

Intrinsic Or Extrinsic Motivation In Perceiving Body Weight Among Iranian Women: A Cross Sectional Study

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Abstract

Background: Obesity and overweight are among the major global health problems. The aim of this study was to identify female BMI predictors.

Methods: A cross-sectional study was conducted among 480 women aged 15-49 years in Ramian city of Golestan province. The ethical code: IR.TBZMED.REC1396.688. The sample population was selected through simple random sampling among healthy women who were covered by health centers, with their consent. Data collection using several valid questionnaires and scales including demographic questionnaire, family property, motivation measurement, physical activity levels and flexibility was performed using the new version of the valid International Adult Physical Activity Questionnaire (IPAQ), visual analogue scale (VAS) and Body Mass Index (VAS). Descriptive and analytical statistical methods including percentage, Mean (M) Standard Deviation (SD), Chi-Square, and t-test were used. Predictors of women's BMI levels (normal, overweight, obese and very obese) were used as dependent variables. Data analysis was performed by SPSS software version 21 at a significance level of $p < 0.05$.

Results: Out of the total number of women participating in the study, 64.68% were in the age group of 25-39 years, 69.58% were housewives, 46.31% had low economic status and 5.73% had high economic status. The obesity ratio in women 40 years and older was 43.5%. BMI showed a significant difference with women's Body Image (BI) ($P < 0.01$), which in turn defined the levels of women's physical activity ($P < 0.01$). That is, 7.23% of women with obesity image of their body engaged in moderate, and 1.7% engaged in intense physical activity.

The Odd Ratio(OR) of women being in the upper BMI ranks: age[OR=1.32, 95%CI(0.99-1.05)]; occupation(unemployed) [OR=0.59,95%CI(0.35-1.00)]; SES(low) [OR=0.90, 95%CI = (0.16-4.92)]; with increasing score of attitude towards eating too much was [OR=1.32, 95% CI(0.99-1.05)]; attitude towards eating less or eliminating unhealthy or high fat foods such as sweets was [OR=0.69, 95 % CI(0.38-1.26)]; and processed foods such as sausages was [OR= 0.91, 95% CI(0.61-1.36)]; attitude (Intrinsic motivation) to exercise or to walk for at least 30 minutes daily was [OR= 1.13,95% CI(0.72-1.77)]; perceiving the importance of the spouse's opinion (external motivation) about her body shape was [OR=0.88, 95% CI (0.68-1.13)];and about body weight as well as body weight control was [OR = 0.86,95% CI (0.64-1.18)]; Weight control was achieved through control food intake [OR=1.34, 95% CI (0.95-1.99)]; and through light and sedentary levels of physical activity [OR=0.97, 95% CI (0.55-1.68)].

Conclusion: The intrinsic motivation of women; that is , their attitude towards eating a lot was the predictor of high levels of BMI; while extrinsic motivation of women related to weight, body shape, eating less, avoiding unhealthy foods, and physical activity were among the predictors of low levels of BMI.

Identifying the motivations for women with high BMI levels is not only vital for weight control, but also is one of the essential prerequisites for public health care system.

Background

Because of the dangerous consequences, obesity and overweight are among the global concern [1, 2, 3]. Obesity both in adulthood and childhood is known as a risk factor for most non-contagious diseases, including cardiovascular diseases, type 2 diabetes, some cancers, and hypertension[3, 4]. Having high body mass, obesity and overweight, is one of the determinants of the global burden of disease [1].

In recent decades, a growing prevalence of obesity has been reported, especially in low-income countries [2, 5, 6]. The global trend of obesity and weight gain at all ages in the Asian region is also increasing. The prevalence of obesity, with the exception of adults, was high among high-income populations in Asia [7]. The difference between the prevalence of obesity, and overweight in terms of sex in women over 18 years (15%) was more than men (11%) [2].

Inactivity [8], and food intake [9] through complex mechanisms [9, 10, 11] contribute to weight gain and obesity.

Preventing the increasing prevalence of obesity in populations is one of the international and national voluntary goals [2, 4]. Weight loss and increased moderate physical activity are among the useful strategies to control the adverse consequences of obesity, i.e. diabetes and hypertension [2]. Further research has been proposed to determine effective ways to control obesity and overweight in different populations [2].

The predictive role of nutritional habits, behavioral psychological factors [12], voluntary and controlled motivations [13, 14], have been proven effective in changing behavior, and controlling weight [15, 16, 17].

Due to the prevalence of obesity and overweight among Iranian women [18,19,20,21], the present study aimed to determine the prevalence of obesity and psycho-behavioral predictors including attitudes, intentions, preferred body shap, physical activity levels, and spouse attitude as motivations for BMI levels among women in Golestan, Iran.

Intrinsic motivation includes satisfaction with body weight and shape, perception and attitude of women towards weight control and loss BMI, and extrinsic motivation includes perceiving the importance of opinion and support of the spouse.

Methods

Participants

This cross-sectional study conducted among women in Ramian city of Golestan province of Iran, during 2018–2019. The needed sample was estimated as 471, based upon previous study regarding the prevalence of obesity = 31.8%, type one error = 0.05, and $d = 4.2\%$, considering 20% attrition due to incomplete, corrupted questionnaires, and or possible individual avoidance the final sample size to be 566 cases. Samples were randomly selected from urban health centers in ... city, based on inclusion criteria (informed consent, being healthy, able to response, without cosmetic and or fat removing surgery) and the

estimated sample size. The women were invited by telephone calls to attend the health center on the designated day. On the day of data collection, the aims of the study were explained. The instructions were given about the method of performing the research and completing the questionnaire. Questionnaires were completed by the interviewer, for the illiterate participants.

After filling out the demographic and main questionnaire, physical activity and anthropometric measures of women were determined.

Data collection

Data collection was done using a multi section questionnaire, anthropometric, and physical activity indices.

Questionnaire

The questionnaire was designed based on the previous studies (13,14,22-24) in several sections.

The demographic section included age (year), education year, employment (employed, unemployed). The woman age was categorized in three groups: under 25, 25–39 and 40 and above.

The economic status of the women was assessed using a valid family affluence scale (FAS) [22, 23] based on existing of the common household items: car, room, personal bedroom, television (TV) set, personal computer, tablet, laptop, access to internet, smartphone, washing machine, dishwasher, landline phone,.... Answers were categorized into two levels: don't have/not existing = 0 and have/existing = 1, and more. Summing up of scores was categorized under three groups of low (under 14), moderate (15–29), and high (30 and above).

Women's attitude, intention along with dissatisfaction with their weight and body shape, i.e. ideal /preferred weight were taken into account as an intrinsic, and spouse opinion or perceived spouse support as an extrinsic motivation.[13, 14].

Women's attitude was assessed using five items including; attitude towards over eating, reducing high caloric, high fat, and processed foods, attitudes towards daily PA and or walking 60 per day, reducing sedentary behaviors, television watching.

The perception of the spouse opinion towards women's body shape, weight, weight control, daily PA to control weight and food intake were considered as the extrinsic motivations which were measured by using six items.

Women's intention to lose weight, and to change their body shape measured by four items based on the likert scale. Intention to change weight, intention to change body shape, intention to lose weight by PA, and intention to gain weight by eating high caloric foods.

Women's dissatisfaction with their weight and body shape was estimated using one question and women's perception of their image. The women were asked if they were unsatisfied with their weight and body shape, they had to choose one of the pictures that showed desired shapes of the bodies [25,26]. All answers categorized based on likert scale (disagree strongly = 1, disagree moderately = 2, disagree = 3, agree = 4, agree moderately = 5, Agree strongly = 6.

Anthropometric measures

To calculate women body mass index (BMI), the height (Centimeter), and weight (Kilogram) of the women were measured by trained women public health expert according to the standard condition using an adult scale [27, 28].

The weight of the woman was measured with a light weight 2 g accuracy dress. In order to control the balance, its accuracy was checked with a 5kg weight before each weighing. Women's height measurement with non-elastic tape, Precision 0.5 in standing position was performed without shoes, while the legs were stitched together, the hips, shoulders and back were in contact with the height gauge. The measurement of waist circumference was done through measuring distance between the lowest rib and the iliac crest with a tape meter [41,42].

The formula ' $BMI = kg/m^2$ ' was used to calculate BMI, and classified based on WHO model [27, 28]: BMI below 18.5 (kg/m^2) = low weight, 18.5–24.9 (kg/m^2) = normal weight, 25-29.9 (kg/m^2) = overweight, and equal and above 30 (kg/m^2) were defined obese [28].

Body image

Woman's body image was determined using a self-perception method, visual analogue scale (VAS) [25, 26]. The scale consisted of nine different size of women body shapes. The women were asked to select one of the representative figures that they imagined resembling their own body shape. Then they were asked to confirm their agreement or disagreement with the similar body shape. Accuracy of body image perception was determined by comparing participants BMI with the selected figure.

Physical activity

Type and duration of physical activities, degree of flexibility and muscle strength were determined using new version of adult physical activity questionnaire [29]. The physical activity assessment questionnaire consisted of nine questions along with graphic guidelines. Women were asked to determine the kind of their physical activities with a yes or no answer. Then scores were categorized based on four levels: sedentary behavior, low physical activity, moderate physical activity, severe physical activity.

The flexibility and strength-enhancing activity of women were assessed per day and categorized based on four levels; not doing any strength-enhancing activities equals 0, performing strength-enhancing activities at least once a week or more equals 1, Performing activities to increase flexibility at least once a week or more equals 2, Performing activities to increase muscle strength as well as flexibility at least once a week or more equals 3 [29].

Statistical analyses

To describe the individual characteristics of the samples and to determine their anthropometric indices, descriptive and analytical statistical methods were used.

To estimate the qualitative variables: women's job, education level, economic status, and anthropometric indices, using frequency (percentage); and to calculate the quantitative variables: age, weight, height using mean (M) and standard deviation (SD) were used.

According to the WHO method, BMI was determined and categorized into three groups: normal, overweight and obese.

Perceived BI and preferred BI were grouped as qualitative variables.

Chi-square test was used to examine the effect of demographic variables, socioeconomic status on BMI, BI and preferred BI. Independent t-test was used to compare quantitative variables between two groups.

To determine the predictors of women's BMI, an ordinal logistic regression method adjusted for age, education, job, ... was used.

Data were analyzed using SPSS software 22.0 version (SPSS Inc, Chicago, IL, USA).

Results

Demographic characteristics of the participants

Out of 480 women participating in the study, 64.68% were in the age group of 29 – 25 years, 69.58% were housewives, 46.31% had low economic status and 73.5% had high status. [Table 1].

Table1 Participant characteristics BMI and body image

| | All | BMI ^a | | | p ^b | BI ^c | | | p ^b | PB ^d | | p ^b |
|-------------------------------|-----|-----------------------|---------------------|---------------|----------------|-----------------------|---------------------|---------------|----------------|-----------------------|--------------------|----------------|
| | | Normal weight N(%) | Over weight N(%) | Obese N(%) | | Normal weight N(%) | Over weight N(%) | Obese N(%) | | Normal weight N(%) | Overweight N(%) | |
| Age(year) | | | | | 0.001 | | | | 0.003 | | | 0.2 |
| >25 | 28 | 14(50.0) | 6(21.4) | 8(28.6) | | 10(35.7) | 16(57.1) | 2(7.1) | | 24(85.7) | 4(14.3) | |
| 25-39 | 304 | 96(30.6) | 120(38.2) | 98(31.2) | | 104(33.1) | 142(45.2) | 68(21.7) | | 238(75.8) | 76(24.2) | |
| 40 above | 138 | 24(17.4) | 54(39.1) | 60(43.5) | | 30(21.7) | 60(43.5) | 48(34.8) | | 98(71.0) | 40(29.0) | |
| All | 470 | 134 | 180 | 166 | | 144(30.0) | 218(45.4) | 118(24.6) | | 360(75.0) | 120(25.0) | |
| Occupation | | | | | 0.223 | | | | 0.020 | | | <0. |
| Unemployed | 334 | 100(29.9) | 118(35.3) | 116(34.7) | | 98(29.3) | 142(42.5) | 94(28.1) | | 230(68.9) | 104(31.1) | |
| Employed | 146 | 34(23.3) | 62(42.5) | 50(34.2) | | 46(31.5) | 76(52.1) | 24(16.4) | | 130(89.0) | 16(11.0) | |
| Education | | | | | 0.011 | | | | 0.003 | | | 0.0 |
| Under 12 | 146 | 54(37.0) | 42(28.8) | 50(34.2) | | 46(31.5) | 56(38.4) | 44(30.1) | | 106(72.6) | 40(27.4) | |
| 12 | 164 | 36(22.0) | 64(39.0) | 64(39.0) | | 38(23.2) | 78(47.6) | 48(29.3) | | 110(67.1) | 54(32.9) | |
| >12 | 170 | 44(25.9) | 74(43.5) | 52(30.6) | | 60(35.3) | 84(49.4) | 26(15.3) | | 144(84.7) | 26(15.3) | |
| SES (item)^e | | | | | 0.198 | | | | 0.460 | | | 0.7 |
| Low(0-14) | 236 | 74(31.4) | 78(33.1) | 84(35.6) | | 70(29.7) | 100(42.4) | 66(28.0) | | 174(73.7) | 62(26.3) | |
| Medium(15-29) | 234 | 56(23.9) | 98(41.9) | 80(34.2) | | 70(29.9) | 114(48.7) | 50(21.4) | | 178(76.1) | 56(23.9) | |
| High(30 above) | 28 | 4(40.0) | 4(40.0) | 2(20.0) | | 4(40.0) | 4(40.0) | 2(20.0) | | 360(80.0) | 120(20.0) | |

^aBMI: Body Mass Index, ^bp-value based on k square test, ^cBI: Body Image, ^dPB: Preferred Body, ^eSES: Socio Economic Status, **Fisher's Exact Test*** Linear-by-Linear Association

BMI status of women participating in the study

Women's BMI status was significantly different based on age (P = 0.001) and literacy level (P = 0.001). In women 40 years and older, the prevalence of overweight and obesity was 39.1% and 43.5%, respectively.

Body image showed a significant difference with the women's age, literacy and occupation, but not with women's economic status (p = 0.460) [Table 1].

BMI of women was correlated with BI and preferred body shape ($P < 0.01$) [Table 2].

Table 2
Distribution of frequency and percentage of women's body index

| BMI ^a | | | | | |
|-----------------------|-----------|-----------|----------|------|----------------|
| | < 25 | 25–30 | >=30 | All | p ^b |
| | N(%) | N(%) | N(%) | N(%) | |
| BI^b | | | | | < 0.001 |
| Normal | 100(69.4) | 40(27.8) | 4(2.8) | 144 | |
| Over weight | 28(12.8) | 126(57.8) | 64(29.4) | 218 | |
| Obese | 6(5.1) | 14(11.9) | 98(83.1) | 118 | |
| PB^c | | | | | < 0.001 |
| Normal | 106(29.4) | 158(43.9) | 96(26.7) | 360 | |
| Over weight | 28(23.3) | 22(18.3) | 70(58.3) | 120 | |

^aBMI: Body Mass Index, ^bp-value based on chi square test, ^cBI: Body Image, ^dPB: Preferred Body.

BMI and levels of physical activity

Levels of physical activity showed a significant difference based on women's marital status ($P = 0.001$). Stretching activities showed a significant difference based on age, literacy level, occupation and economic status of women ($P = 0.001$)[Table 3].

Table 3
Distribution of the physical activity levels among women

| Physical activity levels | | | | | Flexibility levels | | | | | |
|-------------------------------|-----------|-----------|-----------|----------|--------------------|-----------------|----------------|----------------|----------------|----------------|
| | Sedentary | light | moderate | severity | p ^a | Did not perform | 1 ^b | 2 ^c | 3 ^d | p ^a |
| Age (year) | | | | | 0.827 | Did not perform | 1 ^b | 2 ^c | 3 ^d | < 0.001 |
| > 25 | 0(0.0) | 6(21.4) | 20(71.4) | 2(7.1) | | 24(85.7) | 0(0.0) | 4(14.3) | 0(0.0) | |
| 25–39 | 4(1.3) | 76(24.2) | 198(63.1) | 36(11.5) | | 260(82.8) | 4(13.0) | 48(15.3) | 2(0.6) | |
| 40 above | 2 (1.4) | 34(24.6) | 92(66.7) | 10(7.2) | | 130(94.2) | 0(0.0) | 2(1.4) | 6(4.3) | |
| Marital | | | | | < 0.001 | | | | | 0.823 |
| Single | 4(16.7) | 2(8.3) | 18(75.0) | 0(0.0) | | 22(91.7) | 0(0.0) | 2(8.3) | 0(0.0) | |
| Married | 2(0.4) | 144(25.0) | 292(64.0) | 48(10.5) | | 392(86.0) | 4(0.9) | 52(11.4) | 8(1.8) | |
| Education (year) | | | | | 0.171 | | | | | 0.002 |
| 0–11 | 0(0.0) | 44(30.1) | 92(63.0) | 10(6.8) | | 136(93.2) | 0(0.0) | 8(5.5) | 2(1.4) | |
| 12 | 4(2.4) | 36(19.5) | 106(64.6) | 18(11.0) | | 142(86.6) | 0(0.0) | 22(13.4) | 0(0.0) | |
| 12 and above | 2(1.2) | 36(21.2) | 112(65.9) | 20(11.8) | | 136(80.0) | 4(2.4) | 24(14.1) | 6(3.5) | |
| Occupation | | | | | 0.064 | | | | | 0.001 |
| Unemployed | 4(1.2) | 92(27.5) | 208(62.3) | 30(9.0) | | 298(89.2) | 0(0.0) | 34(10.20) | 2(0.6) | |
| Employed | 2(1.4) | 24(16.4) | 102(69.9) | 18(12.3) | | 116(79.5) | 4(2.7) | 20(13.7) | 6(4.1) | |
| SES (item)^e | | | | | 0.106 | | | | | < 0.001 |
| Low(0–14) | 2(0.8) | 70(29.7) | 146(61.9) | 18(7.62) | | 220(93.2) | 0(0.0) | 16(6.8) | 0(0.0) | |
| Medium(15–29) | 4(1.7) | 44(18.8) | 158(67.5) | 28(12.0) | | 188(80.0) | 4(1.70) | 34(14.5) | 8(3.4) | |
| High(30 above) | 0(0.0) | 2(20.0) | 6(60.0) | 2(20.0) | | 6(60.0) | 0(0.0) | 4(40.0) | 0(0.0) | |

^aP-value based on K square test, ^b1 Perform activities to increase muscle strength at least once a week or more, ^c2 Perform activities to increase flexibility at least once a week or more, ^d3 Perform activities to increase strength as well as flexibility, at least once a week or more. ^eSES: Socio-Economic Status,

Levels of physical activity showed significant differences based on body image ($P < 0.01$); 7.23% of women with obesity were moderately active and 1.7% had intense physical activity [Table 4].

Table 4
Distribution of frequency and percentage of body mass index according physical activity ;levels

| | All | BMI ^a | | | PBI ^c | | | PBI ^d | | | p ^b |
|-------------------|-----|------------------------------------|----------------------------------|----------------------------|------------------------------------|----------------------------------|----------------------------|------------------------------------|---------------------------------|--|----------------|
| | | Normal weight N(%) ^e | Over weight N(%) ^e | Obese N(%) ^e | Normal weight N(%) ^e | Over weight N(%) ^e | Obese N(%) ^e | Normal weight N(%) ^e | Overweight N(%) ^e | | |
| Physical activity | | | | | | | | | | | 0.215 |
| Sedentary | 16 | 0(0.0) | 4(2.2) | 2(1.2) | 6(4.2) | 4(1.8) | 6(5.1) | 4(1.1) | 2(51.7) | | |
| Light | 102 | 46(34.3) | 34(18.9) | 36(21.7) | 40(27.8) | 34(15.6) | 28(61.) | 80(22.2) | 36(30.0) | | |
| Moderate | 274 | 76(56.7) | 118(65.6) | 116(69.6) | 68(47.2) | 134(61.5) | 72(23.7) | 242(67.2) | 68(56.7) | | |
| Severity | 22 | 12(0.9) | 24(13.3) | 12(7.2) | 10(6.9) | 10(4.6) | 2(1.7) | 34(9.4) | 14(11.7) | | |
| Flexibility level | | | | | | | | | | | 0.715 |
| Did not perform | 414 | 114(85.1) | 146(81.1) | 154(92.8) | 124(86.1) | 182(83.5) | 108(91.5) | 310(86.1) | 104(| | |
| 1 ^e | 4 | 2(15.0) | 2(1.1) | 0(0.0) | 2(1.4) | 2(0.9) | 0(0.0) | 4(1.1) | 0(0.0) | | |
| 2 ^f | 54 | 16(11.9) | 26(14.4) | 12(7.2) | 14(9.7) | 32(14.7) | 8(6.8) | 41(11.1) | 14(| | |
| 3 ^g | 8 | 2(1.5) | 6(3.3) | 0(0.0) | 4(2.8) | 2(0.9) | 2(1.7) | 6(1.7) | 2(1.7) | | |

^aBMI Body mass index, ^bBI Body image, ^cPBI Preferred body image/ dissatisfaction, ¹Perform activities to increase muscle strength at least once a week or more, ² Perform activities to increase flexibility at least once a week or more, ³ Perform activities to increase strength as well as flexibility, at least once a week or more.

Motivations towards BMI

External motivations for changing BMI or body weight and shape were determined by measuring women's attitude and intention. Women's attitudes toward weight change were significant ($P < 0.001$). About 40% (40.6%) of overweight women and 42.2% of obese women were eager to lose weight. The attitude towards body reshaping was also significant ($P < 0.001$). Women's attitude toward weight change showed significant correlation with physical activity ($P < 0.001$).

Based on attitude toward weight gain by eating high-calorie and high-fat foods, 15% of obese and overweight women agreed that they gain weight by eating high-fat foods. Women's attitude was significant based on BMI levels ($P < 0.001$).

Women's attitude towards eating a lot of fruits and vegetables did not show significant effect ($P = 0.148$). About 35% of obese women (33.8%) and 38.5% of overweight women agreed that they eat a lot of fruits and vegetables.

Women's intention

The distribution of intention (agreement, disagreement, no opinion) of women to gain weight by eating high-fat and high-calorie foods based on BMI levels and body image showed significant effect ($P < 0.001$). But the intention of women based on physical preference except for change in weight and body shape showed significant effect ($P = 0.822$), ($P = 0.290$).

Perceiving spouse opinion, support

Extrinsic motivations of women to change weight with physical activity and eating control were determined by measuring the perception of support from the husband side. Perception of spouse support showed significant differences based on BMI levels ($P < 0.001$). In fact, 63% of obese and 50% of overweight women described the opinion of husband as an important factor.

Predictors of BMI Levels

The results of ordinal logistic regression analysis showed that woman age: [OR = 1.32, 95% CI (0.99–1.05)]; education years below12: [(OR = 0.60, 95%CI(0.31–1.16), 12years:[OR = 1.01, 95%CI(0.56–1.82)]; SES(low level): [OR = 0.90,95%CI=(0.16–4.92)],and average level: [OR=,95%CI(0.18–4.92)]; occupation (unemployed women): [OR = 0.59,95%CI(0.35–1.01)]; women attitude towards eating too much was: [OR = 1.32, 95% CI(0.99–1.05)]; attitude towards eating less or eliminating unhealthy or high fat foods such as sweets was: [OR = 0.69, 95 % CI(0.38–1.26)], and processed foods such as sausages was: [OR = 0.91, 95% CI(0.61–1.36)]; attitude (Intrinsic motivation) to exercise or to walk for at least 30 minutes daily was: [OR = 1.13,95%CI (0.72–1.77)]; perceiving the importance of the spouse's opinion (external motivation) about her body shape was: [OR = 0.88, 95% CI (0.68–1.13)], and about body weight as well as body weight control was [OR = 0.86,95% CI (0.64–1.18)];weight control was achieved through control food intake: [OR = 1.34, 95% CI (0.95–1.99)]; and through light and sedentary levels of physical activity: [OR = 0.97,95%CI(0.55–1.68)]; women intention to change body shape : (OR = 1.37, 95%CI (1.05–1.77)]; intention to reduce weight by PA :[OR = 1.11,95%CI(0.87–1.40)] were predictors of falling women in to the high ranks/levels of BMI.[Table 5].

Table 5. Results of Multivariate ordinal regression analysis for body mass index levels (normal, overweight, and obese)

| | OR ^a | 95%CI ^b | | P ^c |
|---|-------------------|--------------------|-------|----------------|
| | | lower | upper | |
| Age(year) | 1.02 | 0.99 | 1.05 | 0.126 |
| Education (year) | | | | |
| Under 12 | 0.60 | 0.31 | 1.16 | 0.130 |
| 12 | 1.01 | 0.56 | 1.82 | 0.964 |
| 13 and above | Ref. ^d | | | |
| Occupation | | | | |
| unemployed | 0.59 | 0.35 | 1.00 | 0.052 |
| Employed | Ref. ^d | | | |
| SES(item)^d | | | | |
| Low(0-14) | 0.90 | 0.16 | 4.92 | 0.896 |
| Medium(15-29) | 0.95 | 0.18 | 4.92 | 0.956 |
| High (30 and above) | Ref. ^d | | | |
| Body image | | | | |
| Normal | 0.01 | 0.003 | 0.02 | <0.001 |
| Overweigh | 0.10 | 0.05 | 0.20 | <0.001 |
| Obese | Ref. ^d | | | |
| Preferred body | | | | |
| Normal | 1.13 | 0.61 | 2.12 | 0.694 |
| Overweigh | Ref. ^d | | | |
| Intrinsic motivation | | | | |
| Preferred Body | | | | |
| Normal | 1.13 | 0.61 | 2.12 | 0.694 |
| Over weight | Ref. ^d | | | |
| Attitude towards | | | | |
| Eating excessive foods | 1.32 | 0.78 | 2.24 | 0.300 |
| Reduce/Omit high fat foods/caloric foods | 0.69 | 0.38 | 1.26 | 0.227 |
| Reduce / omit processed foods | 0.91 | 0.61 | 1.36 | 0.652 |
| Daily PA30min | 1.13 | 0.72 | 1.77 | 0.599 |
| Reduce daily sedentary behaviors | 0.89 | 0.54 | 1.46 | 0.644 |
| Intention to | | | | |
| Change current weight | 1.17 | 0.86 | 1.58 | 0.305 |
| Change body shape | 1.36 | 1.05 | 1.77 | 0.017 |
| Reduce weight by PA | 1.11 | 0.87 | 1.40 | 0.384 |
| Increase weight by eating high fat/ caloric foods | 0.93 | 0.74 | 1.17 | 0.586 |
| Extrinsic motivation | | | | |
| Perceived Spouse opinion | | | | |
| Current body shape | 0.88 | 0.68 | 1.13 | 0.311 |
| Current body weight | 0.86 | 0.65 | 1.14 | 0.290 |

| | | | | |
|-------------------------------------|-------------------|------|------|--------|
| Weight control | 0.86 | 0.64 | 1.18 | 0.362 |
| Daily PA to weigh control | 0.89 | 0.69 | 1.15 | 0.381 |
| Daily food intake to weight control | 1.38 | 0.95 | 1.99 | 0.092 |
| Physical activity level | | | | |
| Sedentary / light activities | 0.97 | 0.55 | 1.68 | 0.904 |
| Moderate / sever activities | Ref. ^d | | | |
| Strength flexibility(scores) | 0.54 | 0.39 | 0.74 | <0.001 |

^a OR:Odds Ratio, ^b 95%CI: 95%Confidence Interval, ^cP-value, ^dRef.: Referent group, ^eSES: Socio-economic status.

Discussion

The aim of this study was to determine the prevalence of obesity and overweight and also the predictors of BMI among women in Ramian city of Golestan province. Ordinal logistic regression analysis was used to determine BMI predictors. The BMI was considered as a dependent variable in three categories: normal (25-29.9), overweight (30-34.9), and obese (35 and above). The variables of age, occupation and education years of woman, socioeconomic status of the family, body image in three groups: normal, overweight and obese, body preference in both normal and overweight groups, women attitude, and intention(intrinsic motivation), and perception of husband opinion(extrinsic or controlled motivation), and activity levels were entered the model as the independent variables. Among the demographic variables, age, education years (12 years and less), women employment (not having a job) and among psychological variables: intention and attitude, and perception of the spouse opinion about weight control through eating and behavior of stretching activities were predictors of women BMI ranks.

Age is a known determinant of women's body mass index (BMI) [30]. The prevalence of obesity in women 40 years and older (43.5%) was more independent of education years and economic status than other age groups. Contrary to the findings [30, 31, 32] of women's BMI levels based on education level, the economic status did not show a significant difference.

The age as a dominate variable showed a 2% increase in women falling in different ranks of BMI as a predictor of overweight or obesity. That is, increasing age in women was associated with increasing obesity. No significant difference was observed between physical activity levels and women's age, except for the intense physical activity in which a slight and increasing difference was observed in the levels of physical activity of women 40 years and older compared to women 25–39 years. In this study, age is not considered as a critical factor affecting the BMI of women. Probably factors other than age affect the BMI of women in the region.

Socioeconomic status is known to be a distinguishing factor between overweight and obesity [33]. Contrary to the global trend report [7], the prevalence of overweight and obesity among women with low and moderate economic status was lower. It seems that improving the economic situation of women in Golestan region increases their chances of becoming obese and overweight. One of the reasons for the low ratio of overweight and obesity in women with low and moderate economic status can be related to the levels of physical activity, eating behaviors and economic and social conditions of their living environment. Due to the special conditions of the region and the high proportion of nomadic population, women with low and medium economic status are more likely to be physically active due to heavy labor load.

Another reason for low overweight and obesity prevalence among women with low economic status is likely to be due to their degree of awareness [34], motivation and perceptions [35, 36]. Women intrinsic motivations due to attitude towards weight and body shape, eating less or avoiding unhealthy, high-calorie, high-fat foods such as sweets, as well as prepared and processed foods reduced women possibility of falling into the upper BMI rank. According to the research[34, 35], increasing the score of women's attitude towards eating more than physical activity increases the chances of overweight and obesity among women. Increasing the awareness of healthy eating behaviors[34], identifying eating motivations and physical activity, strengthening attitude towards eliminating or avoiding unhealthy foods such as high-calorie, high-fat foods and processed foods can be effective solutions in controlling overweight and obesity among women

External motivations resulting through perceiving the opinion and support of the spouse (Perceived spouse support) to change body shape, control and lose weight, reduce the chances of women falling into the upper BMI ranks. Decreased BMI in women, regardless of women's eating behaviors, also applies to controlling weight through physical activity. It is likely that women with a high perception of the husband attitude follow his recommendations more readily, and in turn, maintain an optimal BMI. Conversely, external motivations (spouse's recommendations) related to a woman's eating and eating habits did not reduce BMI, but rather increased a woman's chances of falling into the upper BMI ranks. There are times that spouse's recommendations may render opposite consequences. It means, women eat extra amount of food instead of watching their weight through controlling food intake. Women with a high BMI who appear to have unhealthy eating behaviors, perceived more advice and support from their husbands to control their weight through dieting. These findings, while indicating high food intake and inadequate nutritional literacy of women, leave unanswered the role of husband as a factor of external motivation in controlling women's eating behaviors to lose weight, which requires in-depth studies. Gast et al., believe that in order to achieve optimal health status in women, it is more beneficial to identify and pay attention to women's eating and physical activity motives than to prescribe and promote dietary restrictions and physical activity [37].

Among the cognitive and psychological factors, BI perception was one of the strongest predictors of a woman's chances of falling into the upper BMI ranks. Women with normal weight were less likely to consider themselves be in the upper BMI ranks than both overweight and obese women. Actually, BI is the perception of a woman of her BMI. In the present study, 83% of obese women and 58% of overweight women found themselves obese or overweight. About 3.4% of women had a normal perception of their body weight. In other words, the perception of women's body weight was in accordance with their BMI.

Physical preferences or dissatisfaction with one's BMI status is one of the motivating factors in the success of lifestyle modification programs. This kind of dissatisfaction was higher among women with high BMI. Nearly three-quarters of all women (72.08–73.33%) were dissatisfied with their weight and BMI status. In the study by Von Lengerk et al., the dissatisfaction with one's body weight among German men and women varied according to economic status. The present study comes to agreement with Von Lengerke and et al., who believed the highest dissatisfaction was observed among well-educated obese women [38]. That is, low-educated women (less than 12 years) had high BMI. The low chances of uneducated/ illiterate women falling into the upper BMI ranks are likely to be due to unfavorable economic status, unemployment, low physical activity and improper eating habits.

The importance of physical and stretching activities along with healthy food selection and eating behaviors is well known not only in overall body health, but also in healthy weight control and general body structure [39]. According to the new version, the index for measuring the four levels of physical activity and the state of stretching movements was determined [29] as sitting behaviors; light, moderate and intense activities. To analyze the data and to estimate OR, data related to the levels of physical activity, i.e. sitting behaviors and light activities were combined in one group, and moderate and intense activity in another.

Findings on women's physical activity levels varied based on BMI. Women with high BMI had moderate to vigorous physical activity. Women with sitting behaviors and light physical activity had lower BMI compared to women with moderate to severe physical activity. On the other hand, women's physical activity and stretching movements based on their BMI levels also showed significant differences. Although women with very low BMI or normal weight, had very low moderate and intense physical activity, their score of stretching movements was high. These findings contradicted the findings of Coelho et al. [40]. Although many psychological and environmental factors play a role in physical activity [41], the role of a person's inner motivations in maintaining and sustaining behavior is also well known [13, 14]. Obese women are more likely to do more intense physical activity with the intention of losing weight, and normal-weight women are more likely to do stretching exercises to strengthen their muscles and to maintain their body shape.

Although the chances of women with intrinsic motivation (intention) to change weight and body shape in the upper BMI ranks were high, more than three-quarters of women with intrinsic motivation (intention) to change weight, body shape and weight control with physical activity had a high BMI. In women of normal weight, with increasing the score of stretching movements, the chances of women falling into the upper BMI ranks showed a significant decrease of nearly fifty percent.

The aim of this study was to investigate the predictors of obesity for the first time among the women population of Golestan region. However, there were some limitations, such as not measuring women's food intake, husband eating behaviors, and other external sources of motivations- family physician, health care personnel, and friends- which should be investigated in future researches considering psycho-behavioral factors, such as women self-efficacy.

To access the desired health status of women, health authorities and practitioners should design and launch educational programs with the purpose of recognizing the women perception of their own body shape, their ideal /desired body shape, and the kind of motivations they have to access that desired body shape. At the end the committee may be able to offer appropriate solutions

Conclusion

Self-image of one's body comes in line with BMI, the status of being overweight or /and obese among women in Golestan region. The higher the prevalence of obesity, the greater the dissatisfaction with weight and body shape among women 40 years and older.

Low and medium economic status was a predictor of low BMI of women. On the other hand, the prevalence of overweight and obesity increased with improving economic status.

Low BMI in women can be attributed to her intrinsic motivations, increasing women's attitudes, and perceptions of eating behaviors, eliminating and reducing high-calorie and processed foods; and extrinsic motivation, increasing the perception of the husband's opinion about weight and body shape.

High levels of BMI among women are strongly influenced by women intrinsic motivations- attitude towards overeating, physical activity, and weight loss through doing exercises. The extrinsic motivation received by the husband to control eating amounts has increased the chances of women falling into the high BMI levels. This phenomenon which requires in-depth studies.

Obese women with high intrinsic motivation and with the intention of changing their weight and body shape, do moderate and intense physical activity. Women of normal weight do stretching exercises and muscle strengthening activities. Increasing the score of women's stretching reduces the chances of obesity and overweight in women of normal weight by nearly fifty percent.

Identifying and strengthening healthy eating motivations and appropriate physical activity levels in women based on BMI levels and economic status is recommended to promote women's health.

Abbreviations

IPAQ; International Adult Physical Activity Questionnaire, VAS: Visual Analogue Scale, BMI: Body Mass Index, BMI; Body, M(SD); Mean(Standard Deviation), OR; Odds Ratio, FAS: Family Affluence Scale,

Declarations

Ethics approval and consent to participate

This is an original study. The proposal, No:5/D/69686, and the questionnaire were approved by the ethic committee of the Tabriz University of Medical Sciences;IR.TBZMED.REC1396.688.

The formal consent forms were filled by participants, whom every aspects of research were explained in advance. All questions were answered and all doubts were clarified.

Consent for publication

All authors approved of the publication of the information provided in this manuscript.

Availability of data and materials

The raw data as supplementary information is available at end of the manuscript

Competing interests

The authors declare that they don't have any competing interests.

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Authors' contributions

BS participated in the study designing, providing the first draft and revising the manuscript. SY carried out the data gathering. NS assisted in preparing the first draft of the manuscript. PS participated in performing statistical analyses. MH-A: participated in conception, interpretation, drafted and critically revised the manuscript The author(s) read and approved the final manuscript.

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