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Socioeconomic Status and Osteoporosis Risk: A Case-control Study in Outpatient Women in Yazd

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ABSTRACT

Introduction: Osteoporosis is a skeletal disorder that reduces bone strength and ultimately increases the risk of fractures. The socioeconomic status is one of the important factors affecting health, and it is confirmed as a predictor of various diseases and deaths. This study aimed to determine the relationship between osteoporosis and socioeconomic status.

Methods: This study was a case-control study that included 270 women who were selected from Khatam-ol-Anbia Bone Density Center in Yazd, in which women were randomly selected for both groups, with and without Osteoporosis, by matching their age (± 2 years old). A structured socio-economic questionnaire was filled up for them. We used clustering method, logistic regression, Chi-square and independent t-tests in SPSS 16 software.

Results: In this study, 135 women with osteoporosis and 135 with non-osteoporosis were included. The odds ratio for osteoporosis in low and moderate e socioeconomic groups respectively (OR=4.39 , CI : 2.57-7.50) and (OR=2.42 , CI : 0.97-6). Which had a significant difference between the two groups (P <0.001).

Conclusion: In this study, the improvement of socioeconomic level, increasing the level of education had a preventive role in the development of osteoporosis.

Keywords: Osteoporosis, Social Class, Bone Density

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Introduction

Osteoporosis is a skeletal disorder that decreases bone strength and ultimately increases the risk of fracture [1]. Osteoporosis is referred to as a reduction in bone density of ± 2.5 standard deviation from the mean of maximum bone density in young and normal people (T-score≤ -2.5) [2]. The complications of osteoporosis due to the cost of treating fractures and expensive drugs impose a major burden on families [3]. In 2010, the global burden of reducthe e bone density had doubled than in 1990 [4].

At present, the greatest osteoporosis fractures occur in Europe and North America. The prevalence of osteoporosis in women in the UK is 9%, in France and Germany 15%, in the United States 16%, and in Japan 38%. Demographic changes will lead to an increase in the aging population in Asia, Africa, and South America. Therefore, more than 75% of osteoporosis fractures are expected to occur over the next 50 years in developing countries [5]. According to researches, achieving high levels of bone density and maintaining it throughout life has an essential role in preventing the occurrence of osteoporosis in old age. Physiological, environmental and lifestyle factors can play a significant role in achieving maximum bone density and maintaining it throughout life. Although the low socioeconomic level is not a biological cause, it may increase the risk of osteoporosis through environmental exposure, lifestyle, and diet. Iran along with other developing countries, due to the high prevalence of osteoporosis and an increase in the mean of aging, has given osteoporosis a substantial attention. Such studies have shown that the prevalence of osteoporosis in Tehran's women aged 60-69 years were 32.4% and 5.9% in the spinal and lumbar spine, respectively [6].

The prevalence of osteoporosis and osteopenia in women less than 50 years in Zahedan were 27.3% and 31.8%, respectively, and in women, 50 years and older were, 34.5% and 36.2%, respectively [7]. In Yazd, the prevalence of osteoporosis in postmenopausal women was between 20.5% to 43%, and osteopenia was 43% to 52% [8]. According to available reports, the prevalence of osteoporosis between countries and even within countries varies. Therefore, we conducted a case-control study on the relationship between the socioeconomic status of the population of Yazd and the risk of osteoporosis.

Methods

This research paper is a case-control study. In the present study, women who refer to the Yazd BMD (Bone mineral density center) Clinic from March 2016 to March 2017 were assessed. Women with osteoporosis and without osteoporosis were identified according to WHO criteria. According to the Density Response method, Dual Energy X-Ray absorptiometry, (DEXA); Bone density data were collected from individuals due to femoral neck and lumbar vertebrae (L2-L4) bone density. To estimate the sample size, we used case-control studies sample size formula by considering the first type error of 5% and the second type error of 20% and the exposure ratio (0.4%) in the case group and 0.57% in the control (Physical activity in people with osteoporosis) [9] A total of 270 women were obtained.

The inclusion criteria were women who had at least 5 years of experience living in Yazd and had a willingness to participate in the study. For each woman who suffered from osteoporosis, we choose one woman without osteoporosis as a control group after matching for age (± 2 years). Women with osteoporosis and without osteoporosis were randomly selected with Random numbers table.

We had received informed consent from all participants. Interviews were used to collect data from the participants. We gathered information on demographic characteristics, and socioeconomic characteristics using a structured questionnaire. The socio-economic status questionnaire included 17 questions. The questions included the level of education, source of income, family income, family financial condition at the moment, the ability of individuals to provide food, clothes, heating, late or timely payment of bills, health

insurance and, if they had insurance, which type, housing status, personal or rental home, having car and its cost, and having some home appliances like a separate freezer, washing machine, dishwasher Washing machine, microwave oven, vacuum cleaner, TV, computer, motorcycle, home bathroom, and internet. Reliability of the questionnaire was calculated by Cronbach's alpha coefficient 0.77. Therefore, the questionnaire had good reliability. Validity was confirmed after sending the questionnaire to an epidemiologist and a statistician.

The Multicollinearity was investigated between variables. For all variables, the variance inflation factor (VIF) was less than 10, and the tolerance statistic was more than 0.1. So there was no Multicollinearity between variables.

After collecting information, the data was entered into the SPSS 16 software. We used a clustering method, for socioeconomic status. We ranked the calculated scores into three levels: High, Moderate, and Weak. We gave a score for each of the options. Finally, we analyzed the collected data using Chi-Square, independent t-test, logistic regression was at 95% confidence level.

Results

In this study, 135 women with osteoporosis and 135 women without osteoporosis were included. The mean age of the case group with osteoporosis was 53.67 ± 7. 15 years and in the control group was 53.22 ± 7.10, there was no significant difference between the two groups (p = 0.85). 47.4% of the cases and 48.9% of the controls were in the age group of 46-55 years. Regarding marital status, 82.2% of the cases and 83% of the controls were married, which was no significant difference (p = 0.52). Regarding educational level, 38.5% of the cases had an elementary education, and 37.8% of the control group had high school/college education, and there was a significant difference between the two groups (p < 0.001). 69.8% of the cases and 74.1% of the controls were housewives.

Regarding home ownership, 79.1% of the cases and 89.6% of the controls had personal possessions. Which was also statistically different (P= 0.01). In the case and control groups, 46.7% and 56.3% had a monthly family income of Ten to thirty million Rials, which had a significant difference between the two groups (P < 0.001) (Table 1).

Table 1. The subjects of study Regarding demographic characteristics and questions in the questionnaire:

Variables		Case N (%)	Control N (%)	P-value
Age	35-45	14(10.4)	16(10.4)	0.85
	46-56	64(47.4)	66(48.9)	
	57-65	57(42.2)	53(39.3)	
Marital status	Single	1(0.7)	3(2.2)	0.55
	Married	111(82.2)	112(83)	
	Divorced	3(2.2)	5(3.7)	
	Widow	20(14.8)	15(11.1)	
Source of income	Affiliated with others	42(31.1)	11(8.1)	<0.001
	Asset or work of a spouse	83(61.5)	108(80)	
	Recruitment	10(7.4)	16(11.9)	
Fiscal condition	Hard	18(13.3)	6(4.4)	0.004
	Middle	77(57)	63(46.7)	
	Almost comfortable	33(24.4)	58(43)	
	Comfortable and rich	7(5.2)	8(5.9)	
Fiscal condition compared to the previous year	Got Worse	35(25.9)	19(14.1)	0.05
	No difference	96(71.1)	112(83)	
	Improved	4	4	

Variables		Case N (%)	Control N (%)	P-value
Purchasing power in nutrition	Hard	26(19.3)	3(2.2)	<0.001
	A little hard	33(24.4)	30(22.2)	
	Comfortable	76(56.3)	102(75.6)	
Purchasing power in the closet	Hard	15(11.1)	4(3)	0.01
	A little hard	35(25.9)	28(20.7)	
	Comfortable	85(63)	103(76.3)	
Purchase power in heating appliances	Hard	13(9.6)	4(3)	0.008
	A little hard	45(33.3)	31(23)	
	Comfortable	77(57)	100(74.1)	
Purchase power at lease or mortgage home	Hard	11(8.1)	2(1.5)	0.02
	A little hard	5(3.7)	12(8.9)	
	Comfortable	119(88.1)	121(89.6)	
Purchase power to buy in the things he likes	Hard	21(15.6)	6(4.4)	<0.001
	A little hard	54(40)	31(23)	
	Comfortable	60(44.4)	98(72.6)	
How to pay bills	Delayed	36	33	0.67
	On Time	99	102	
Kind of insurance	No insurance	3(2.2)	5(3.7)	0.81
	Social Security	48(35.6)	52(38.5)	
	health Service	70(51.9)	64(47.4)	
	Others	14(10.4)	14(10.4)	
House ownership	Personal	106(79.1)	121(89.6)	0.01
	Rental	28(20.9)	14(10.4)	
Location	with other	8(5.9)	2(1.5)	.0051
	Personal home	127(94.1)	133(98.5)	
Car prices	NO	54(40)	16(11.9)	<0.001
	< 20 Million	34(25.2)	25(18.5)	
	20-40 Million	37(27.4)	57(42.2)	
	>40 Million	10(4.4)	37(27.4)	
Level of education	Illiterate	15(11.1)	3(2.2)	0.001
	Elementary	35(25.9)	34(25.2)	
	Middle schools	17(12.6)	8(5.9)	
	High school / College education	26(19.3)	19(14.1)	
	Super-diploma and higher	42(31.1)	71(52.6)	
Job	Housewife	93(14.1)	100(74.1)	0.38
	Employee	13(9.6)	15(11.1)	
	Retired	24(17.8)	14(10.4)	
	Others	5(3.7)	6(4.4)	
Number of items available at home	<5	86(63.7)	48(35.6)	<0.001
	>5	49(36.4)	87(64.4)	

In the present study, the odds ratio for osteoporosis in people who 'Affiliated with others', (OR= 6.10 , CI : 2.17-17.1) was statistically significant. The odds ratio for osteoporosis in people with high school/college education was (OR= 2.31 , CI : 1.14-4.67). There was a statistically significant relationship between educational level and risk of osteoporosis ($p < 0.001$) (Table 2).

Table 2. The odds ratio of socioeconomic status factors for individuals with a risk of osteoporosis

Variables		Crude Odds Ratio(CI)*	Adjusted Odds Ratio(CI)*	P-value
Source of income	Affiliated with others	6.10(2.17-17.1)	5.32(1.46-19.34)	<0.001
	Asset or work of a spouse	1.23(0.53-2.84)	0.77(0.27-2.17)	
	Recruitment	1	1	
Purchase power at lease or mortgage home	Hard	5.59(1.21-25.76)	7.82(0.78-78.07)	0.01
	A little hard	0.42(0.14-1.24)	0.16(0.03-0.84)	
	Comfortable	1	1	
Car prices	NO	12.48(5.10-30.53)	13.30(3.07-57.52)	0.002
	< 20 Million	5.03(2.11-11.99)	9.80(2.72-35.23)	
	20-40 Million	2.40(1.06-5.40)	3.91(1.31-11.67)	
	>40 Million	1	1	
Level of education	Illiterate	8.45(2.31-30.92)	9.83(1.57-61.34)	0.02
	Elementary	1.74(0.94-3.19)	0.79(.034-1.83)	
	Middle schools	3.59(1.42-9.04)	2.27(0.67-7.62)	
	High school / College education	2.31(1.14-4.67)	2.22(0.90-5.47)	
	Super-diploma and higher	1	1	

*Significant at 95% confidence level

Most of the cases (64.4%) were low in the socioeconomic group, and most of the controls were in the high socioeconomic group (59.3%). The odds ratio for osteoporosis in low and moderate e socioeconomic groups respectively (OR=4.39 , CI : 2.57-7.50) and (OR=2.42 , CI : 0.97-6).

Table 3. The odds ratio of socioeconomic status factors for individuals with a risk of osteoporosis

Variables		Case N (%)	Control N (%)	Odds Ratio(CI)*	P-value
Socio-economic status	Low	87(64.4)	44(32.6)	4.39(2.57-7.50)	<0.001
	Moderate	12(8.9)	11(8.1)	2.42(0.97-6)	
	High	36(26.7)	80(59.3)	1	

*Significant at 95% confidence level

Discussion

Osteoporosis is one of the important non-communicable diseases, that its prevalence is increasing due to the aging population. The purpose of this study was to determine the socioeconomic status and osteoporosis risk among women referred to the BMD Clinic in Yazd, Iran.

In the present study, most people with osteoporosis were married. This is because osteoporosis is a chronic disease and shows itself at an intermediate age and aging that most people might be married at this age. Most of the women with and without osteoporosis in both groups were housewives, in which the study

conducted by Moradzadeh, et al. showed the same result [10].

Most of the women with and without osteoporosis were in the age of 46 to 55 years. Women were more likely to refer for osteoporosis test in this age group, and such studies also showed that most people were in this age range [11-13].

At the level of low income, the percentage of osteoporosis in the case group was greater than that of the control group which is consistent with Nam's study [14].

In this study, the odds ratio for osteoporosis in people who had hard 'Purchase power' at lease or mortgage home was about six times higher than those who had the 'Comfortable'. The odds ratio for osteoporosis in people In people who did not have a car was More than 12 times. In the study of Esmaeili Shahmirzadi et al., was a significant relation between mean quality of life score and development of osteoporosis symptoms. Increasing the quality of life can mean higher purchasing power in the people. Moreover, this reduces the odds ratio disease [15].

Also, in the present study, a statistically significant relationship was found between the risk of osteoporosis and a lower level of education. The study conducted by Kim, et al. also confirms our findings [16]. People with a higher level of economics are more likely to continue their education and on the other hand benefit from better nutrition and a higher level of health in childhood and adolescence, which affects bone density.

In this study, osteoporosis was significantly associated with socioeconomic status. The odds Ratio of osteoporosis in the poor socioeconomic level were more than four times higher than the high socioeconomic level. In this regard, our study is consistent with such studies conducted in Iran and the world [17-20]. Low socioeconomic level reduces the opportunities for health care and increases the chance of getting worse. High socioeconomic status can be accompanied by increased consumption of calcium and vitamin D foods and more personal care. Moreover, even these people do proper exercises and their bone strength increases. And due to better financial condition, they probably have better nutrition during fetal and childhood and adolescence, and therefore have higher bone density.

In this study, we tried to use hidden factors such as insurance, purchasing power, or home facilities and we create the same criterion for all people. The shortcoming of our study was that some women did not cooperate with us because they had bone pain or they feel sick. At the end, we would suggest a population-based, prospective studies with extensive planning to be conducted in Yazd.

Conclusion

In the present study, there was a significant relationship between socioeconomic status and osteoporosis. Improving the socioeconomic status was an important factor in reducing the occurrence of osteoporosis. One of the most important problems in assessing the socioeconomic status of people was the measurement of occupation, income, and housing status of individuals. Increasing the socioeconomic level will increase the purchasing power of people and increase their education and their attitude to non-neglected diseases. So, with the improvement of socioeconomic status, people would be less likely to develop osteoporosis, and it will potentially have a preventable role in osteoporosis.

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Conflict of Interest

The authors declare no conflict of interest.

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