Association of Body Mass Index and Risk of Diabetes and Hypertension in the Rural Women Aged over 30 Years in Saeidabad, East Azarbayjan, Iran

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A R T I C L E   I N F O

A B S T A R A C T

Background: Obesity could lead to different diseases. Regarding the lack of statistical information about obesity, Body Mass Index (BMI), diabetes and high blood pressure in rural women over 30 years old in Saeidabad, located in East Azarbayjan province of Iran, as well as the relationship between these two categories, the present study was designed to determine the prevalence of obesity and the amount of BMI, the association of these index with diabetes and high blood pressure.

Methods: The study population was rural women over 30 years old in Saeidabad. The sample size was selected 106 women using SPSS software.

Results: There was a significant relationship between prevalence of obesity and BMI in women over 30 years of age in Saeidabad, with a high incidence of diabetes, and hypertension.

Conclusion: Obesity is an important risk factor for diabetes and hypertension in women aged more than 30 years and they should be informed about the risky consequences.

1. Introduction

Today, civilized lifestyle and technological progress have led to limited mobility, which may cause numerous physical and psychological disorders. Obesity is one of the major complications associated with the lack of physical mobility and exercise, which leads to various health consequences, such as osteoporosis, hypertension, diabetes, and cardiovascular diseases. Furthermore, obesity imposes significant costs on the community each year, including the costs of treatment and care for disabled patients [1-5].

Previous studies have used various indices to evaluate body fat distribution and obesity, such as the waist-to-hip ratio (WHR), waist circumference (WC), waist-to-height ratio (WHtR), and body mass index (BMI).

BMI is considered to be the foremost index in epidemiological studies due to the easiness of its measurement [6-8]. By definition, BMI of 25-29.9 kg/m^2 is referred to as overweight, and amounts of over 30 kg/m^2 represent obesity [9].

The importance of the evaluation of the relationship between BMI and obesity lies down in the associated consequences occurring due to the obesity namely diabetes, insulin resistance, hypertension, hyperlipidemia, etc. which puts it among the most prominent health problems.

According to statistics, the prevalence of obesity has been increased within industrialized and developing countries. Some of the main complications associated with obesity are [10-12].

According to a study in Brazil, there is a significant association between obesity and simple anthropometric indices with the prevalence of diabetes and the risk factors for cardiovascular diseases [13].

Obesity affects both sexual category (men and women). A research conducted in the United States indicated that the prevalence of obesity has increased in the women of all age groups, which is considered most significant in the women aged 50-59 years [14, 15]. Similarly, the previous studies in this regard have denoted the highest prevalence of overweight and obesity in women, especially housewives, due to their lack of mobility and physical activity. On the other hand, various factors have been reported to increase the occurrence of obesity in women, including the education level, lack of information regarding the complications associated with overweight and obesity, hormonal changes caused by menopause or pregnancy [16, 17].

Despite the findings of the previous studies regarding the beneficial effects of physical exercise and adjustment of body composition, regular physical exercise has been reported to be extremely low in women [18].

Diabetes and hypertension are among the main diseases causing mortality and morbidity throughout the world. According to the literature, they may be caused by various factors, such as inappropriate lifestyle, lack of physical activity and mobility, uncomfortable nutrition status, and smoking habits. The prevalence of diabetes and hypertension also has been reported to be particularly high in many developing countries, including Iran [19].

Data obtained by the statistical correlation of BMI and prevalence of obesity could be beneficial in the identification and treatment of the associated complications, as well as preventing obesity and reducing the subsequent charges. Considering the lack of statistical data on the rate of obesity, BMI, diabetes, and hypertension in Saeidabad (Iran), the aim of present study was to assess the correlation between these variables in the rural women aged over 30 years in this region. In addition to determining the prevalence of obesity and its correlation with BMI, we have investigated the association of BMI, obesity, and the risk of diabetes and hypertension in these women. Our findings would be useful to provide the data in order to train necessary information to the women living in the rural areas of Saeidabad and consequently improve the quality of their lifestyle.

2. Materials and Methods

This descriptive, applied research was conducted on the rural women aged more than 30 years in Saeidabad, East Azarbayjan, Iran. Sample population consisted of 106 women, who were selected using Krejcie and Morgan's table. Data analysis was performed using chi-square test with a $P < 0.05$ by SPSS software (version 16).

3. Results and Discussion

Significant associations were observed between the prevalence of obesity, BMI, and risk of diabetes in the rural women with ages of more than 30 years in Saeidabad.

According to the results of Chi-square, there was a significant correlation between the prevalence of obesity and BMI. The Chi-square factor for the first hypothesis was $X^2 = 4.10$, and the reliability was estimated at 0.43, which was smaller than the maximum acceptable ($P < 0.5$).

Table 1: Results of chi-square regarding the correlation of obesity and risk of diabetes in rural women aged more than 30 years in Saeidabad, Iran

Description	Overweight Disease	
	With overweight	Without overweight
With diabetes	13	1
Without diabetes	70	22
Total	**83**	**23**
$X^2 = 4.10$	$P = 0.43$	

According to the findings, the risk of diabetes was higher in the overweight rural women aged more than 30 years. We have evaluated the association between the obesity, BMI, and risk of hypertension. In this regard, a significant correlation was observed between the prevalence of obesity, BMI, and risk of hypertension among the subjects.

According to the results of Chi-square, X^2 was 5.20, and the reliability was estimated at 0.03, which was smaller than the maximum acceptable value ($P < 0.5$). In other words, a significant correlation was observed between the prevalence of obesity, BMI, and risk of hypertension in the rural women aged more than 30 years in Saeidabad. Furthermore, the risk of hypertension was observed to be higher in the subjects.

Table 2: Results of chi-square regarding associations of obesity and risk of hypertension in rural women aged more than 30 years in Saeidabad, Iran

Description	Overweight Disease	
	With overweight	Without overweight
With hypertension	22	1
Without hypertension	61	22
Total	**83**	**23**

The findings of the current research were indicative of an association between the prevalence of obesity and BMI with the risk of hypertension in the rural women aged more than 30 years in Saeidabad (Iran). Similarly, Burke et al. (2007) conducted a randomized, controlled trial on 241 subjects, denoting that a low-sodium, high-fiber diet with the consumption of fish along with increased physical activity was associated with improved health behaviors and reduction of the risk factors for cardiovascular diseases in the long run [20].

According to the results of the present study, there was a significant association between the prevalence of obesity and risk of hypertension. Consistently, Geleijnse et al. (2004) performed a study suggesting that dietary and lifestyle factors have a significant impact on the prevalence of hypertension in Western populations. The findings of the current research demonstrated a significant association between the prevalence of obesity, BMI, and risk of hypertension. The main predisposing factors for hypertension include being overweight, lack of physical activity, high salt intake, and low potassium intake, which should be considered in taking preventive measures in this regard [21].

In another research, Paffenbarger et al. (1983) investigated the male alumni in Harvard University during a follow-up for 6-10 years, concluding that obesity, rather than excess weight-for-height ratio, was associated with the higher risk of hypertension. In other words, there was a correlation between the prevalence of obesity, BMI, and rate of hypertension. Therefore, it could be inferred that vigorous physical exercise should be incorporated into interventional regimens in order to prevent hypertension. Vigorous exercise is associated with the lower risk of hypertension, while it also eliminates or reduces body fat and promotes muscle strength without altering the weight-for-height ratio [22].

In the present study, an association was also observed between the prevalence of obesity and rate of hypertension.

Similarly, Punia et al. (2016) assessed 36 adult men and women with mild hypertension (age range: 31-57 years) in Thailand, and 24 patients (experimental group) received training for 80 sessions (50 minutes each) five days per week for 16 weeks. The control group included 12 patients, who continued their daily activities without participation in the physical exercise program. According to the obtained results, there was a correlation between the BMI of the women and incidence of hypertension. Furthermore, a positive correlation was observed between decreased blood pressure and weight loss. However, the effects of exercise on the blood pressure and body weight differed between the male and female patients. Changes in the systolic blood pressure of men and diastolic blood pressure of women were considered significant, while body weight significantly decreased in the women only. In addition, no significant difference was denoted in the blood pressure and body weight between the experimental and control groups. According to the findings, aerobic exercises may be effective in the treatment of mild hypertension in India [23].

Li et al. (2008) performed a cross-sectional research in Tushala (China) and 28 surrounding villages using stratified random sampling. According to the obtained results, the prevalence of hypertension in Hetian Township was 25.6%,

and the incidence of hypertension was positively correlated with BMI, triglyceride, and cholesterol. Moreover, positive correlations were reported between the risk of hypertension, waist-to-hip ratio, and abdominal circumference. The mentioned analysis also denoted abdominal circumference as the predominant risk factor for hypertension, while high-density lipoprotein was considered to be the main protective factor against hypertension. The findings of the mentioned study also indicated that high-calorie food intake may trigger hyperlipidemia, followed by elevated blood pressure [24].

Another finding of the current research demonstrated a correlation between the prevalence of obesity and BMI with the risk of diabetes in the women aged more than 30 years.

Consistently, Banz et al. (2003) investigated the effects of resistance aerobic training on the risk factors of coronary artery disease in a random trial, concluding that resistance training and aerobic exercises could effectively reduce the risk factors of coronary artery disease. It is notable that each type of training had unique benefits. Previous studies have also reported that the incidence of hypertension tends to be lower in physically active individuals compared to those with insufficient physical activity [25].

In the present study, a correlation was observed between the prevalence of obesity, BMI, and incidence of diabetes. In this regard, Nambi et al. (2002) performed a review study, in which weight loss and increased physical activity were reported to play a key role in preventing obesity, hypertension, hypertriglyceridemia, and hyperinsulinemia. Therefore, the findings of the mentioned study also confirmed the association between the prevalence of obesity, BMI, and incidence of diabetes [26].

In another research, Lee et al. (2001) concluded that coronary heart disease was the main cause of mortality among women in the United States, and lack of physical activity was reported to be one of major risk factors for coronary heart disease. Through 1990 meta-analyses, the researchers demonstrated that the prevalence of coronary heart disease decreased by 50% in physically active subjects compared to those with no physical activity. Even light-to-moderate physical activity was associated with the lower incidence rate of this disease in women [27].

In the present study, a correlation was denoted between the prevalence of obesity and incidence of diabetes, while a minimum of one hour of walking per week predicted the lower risk of diabetes.

Also the results of the present study indicated an association between the prevalence of obesity and BMI with the incidence of diabetes. In congruence with this finding, Choudhury and Lip (2005) reported that moderate-intensity aerobic exercise (40-70% VO_2 max) could significantly

reduce blood pressure in hypertensive and normotensive patients, as well as overweight subjects and those with normal body weight. Our findings confirmed the correlations between the prevalence of obesity, BMI, and incidence of diabetes [28].

Consistently, a review study of Whelton et al. (2002), which consisted of 54 trials during 1986-2000, was conducted on 2,419 adult patients, and the results indicated that aerobic exercise, even with a relatively low duration and relatively low intensity, should be an inherent element in the lifestyle modification for the prevention and treatment of hypertension. In the mentioned research, aerobic exercise was associated with the significant reduction of the mean systolic and diastolic blood pressure. The review of the current literature in this regard has suggested that aerobic exercise has a significant effect on the reduction of blood pressure regardless of weight loss [29].

Similarly, Tsai et al. (2002) evaluated 23 Taiwanese patients with mild hypertension, who were divided into two groups of control and moderate-intensity exercise (6.4 mat 3). The exercise group received training during three weekly sessions for 12 weeks using the treadmill exercise test. The blood pressure, heart rate, and biochemical blood parameters of the subjects were measured every four weeks for 12 weeks. According to the findings, after 12 weeks of moderate-intensity physical exercise, a significant reduction was observed in the blood pressure of the patients with mild hypertension. Furthermore, favorable changes occurred in the high-density lipoprotein cholesterol, and a correlation was also observed between the prevalence of obesity with incidence of diabetes [30].

4. Conclusion

The present study aimed to investigate the associations between the prevalence of obesity, BMI, and risk of diabetes in the rural women aged more than 30 years in Saeidabad, East Azarbayjan, Iran. According to the results, there was a significant correlation between the mentioned variables, and the risk of diabetes was higher in the overweight rural women aged more than 30 years.

Another objective of the study was to determine the correlation between the prevalence of obesity, BMI, and risk of hypertension, and the obtained results suggested significant correlations between the mentioned variables.

Respectively, the risk of hypertension was higher in the overweight rural women aged more than 30 years.

Authors' Contributions

R.Z., conducted the field work, designed the study, analyzed the data; R.M., conducted the field work, wrote and revised the manuscript; H.J., conducted the field work. All authors revised and approved the final manuscript.

Conflict of Interest

The authors declare no conflict of interests in the present study.

Acknowledgments

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