ORIGINAL ARTICLE

Association between parity and obesity: a cross sectional study on 6,447 Iranian females

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Keywords

Parity • Obesity • Iranian women • Body mass index

Summary

Background. *The aim of this study was to determine the relationship between parity and obesity in Iranian women.*

Methods. *In a cross-sectional study, a total of 6447 urban women aged 40-65 were studied. Parity(number of full-term births), age at menarche, menopausal status, age, height, weight, marital status, education level and occupation were gathered by a checklist. Body Mass Index (BMI) was calculated. Statistical associations between parity and obesity using multiple logistic regression model were examined.*

Results. *The mean age of the enrolled women was 48.40 ± 6.13 years. The mean BMI was 27.55 ± 4.47 kg/m^2. Of the total participants enrolled, 3517 (54.55%) had < 3 parities, while 2930 (45.44%) had ≥ 3 parities. The prevalence of obesity (BMI ≥ 30 kg/m^2) and overweight (30 > BMI ≥ 25) was 27.50 % (95% CI 26.85-28.15) and 43.70% (95% CI 42.98-44.42), respectively. After adjustment for potential confounders, women with ≥ 3 parities were at higher risk of being obese (OR 1.19, 95% CI 1.05-1.35).*

Conclusion. *There was a statistically significant positive association between higher parity and obesity. It is recommended that health policymakers plan appropriate weight loss programs for postpartum.*

Introduction

The global prevalence of overweight has been reported as 39 % among adults by World Health Organization (WHO) [1]. The overweight and obesity are accounted as main contributors of 19.4 million deaths [2]. The risk of some diseases such as dys-lipidemia, type 2 diabetes and hypertension is associated with Obesity [3, 4]. Asians are more susceptible to metabolic syndrome and cardiovascular diseases and percentage of body fat in Asian people is also higher than in Europeans [5, 6]. Iran as a developing country in Persian Gulf region has a high prevalence of obesity [7]. Pregnancy and childbearing are associated with insulin resistance, weight gain and obesity in women [8-11]. Parity(number of full-term births) has been reported to be associated with obesity [12]. Several studies have reported an association between parity and obesity [12-14]. In some longitudinal studies, obesity was only observed after the first childbirth [8, 9], whereas other studies have stated an association with number of pregnancies [12, 13].

However, the results of a prospective study in the United States have shown that childbearing does not increase the risk of obesity in young women [15]. Also, several studies have reported a non-significant statistical relationship between parity and obesity [16, 17]. Current evidence suggests that the parity-obesity association varies among different cultures [18], ethnic groups [14, 19-21] and levels of country development. However, there is not much information about the effect of parity on body size in this ethnic group. In addition, the relationship between parity and obesity has been suggested to depend on the level of development of countries. [22], it is reasonable to assess this relationship in both developed and developing regions. The present study examined the relationship between parity and body mass index (BMI) in 6447 Iranian women aged 40 to 65 years.

Material and methods

A breast cancer screening program, was done between 2005 and 2013 in Shahid Motahhari Breast Clinic affiliated to Shiraz University of Medical Sciences (SUMS). A total of 11,850 women who refer to the hospital for breast cancer screening during an 8-year period were screened. Initially, a clinical examination was performed on all women participating in the screening program. Participants were then subjected to mammography, ultrasound, needle aspiration, biopsy, or surgery, depending on the physician's decision. A face-to-face interview was conducted by trained personnel. In the present study all participants

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over the age of 40 (6447 women) entered the analysis by census. The information (age at menarche, menopausal status, parity, age, height, weight, marital status, education and occupation) were gathered by a checklist. Parity was considered as number of full-term births (any pregnancy lasting longer than 5 months, regardless of outcome). Parity was divided into categories as < 3 and ≥ 3. Each subject was weighed using a digital scale to the nearest 100 grams, while the participant had the least clothing and no shoes. Height was measured with a un-stretchable tape measure, and the BMI was calculated as weight divided by height squared (kg/m^2). Women were classified according to BMI as non-obese/overweight (BMI < 30 kg/m^2), obese (BMI ≥ 30 kg/m^2) or overweight (30 > BMI ≥ 25).

Statistical analysis

All analyses were performed with SPSS software (version 16.0; SPSS, Chicago, Ill., USA). We summarized continuous data as means ± standard deviation (SD) and presented categorical variables as percentages. The difference in the distribution of the women by parity and BMI variables was tested using χ^2 test or used analysis of variance. The multiple logistic regressions were used to determine the effect of factors that are associated with obesity. The odds ratios (OR) were presented together with 95% Confidence Intervals (CIs). Adjusted ORs according to age, marital status, education, occupation, menopausal status and age at menarche were calculated.

Results

The mean (± SD) of age was 48.40 ± 6.13 years (Min:40 y, Max: 65 y). The mean (± SD) of weight, height and BMI for the total population was 67.94 ± 11.12 kg (Min:38,Max:128); 157.13 ± 5.8 cm (Min:130,Max:194), and 27.55 ± 4.47 Kg/m^2(Min:15.23,Max:51.9) respectively. A total of 3517 (54.55%) women had < 3 parities. Table I presents the descriptive characteristics of the study population, by parity. A higher parity was observed among women in 45-49 years group, those currently married, housewives, those that were overweight, and those with a lower level of education. The prevalence of obesity (BMI ≥ 30) and overweight (30 > BMI ≥ 25) was 27.50 % (95% CI 26.85-28.15) and 43.70% (95% CI 42.98-44.42), respectively (Data not shown in Table). The mean BMI of the women by selected variables was shown in Table II. The mean BMI was greater in women who had higher parity (p = 0.0001), were housewives (p = 0.01), married (p = 0.04),were post menopause (p = 0.04) and were uneducated (p = 0.002).The crude

Tab. I. Descriptive characteristics of 6447 women aged 40-65 by parity.

Variables	Parity< 3 (n = 3517)	Parity ≥ 3 (n = 2930)	
	n (%)	n (%)	P-value
Marital status			
Married	3015 (85.7)	2598 (88.7)	0.0001
Single	502 (14.3)	332 (11.3)	
Occupation			
Housewife	2536 (72.1)	2699 (92.1)	0.0001
Employed	981 (27.9)	231 (7.9)	
Education level			
Illiterate	96 (2.7)	440 (15)	
Elementary	929 (26.4)	1682(57.4)	0.0001
High school	1780(50.6)	713(24.3)	
University	711 (20.2)	94 (3.2)	
Age at menarche (yrs)			
< 12	269 (7.6)	202 (6.9)	0.13
≥ 12	3248 (92.4)	2728 (93.1)	
Menopause status			
Pre-menopausal	2689(76.3)	1849 (63.1)	0.0001
Post-menopausal	835(23.7)	1081 (36.9)	
BMI (Kg/m^2)			
< 25	1094 (31.1)	765 (26.2)	0.0001
25-29.9	1541 (43.9)	1264 (43.2)	
≥30	878 (25.0)	894 (30.6)	
Age (yrs)			
40-44	1410 (40.10)	650 (22.2)	
45-49	1057 (30.1)	829 (28.3)	0.0001
50-54	605(17.2)	756(25.8)	
55-59	299 (8.5)	446 (15.2)	
60-65	146 (4.2)	249 (8.5)	

Tab. II. Mean BMI among women aged 40 - 65 according to selected variables.

Variables	n (%)	Mean BMI(SD)	P-Value
Age			
40-44	2060(32)	27.28(4.4)	0.01
45-49	1886(29.30)	27.60(4.5)	
50-54	1361(21.10)	27.78(4.6)	
55-59	745(11.60)	27.77(4.6)	
60-65	395(6.10)	27.55(4.2)	
Parity			
Nulliparous	386(6)	26.7(4.7)	0.0001
1-3	3131(48.6)	27.3(4.4)	
4-6	2467(38.3)	27.8(4.5)	
6+	463(7.2)	28.3(4.5)	
Marital status			
Married	5613(87.10)	27.6 (5.3)	0.04
Single	834(12.90)	27.2 (4.3)	
Occupation			
Housewife	5235(81.20)	27.6 (4.5)	0.01
Employed	1212(18.80)	27.2 (4.4)	
Education level			
Illiterate	538(8.30)	27.9 (4.5)	0.002
Elementary	2611(40.50)	27.6 (4.5)	
High school	2493(38.70)	26.5(4.4)	
University	805(12.50)	25.0 (4.4)	
Age at menarche			
< 12	471(7.30)	28.2 (5.1)	0.0001
≥ 12	5976(92.70)	27.5 (4.5)	
Menopause status			
Pre -menopausal	4531(70.30)	27.4 (4.4)	0.04
Post-menopausal	1916(29.70)	27.7 (4.6)	

Tab. III. The Crude and adjusted Odds Ratio for obesity based on characteristics of 6447 women, aged 40-65 .

Variables	Crude OR (95%CI)	Adjusted OR (95%CI)
Parity		
< 3	1	1
≥ 3	1.32(1.18-1.47)	1.19(1.05-1.35)
Age	1.01(1.008-1.02)	1.01(1.001-1.02)
Marital status		
Married	1.13(0.95-1.33)	1.17(0.99-1.40)
Single	1	1
Occupation		
Housewife	1.17(1.01-1.35)	0.99(0.89-1.20)
Employed	1	1
Education level		
Illiterate	1.45(1.13-1.85)	1.23(0.90-1.67)
Elementary	1.38(1.15-1.66)	1.25(0.98-1.60)
High school	1.18(0.98-1.42)	1.14(0.91-1.43)
University	1	1
Age at menarche		
< 12	1.31(0.07-1.60)	1.32(1.08-1.62)
≥ 12	1	1
Menopause status		
Pre-menopausal	1	1
Post-menopausal	1.16(1.03-1.31)	1.02(0.87-1.19)

OR showed a significant association between parity and obesity (OR 1.32, 95% CI 1.18-1.47, Tab. III). After adjusting for age, age at menarche, employment status, educational level, menopausal and current marital status, higher parity (≥ 3 pregnancies) was associated with obesity and this association was statistically significant (OR 1.19, 95% CI 1.05-1.35, Tab. III).

Discussion

The results of current study show that higher parity in women is related to increased BMI and obesity. In this study, the prevalence of obesity (BMI ≥ 30) of 27.5% is much lower than the 38.3 % reported in Tehran [23]. The mean BMI of 27.55 kg/m^2 observed in present study is similar to the average of 29.1 kg/m^2 reported in Iran by Hajiahmadi et al in 2015(23).

The results of other studies have shown that there is a positive relationship between parity and BMI [12, 13, 23-26] that is consistent with results of the present study. The results of a study conducted in Finland show that there is a direct relationship between parity and BMI [25]. Also, the results of a study in China showed that higher parity in the long run is associated with an increased risk of obesity [27]. A large population-based study found that women who had at least one delivery had an average BMI higher than women with no pregnancy experience [28]. In addition, a U-shaped trend of postpartum weight retention has been reported for women during pregnancy [15]. A significant weight gain during a 10-year follow-up has also been reported in US [21]. However, Martinez et al. [14] reported no association between parity and obesity in Mexican-American women, though nulliparous women hadn't been included in their study. In previous studies, age, level of education, age at menstruation, menopausal status, employment status and marital status have been reported as factors related to BMI in women [7, 24]. The results of current study showed that the mean BMI was greater in women who were housewives, married, post menopause or uneducated. After adjusting other variables(age, age at menarche, employment status, educational level, menopausal and current marital status), higher parity (≥ 3 pregnancies) has a statistically significant association with higher BMI.

The mechanisms of the association between parity and obesity are unclear, although some evidence suggests that high concentrations of glucose, fatty acids and amino acids may contribute to weight gain during pregnancy and postpartum, thus increasing the risk of obesity [12, 14]. During pregnancy, the release of corticotrophin realizing hormone from placenta-drive the hypothalamic-pituitary-adrenal axis and cortisol concentrations in pregnant women which may contribute to pathophysiological mechanism of obesity [29, 30]. In addition, during pregnancy, some factors such as stress, depression and anxiety may also play role in hypothalamic- pituitary-adrenal hyperactivity [27, 30]. Women with several children may have gained weight as a result of their reduced physical activity. Women with further children have less time to focus on health behaviors including weight management. Because obesity increases the risk of diseases such as diabetes, cardiovascular disease, metabolic syndrome and some cancers, it is important to identify the risk factors for obesity in women. Encouraging women to follow a healthy lifestyle may be effective in preventing obesity.

The main limitation of the present study is that the amount of physical activity and the quantity and quality of the diet were not considered. So, further support from longitudinal studies is required. Another limitation is lack of data on BMI, prior to any pregnancy. In this cross-sectional study, it is not possible to determine whether weight gain occurred during pregnancy or at any other time. Because the prevalence of obesity is relatively high in the general population, some women may be obese before their first pregnancy and childbirth, and as a result, parity may have little effect on their obesity. Though, a strength point of present study was measuring variables by trained staff using standard procedures, instead of relying on the self-reporting. Hence, the risk of ascertainment bias was reduced. As a final point, our study had a high precision due to large sample size.

Conclusion

The present study showed that higher parity is a risk factor for obesity in later life. Higher parity was observed among women in 45-49 years group, those currently married, housewives, and those with a lower level of education. Following a healthy lifestyle after childbirth may be helpful in preventing weight gain. The study's findings might help health professionals diagnose women at higher risk for obesity, as well as help health policymakers plan programs to prevent weight gain and postpartum obesity.

Ethical statement

This study was approved by the Ethics Committee of Research at Shiraz University of Medical Sciences, Iran (IR.SUMS.REC.1391.S6422).

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Conflict of interest statement

The authors declare no conflict of interest.

Authors' contributions

MS,MT and AR: conceptualization and design; AR,MS and YA: methodology; AR and MS: acquisition of data; AR, MS, MT, YA: formal analysis and interpretation of data; MT, MS, AR, YA,FMM and SA: writing - original draft; SA, FMM and MS: writing - review and editing; AR and MS: supervision and project administration.
All authors have read and agreed to the submitted version of the manuscript.

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