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Impact of Parity on Obesity: A Cross-Sectional Study in Iranian Women

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Key Words
BMI · Pregnancy · Women's health

Abstract
Objective: The aim of the present study was to analyze whether or not parity influenced the prevalence of obesity in both pre- and postmenopausal women. ***Subjects and Methods:*** A cross-sectional study was conducted on characteristics of urban women regarding parity. A total of 1,620 women aged 45–63 years were selected using cluster sampling. A face-to-face household interview was conducted by trained, skillful personnel. A risk factor questionnaire was used to obtain information on reproductive history and sociodemographic factors. Statistical associations between parity and obesity using logistic regression were then investigated. ***Results:*** The mean BMI was 29.1 ± 5.1, and 96.8% of the sample population were parous, with a median of 4 births. Of the total women enrolled, 216 (13.3%) had <3 parities, while 1,404 (86.7%) had ≥3 parities. The prevalence of obesity (BMI ≥30) was 38.3%, diagnosed at a mean age of 51.4 ± 5.2 years. After adjustment for a range of potential confounders (age, marital status, employment, education, smoking status, abortion history, savings situation and menopausal status), women with ≥3 parities were at higher risk of being obese (OR 1.74, 95% CI 1.24–2.45; p = 0.001). ***Conclusion:*** A positive association was observed between the number of parities and obesity. The findings of this study suggest that the BMI is associated with high parity in Babolian women. Health policymakers should work with health providers to develop appropriate postpartum weight loss interventions.

Introduction

Obesity is a serious health concern in both developed and underdeveloped countries; it is associated with dyslipidemia, type 2 diabetes and hypertension, and elevated risk of morbidity and mortality [1–3]. Obesity plays a central role in coronary heart disease risk factors [4]. Pregnancy may be considered as having a permanent effect on BMI and may promote weight gain, hypertension, dyslipidemia and insulin resistance in later life [5].

The prevalence of obesity varies significantly across the world. It is usually more common in women than men [6]. Obesity has become a common factor among Iranian women due to lifestyle factors such as diet, lack of physical activity and adaptation to a western lifestyle. In Iran, the prevalence of obesity (BMI ≥30) is 28.0% [7], but in a recent survey in the city of Babol, the overall preva-

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lence of obesity was 45.0% among middle-aged women [8].

Several studies have revealed that some women may be especially prone to obesity following pregnancy due to the natural process of weight cycling, the accumulation of fat or a high maternal metabolism during the postpartum period. Pregnancy and childbearing are causes of obesity in women during reproductive years [9–12]. Given this evidence, it is likely that a positive association between gestational weight gain and postpartum body weight exists. Little is known about the relationship between parity and the risk of obesity in later life among women living in developing countries. Therefore, the present study investigated the relationship between parity and BMI in Babol, Iran, among highly parous women in later life.

Subjects and Methods

This study was approved by the Ethics Medical Research Committee of Babol University of Medical Sciences. Based on the geographical area, 60 clusters in Babol were selected according to the list of census enumeration areas with population and household information from the 2009 population census. The primary sampling unit for this study was based on a ward in urban and peri-urban areas of the city. At the second stage of sampling, an average of 27 households per primary sampling unit in urban areas was selected. A starting household was randomly selected in each cluster. After that, one household after the other was surveyed until the entire selected cluster of 1,620 was done. Exclusion criteria were a history of renal or thyroid dysfunction, acute hepatitis, and acute or chronic joint diseases. Otherwise, inclusion criteria were women aged 45–65 years who had the ability to understand a Persian-language questionnaire with the help of an interviewer.

Written informed consent was obtained from all participants in the study. A face-to-face household interview was conducted by a trained, skillful coauthor (M.A.D.). A valid and reliable questionnaire of risk factors was used to obtain information on reproductive history (age at menarche, gravidity, parity, abortion history and menopausal status) and sociodemographic factors, such as age, height, weight, marital status, education, occupation and savings situation.

Parity data or the number of full-term pregnancies were collected using the interview-administered questionnaire. The study population was divided into two groups according to parity. Parity was considered as any pregnancy lasting longer than 20 weeks and summarized as <3 and ≥3 pregnancies.

The weight of each subject was recorded using digital scales to the nearest 100 g, with the participant minimally clothed and without shoes. Height was measured with a tape measure [13], and the BMI was calculated as weight divided by height squared (kg/m^2) [14].

All analyses were performed with SPSS software (version 16.0; SPSS, Chicago, Ill., USA). The difference in the distribution of the women by parity for sociodemographic characteristics, smoking, reproductive and BMI variables were tested by mean and χ^2 test. The mean BMI (with 95% confidence intervals, CIs) was reported for the categories of parity and other factors where appropriate. Measurement variables for the <3 and ≥3 parity groups were compared using the t test. The multiple logistic regressions were used to determine the effect of factors that are associated with obesity. The odds ratios (OR) are presented together with 95% CIs.

The following potential confounders were included in the statistical models for the main analyses: age (continuous variable), marital status (married or not), education (less than elementary level or at least elementary level), occupation (housewife or employed), menopausal status and economic status (a combination of variables, including occupation, education, income, and savings or no savings).

Results

Of the 1,620 participants interviewed, 1,460 completed the questionnaire, representing a 90.1% response rate. The mean values (±SD) for the total population were: weight 71.0 ± 12.6 kg; height 156.4 ± 5.7 cm, and BMI 29.1 ± 5.1. Among married women, parity ranged from 0 to 14, with a median of 4 births. A total of 216 (13.3%) women had <3 parities, and 1,404 (86.7%) had ≥3 parities. A higher parity was reported among older women (age ≥50 years), those currently married, housewives, current smokers, those that were obese, and those with a lower level of education or history of at least one abortion (table 1).

The mean BMI of the women by selected characteristics are described in table 2. The mean BMI was greater in women who had higher parity ($p = 0.0001$), were housewives ($p = 0.001$), older ($p = 0.0001$) or premenopausal ($p = 0.002$). The prevalence of obesity (BMI ≥30) was 38.3% at a mean age of 51.4 ± 5.2 years. The crude OR showed a strong association between parity and obesity ($p = 0.0001$). After adjusting for a range of potential confounders (age, marital status, employment, education, smoking status, abortion history, menopausal status and economic status), higher parity (≥3 pregnancies) was significantly associated with obesity (OR 1.74, 95% CI 1.24–2.45; $p = 0.001$; table 3).

Discussion

In this study, the mean BMI of 29.1 is similar to the value of 28.6 for women aged 35–81 years in Golestan Province, northeastern Iran [7], but greater than the average of 25–27 amongst Americans and Europeans and in some Latin American, North African and Pacific Island countries, as reported by WHO [11]. The overall preva-

Table 1. Study characteristics grouped by parity in women aged 45–63 years

Characteristies	Parity			χ^2 p value
	mean ± SD	<3 (n = 216)	≥3 (n = 1,404)	
Age				0.0001
<50 years	3.9±1.6	112 (51.9)	547 (39.0)	
≥50 years	4.6±2.0	104 (48.1)	857 (61.0)	
Marital status				0.0001
Married	4.4±1.8	174 (80.6)	1,299 (92.5)	
Single (divorced/widowed/unmarried)	3.7±2.4	42 (19.4)	105 (7.5)	
Education level				0.0001
Less than elementary level	4.9±1.9	65 (30.1)	864 (61.5)	
At least elementary level	3.5±1.5	151 (69.9)	540 (38.5)	
Occupation				0.0001
Housewife	4.5±1.9	155 (71.8)	1,273 (90.7)	
Employed	3.2±1.4	61 (28.2)	131 (9.3)	
Savings situation				0.0001
With savings	3.7±1.6	57 (26.4)	193 (13.7)	
No savings	4.4±1.9	159 (73.6)	1,211 (86.3)	
Smoking status				0.012
Smoker	3.7±1.9	6 (2.8)	12 (0.9)	
Nonsmoker	4.3±1.9	210 (97.2)	1,392 (99.1)	
Age at menarche				0.298
<13 years	4.2±1.9	61 (28.2)	350 (24.9)	
≥13 years	4.4±1.9	155 (71.8)	1,054 (75.1)	
Abortions				0.0001
None	4.1±1.9	157 (72.7)	808 (57.5)	
At least one	4.7±1.9	59 (27.3)	596 (42.5)	
Menopausal status				0.004
Premenopause	3.9±1.6	106 (49.1)	550 (39.2)	
Postmenopause	4.6±2.0	110 (50.9)	854 (60.8)	
BMI				0.0001
Normal or below (<24.9)	4.0±1.9	59 (27.3)	272 (19.4)	
Overweight (25.0–29.9)	4.2±1.8	99 (45.8)	568 (40.5)	
Obese (≥30.0)	4.7±1.9	58 (26.9)	564 (40.2)	

Data are presented as mean parity ± SD, or number with percentage in parentheses.

lence of obesity (BMI ≥30) of 38.3% is similar to that of Mexican-American women (39.9%) [15], lower than that of women in the Kingdom of Saudi Arabia (44%, age-adjusted prevalence of obesity) [16], but higher than the 30.1% reported in Tehran [17].

Studies have shown a wide variability in factors that are likely to influence BMI among women, including age, maternal status, education level, age at menarche, economic status, abortion history, menopausal status, smoking status and other factors [4, 7, 15, 18, 19]. However, in this study we also found increased BMI in women to be associated with a higher parity, as previously reported [9, 18, 20–22].

Martinez et al. [15] reported no relationship between the number of pregnancies and obesity, although they did not include nulliparous women. The mechanisms for the association between obesity and multiparity are not known, but new evidence suggests that high maternal glucose, free fatty acid and amino acid concentrations may also play a role in gestational weight gain and postpartum weight retention, thereby increasing the risk of obesity in later life [6, 15, 21]. Hence, we recommend postpartum and peripartum counseling on weight loss.

This study has several limitations. These include its cross-sectional nature and the inability to measure BMI prior to pregnancy; that physical activity status, diet

Table 2. Mean BMI among women aged 45–63 years corresponding to selected characteristics

Characteristics	n	Mean BMI (95% CI)	p value
Parity			0.0001
Nulliparous	52	27.6 (26.0–29.1)	
1–2	164	27.5 (26.9–28.2)	
≥3	1,403	29.3 (29.0–29.6)	
Age			0.060
<50 years	659	29.3 (29.0–29.7)	
≥50 years	960	28.9 (28.5–29.2)	
Marital status			0.459
Married	15	29.1 (28.8–29.3)	
Single (divorced/widowed/unmarried)	1,605	28.8 (28.0–29.6)	
Education level			0.120
Less than elementary level	929	29.2 (28.9–29.6)	
At least elementary level	690	28.8 (28.5–29.2)	
Occupation			0.001
Housewife	1,427	29.2 (28.9–29.5)	
Employed	192	27.9 (27.3–28.6)	
Savings situation			0.082
With savings	250	28.5 (28.0–29.1)	
No savings	1,369	29.2 (28.9–29.4)	
Smoking status			0.294
Smoker	18	27.8 (25.7–29.9)	
Nonsmoker	1,601	29.1 (28.8–29.3)	
Age at menarche			0.430
<13 years	411	29.2 (28.7–29.7)	
≥13 years	1,208	29.0 (28.7–29.3)	
Abortions			0.984
None	964	29.1 (28.7–29.4)	
At least one	655	29.1 (28.7–29.4)	
Menopausal status			0.002
Premenopause	656	29.5 (29.1–29.9)	
Postmenopause	963	28.7 (28.4–29.1)	

quantity and quality were not considered, and the exclusion of women with a history of renal or thyroid dysfunction. However, a strength of our study was that measurements of body weight and height were actually performed, rather than relying on the self-reporting of each participant.

Conclusion

The current study has shown that multiparity is a risk factor for obesity in later life. This information can be used widely to design public health interventions over time for supporting targeted health interventions, even for obese women either before or after menopause. Iranian health policymakers should develop an appropriate intervention plan to decrease the incidence of obesity.

Table 3. Analysis of the association of obesity with parity, occupation and menopausal status (n = 1,620)

Characteristics	Adjusted OR	95% CI	p value
Parity			0.001
≥3	1.77	1.26–2.47	
<3	1.00		
Occupation			0.005
Housewife	1.70	1.17–2.47	
Employed	1.00		
Menopausal status			0.118
Premenopause	1.23	0.95–1.59	
Postmenopause	1.00		

Adjusted for age, marital status, employment, education, smoking status, abortion history, menopausal status and economic status.

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