



Association between Demographic Factors and BMI with Osteoporosis: A Cross-Sectional Study in Kurdistan Province, West of Iran

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JPRI/2018/v25i530109

Editor(s):

(1) Dr. Rafik Karaman, Professor, Department of Bioorganic Chemistry, College of Pharmacy, Al-Quds University, Jerusalem, Palestine.

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Reviewers:

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(2) Pوران Famili, Periodontics, University of Pittsburgh, USA.

Complete Peer review History: <http://www.sdiarticle3.com/review-history/46382>

Original Research Article

Received 05 September 2018

Accepted 26 December 2018

Published 09 March 2019

ABSTRACT

Background: Regarding the association of osteoporosis with various fractures and its disabilities, high cost of treatment and rehabilitation, asymptomatic majority of patients and revealing after serious disability and preventable disability and its complications, this study was conducted to determine the prevalence of osteoporosis and its association with demographic factors and body mass index (BMI) in patients referred to Sanandaj densitometry center.

Methods: This cross-sectional descriptive-analytic study was carried out on 250 patients referring to Sanandaj densitometry center from September 2017 to September 2018. For the subjects, BMD was determined by dual-energy X-ray absorptiometry method at two bone segments, ie the hip and spine. Data were analyzed using independent t-test, fisher exact test, chi-square test and logistic regression test using SPSS V.23 software.

Results: In 250 studied subjects, there were found 68 cases (27.2%) osteoporosis in spine region and 38 cases (15.2%) in hip region. There was a significant correlation between age and incidence

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of osteoporosis in the spine and hip (P-value < 0.001), with the increase in age, the prevalence of osteoporosis increased. Despite the prevalence of osteoporosis in females, there was no significant relationship between sex and osteoporosis in spine and hip (P-value > 0.05). Despite the higher prevalence of osteoporosis in the study population living in the city, there was no significant relationship between residence and osteoporosis in spine and hip (P-value > 0.05). There was a significant relationship between education level and osteoporosis in spine and hip (P-value < 0.001), so that with the increase in education, the prevalence of osteoporosis decreases. There was a significant correlation between BMI and osteoporosis in spine and hip (P-value < 0.05), with an increase in BMI, the prevalence of osteoporosis decreases.

Conclusion: This study revealed a high prevalence of osteoporosis. Therefore, considering the increased risk of fracture, the morbidity and mortality due to osteoporosis and their costs, increasing awareness of people about complications, how to reduce the risk factors and timely treatment, it seems necessary.

Keywords: Demographic factors; osteoporosis; Kurdistan.

1. INTRODUCTION

Osteoporosis is a common clinical condition that is associated with decreased bone density and increased risk of fracture, morbidity and mortality [1]. The World Health Organization defines osteoporosis in practical terms as a bone density reduction of 2.5 SD below the mean for healthy and young adults with similar gender [2]. The prevalence of osteoporosis is on the rise, as in a systematic review study of 2018 that found on 50 articles related to the prevalence of osteoporosis in postmenopausal Iranian women, the prevalence of osteoporosis and osteopenia in Iranian postmenopausal women was estimated respectively 32% and 51% [3].

It is important, however, that osteoporosis is often hidden in the same high prevalence, causing a large number of people to inflict high economic and social costs and spend tens billions of dollars in annual costs in a country like the United States [4]. Pelvic fractures are responsible for most of the costs and deaths caused by osteoporosis, and septum fractures also cause significant pain and disability in patients with only one-third of these fractures diagnosed clinically and these problems have a significant effect on the quality of life of individuals, especially women, is at the age of menopause [5,6].

The results of existing studies confirm the high role of genetics and race in bone density and osteoporosis. Recent studies in recent years have shown that family history of osteoporosis increases the risk of osteoporosis, and it is estimated that 50-80% of the difference in bone mass between individuals is due to their genetic and hereditary differences [6,7].

Considering the difference in bone density in humans based on the genetic factors of individuals and the lack of a study on this issue during the last decade in Kurdistan province and on the other hand due to the high prevalence of osteoporosis in the society and its association with various fractures and disabilities, high cost of treatment and rehabilitation, asymptomatic majority of patients and revealing after severe disabilities and preventability of disease and its complication, this study was conducted to determine the frequency of osteoporosis and its relation with age, sex, body mass index (BMI), place of life and level of education in patients referring to Sanandaj densitometry center.

2. MATERIALS AND METHODS

2.1 Subjects

This cross-sectional descriptive-analytic study was performed on 250 patients referring to Sanandaj densitometry center from September 2017 to September 2018.

2.2 Inclusion and Exclusion Criteria

Subjects aged 15-75 were included in the study. Subject with bone diseases cardiovascular, autoimmunity, cancer and immunodeficiency were excluded.

2.3 Ethical Consideration

All patients were included in the study after being informed about the purpose of the research and completion of the written consent based on exclusion and inclusion criteria. This study was

approved by Ethical Committee of Kurdistan University of Medical Sciences.

2.4 Gathering Information

Demographic information (age, sex, location and level of education) of patients was completed by checklist. Individual weights were measured with a scale (100 g accuracy) and height using a meter (precision centimeters). Mass Body Mass Index (BMI) was also calculated in weight (kg) divided by height (m) squared. BMD of the hip and spine (L1-4) was conducted with a hologic QDR 4500 Elite Bone Densitometer (USA). Then, data from densitometry including bone density including osteopenia ($-2.5 \leq T+Score \leq -1$) and osteoporosis ($T-Score \leq -2.5SD$) were extracted based on WHO criteria. Data were analyzed by independent t-test, Chi-square test, and logistic regression test using SPSS V.23 software. The significance level was considered to be 0.05 in all tests.

3. RESULTS

In this study, 250 patients were studied. 232 (92.8%) women (155 menopause: 62% of the subjects and 66.8% female subjects) and 18 (7.2%) were male. The mean age of subjects was 56.2 ± 12.27 years (at least 28 years and maximum 84 years). 62 persons (24.8%) were illiterate, 138 persons of them (55.2%) had nonacademic education and 50 persons of them (20%) had academic education. 136 persons (54.4%) of the subjects lived in the city and 114 (45.6%) lived in the village. The average body mass index (BMI) of subjects was 28.51 ± 4.59 kg/m² (min.:17.48 kg/m² and max 42.52 kg/m²) (Table 1).

In BMD, in the spine area, 74 cases (29.6%) were normal, 108 cases (43.2%) had osteopenia and 68 cases (27.2%) had osteoporosis. In the hip region, 107 cases (42.8%) were normal, 105 cases (42%) had osteopenia and 38 cases (15.2%) had osteoporosis (Table 2).

Table 1. Demographic data of the studied subjects

Variable		Frequency (%)
Sex	Female	232 (92.8)
	Male	18 (7.2)
Address	City	136 (54.4)
	Village	114 (45.6)
Education	Illiterate	62 (24.8)
	Non-academic	138 (55.2)
	Academic	50 (20)

In this study, 68 cases of osteoporosis (63 cases of female and 5 cases of male) were seen in spine region and 38 cases of osteoporosis (35 cases of female and 3 male) were seen in the hip region. Considering the presence of osteoporosis in one of the spine or hip regions (the conventional method for diagnosis of osteoporosis), 75 cases of osteoporosis (70 cases in women and 5 cases in men) was observed (Table 3).

In this study, there was a significant relationship between the age and incidence of osteoporosis in the spine and hip ($P\text{-value} < 0.001$), as the age increases, the prevalence of osteoporosis increases.

In this study, despite the higher prevalence of osteoporosis in female, there was no significant relationship between sex and osteoporosis in the spine and hip ($P\text{-value} > 0.05$).

In this study, despite the prevalence of osteoporosis in the study population who lived in the city, there was no significant relationship between location and occurrence of osteoporosis in the spine and hip ($P\text{-value} > 0.05$).

In this study, there was a significant relationship between education level and incidence of osteoporosis in the spine and hip ($P\text{-value} < 0.001$). As a result of higher education, the prevalence of osteoporosis decreases.

Table 2. Frequency distribution of the disease according to the spine and hip diagnostic points

Region	The condition of the disease		
	Normal	Osteopenia	Osteoporosis
Spine	74 (29.6%)	108 (43.2%)	68 (27.2%)
Hip	107 (42.8%)	105 (42%)	38 (15.2%)

Table 3. Distribution of osteoporosis according to the studied areas and sex

Region	Osteoporosis		
	Female	Male	Total
Spine	63 (92.64%)	5 (7.36%)	68 (100%)
Hip	35 (92.10%)	3 (7.90%)	38 (100%)
Spine and Hip	70 (93.33%)	5 (6.67%)	75 (100%)

In this study, there was a significant correlation between BMI and osteoporosis in the spine and hip (P-value<0.05), with an increase in BMI, the prevalence of osteoporosis decreases.

Logistic regression analysis showed that there is a significant relationship between age and osteoporosis in one of the two regions of the spine or hip, either unadjusted or adjusted (P-value<0.001), so as the age increases, the prevalence of osteoporosis increases. The average body mass index (BMI) of subjects with osteoporosis in one of two regions of the spine or hip (conventional method) was 27.24 ± 5.02 kg/m² and in subjects without osteoporosis was 29.06 ± 4.30 kg/m². The results of statistical analysis of logistic regression also showed that between BMI and osteoporosis in one of two regions of spine or hip (conventional method), in unadjusted (P-value=0.005) and adjusted (P-value=0.01), there is a significant relationship

between weight gain and the prevalence of osteoporosis.

But the results of statistical analysis of logistic regression showed that there is a significant relationship between education and osteoporosis in one of the two regions of the spine or hip (conventional method) in the unadjusted state (P-value<0.05) so that with increasing education, the prevalence of osteoporosis decreases, but in adjusted mode, this relationship is not significant (P-value>0.05), which indicates that education is a confounding factor in this study. Also, despite the prevalence of osteoporosis in female, there was no significant relationship between unadjusted (P-value: 0.831) and adjusted (P-value: 0.5). Regardless of the prevalence of osteoporosis in urban areas, there was no significant relationship between unadjusted (P-value: 0.376) and adjusted (P-value: 0.132) (Table 4).

4. DISCUSSION

In this study, the prevalence of osteoporosis in the lumbar spine was 27.2% and in the hip was 15.2%. Hemmati et al. in a systematic review and met analysis study in 2018, studied 50 articles about the prevalence of osteoporosis in Iranian postmenopausal women, it was estimated that prevalence of osteoporosis in Iranian postmenopausal women is 32% and the prevalence of osteopenia was 51%. The prevalence of osteoporosis was 32% in the

Table 4. Logistic regression results of the reviewing of relationship between demographic variables and BMI with osteoporosis event in positive cases in one of the two regions of hip or spine

Variable	The level of variable	Unadjusted		Adjusted	
		OR (95%CI)	P-value	OR (95%CI)	P-value
Age		1.109 (1.076-1.144)	<0.001	1.092 (1.051-1.135)	<0.001
Sex	Male	1	-	1	-
	Female	1.12 (0.39-3.27)	0.831	1.56 (0.37-6.62)	0.5
Education	illiterate	1	-	1	-
	non-academic	0.19 (0.10-0.38)	<0.001	0.67 (0.30-1.50)	0.3
	academic	0.07 (0.03-0.17)	0.04	0.52 (0.14-1.99)	0.1
Address	village	1	-	1	-
	city	1.281 (0.741-2.213)	0.376	1.64 (0.861-3.127)	0.132
BMI		0.91 (0.85-0.97)	0.005	0.91 (0.85-0.98)	0.01

lumbar spine and 21% in the femoral neck [3]. In a study by Kaushal and et al. in 2017 in the healthy population of India, the overall prevalence of osteoporosis and osteopenia was 6.9% and 34%, respectively. The prevalence of osteoporosis in men and women in the lumbar spine was 11.1% and 3.9% respectively, and in the femoral neck were 4.1% and 3.6%, respectively [8]. Tian et al. in a study in China reported a prevalence of osteoporosis in the distal region of forearm in women over 50 years old, 65.6% and in men older than 60 years old was 8.08% [9].

The Meiyanti study in Singapore studied women aged 47-60 years and showed that the prevalence of osteoporosis in the Lumbar region was 20.2%, in the hip region 4.9%, and in the distal region of the forearm 30% [10]. The prevalence of osteoporosis was higher in the Hemati and Kushal studies compared to our study, but it was less common in Tian and Meiyanti studies. This difference in the prevalence of different geographical areas can be due to racial diversity, lifestyle, age and gender of the studied subjects, the design of the study and various measuring instruments.

This study showed that as the age increases, the prevalence of osteoporosis increases. This finding is consistent with result of Hemmati et al. [3], Tian and et al. in China [9], and Kaushal et al. in India [8].

In this study, despite the prevalence of osteoporosis in female, there was no significant relationship between sex and prevalence of osteoporosis. In the study of Bazrafshan et al. in Iran, there was no relationship between the prevalence of osteoporosis and gender [11]. The prevalence of osteoporosis was significantly higher in women in the study of Aghallikhani et al. in Iran [12] and Habib and et al. in Pakistan [13]. In the study of Nidhi et al. in India, the highest prevalence of osteoporosis was observed in postmenopausal women, followed by men and the lowest incidence was in premenopausal women [14]. These differences can be due to the role of genetic and race or the geographical and cultural differences (physical activity in the sex) in different regions, hormonal differences in two sexes, especially estrogen reduction in postmenopausal women.

In this study, despite the prevalence of osteoporosis in people living in the city, there

was no significant relationship between location and prevalence of osteoporosis. In the study of Tian et al. in China, there was no significant relationship between the location and prevalence of osteoporosis [9]. In a systematic review and meta-analysis of Matsuzaki et al. on 15 papers, it was showed that in developing countries, the BMD of urban residents is higher than the BMD of the rural population. But there is no study to show this difference in developed countries [15].

In a study by Begum et al. in Bangladesh on 376 women aged 35-85 years, it was shown that BMD in urban areas is higher than that of people living in rural areas [16]. The results of our study are similar to the results of the Tian study and are different from the study of Matsuzaki and Begum. These differences in different geographic regions can be related to the difference in lifestyle, nutrition and physical activity of urban and rural life in that area. The decrease in this difference in our study area leads to the absence of a difference in BMD of people living in the city and the country side.

In this study, although with an increase in education, the prevalence of osteoporosis was reduced, but there was no significant relationship between education level and prevalence of osteoporosis. In the study of Tian et al. in China [9] and the study of Maddah et al. in Iran in [17] also the prevalence of osteoporosis reduced with an increase in educational level. This relationship can be due to an increase in the level of information about preventive measures against osteoporosis, including adequate physical activity, adequate levels of calcium and vitamin D, or less smoking.

This study showed that the reduction of BMI can increase the prevalence of osteoporosis. A systematic review and meta-analysis by Hemmati et al., Nidhi et al. study in India [14] and a Mazocco et al. study in Brazil [18] also showed that there is an inverse relationship between BMI and the prevalence of osteoporosis.

5. CONCLUSION

This study, like other studies, showed a high prevalence of osteoporosis. Therefore, considering the increased risk of fracture, the morbidity and mortality due to osteoporosis and their costs, increasing the awareness of people about its complications, how to reduce the risk factors and timely treatment, it seems necessary.

Our study limitation was sample size and lack of some confounder information.

ETHICAL CONSIDERATION AND CONSENT

All patients were included in the study after being informed about the purpose of the research and completion of the written consent based on exclusion and inclusion criteria. This study was approved by Ethical Committee of Kurdistan University of Medical Sciences.

ACKNOWLEDGEMENT

This article was the result of thesis of Dr Mohsen Rajabnia that approved by the Research Deputy of Kurdistan University of Medical Sciences (with code 1396.205) and it was conducted under its financial support.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:

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