wolk A. Strandhagen E, Torén K, Rosengren A, et al. Eating patterns and portion size associated with obesity in a Swedish population. Appetite. 52;(2009):21-26.

[13] de Castro JM. Circadian rhythms of the spontaneous meal pattern, macronutrient intake and mood of humans. Physio Behav. 1987;40:437-66.

[14] Sheikholeslam R, Mohamad A, Mohammad K, Vaseghi S. Non communicable disease risk factors in Iran. Asia Pac J Clin Nutr. 2004;13(Suppl.):S100.

[15] Brown A, Siahpush M. Risk factors for overweight and obesity: Results from the 2001 National Health Survey. Public Health. 2007; 121:603-13.

[16] Bertéus Forslund H, Torgerson JS, Sjöström L, Lindroos AK. Snacking frequency in relation to energy intake and food choices in obese men and women compared to a reference population. Int J Obes. 2005;29:711-19.

[17] French SA, Harnack L, Jeffery RW. Fast food restaurant use among women in the Pound of Prevention study: Dietary, behavioral and demographic correlates. Int Jl Obes. 2000;24,1353-59.

[18] Basdevant A, Craplet C, Guy-Grand B. Snacking patterns in obese French women. Appetite. 1993;21(1):17-23.

[19] Janghorbani M, Amini M, Rezvanian H, Gouya MM, Delavari A, Alikhani S, et al. Association of Body Mass Index and Abdominal Obesity with Marital Status in Adults. Arch Iranian Med. 2008;11(3):274-81.

[20] Chambers J, Swanson V. A health assessment tool for multiple risk factors for obesity: Results from a pilot study with UK adults. Patient Educ couns. 2006;62:79-88.