



The Prevalence and risk factors of osteoporosis among the elderly in Hamadan province: A cross sectional study

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Abstract

Background: Osteoporosis is the most common metabolic bone disease and is a public health issue, particularly among the elderly, across the world. Given the significance of the disease in causing disability and, in particular, its dangers in old age, we aimed to examine osteoporosis and its determinant factors among the elderly.

Methods: We conducted a cross sectional study in the province of Hamadan from September 2015 to March 2016 on all the elderly men and women covered by 'Integrated and Comprehensive Elderly Care Program'. The data required for this study was collected through an aging health care checklist. To estimate the adjusted association of potential risk factors and other confounding variables of osteoporosis, multiple logistic regression was used at a significance level of 5%.

Results: In this cross sectional study, 1779 elderly men and women aged 60 years and over were studied. The prevalence of osteoporosis was 7.99% (95%CI:7.79-8.18), which was higher among women than in men (8.08% vs. 7.83%). The factors that raised the probability of osteoporosis were as follow: aging (OR= 1.05, 95% CI: 1.02-1.07, p<0.001), low education (OR=1.96, 95% CI:1.02-3.84, p=0.04), living in urban areas (OR=2.82, 95% CI:1.93-4.11, p<0.001), smoking (OR=2.39, 95% CI:1.42-4.04, p<0.001), and family history of osteoporosis (OR=1.95, 95% CI:1.07-3.54, p=0.03).

Conclusion: Based on our results, aging, low education level, living in urban areas, being a cigarette smoker, and having a family history of osteoporosis were all predicting factors for osteoporosis among the elderly.

Keywords: Osteoporosis, Elderly, Prevalence, Iran, Hamadan

Conflicts of Interest: None declared

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Introduction

Osteoporosis is the most common metabolic bone disease and is considered a public health issue throughout the world; its most outstanding characteristic is reduced bone density, which makes the individual prone to fractures (1).

There are different methods of evaluating bone density; however, the current method is the non-invasive, simple, and harmless method of dual-energy X-ray absorptiometry

(DEXA). According to the World Health Organization's criteria, it is normal when the T criterion is greater than -1; however, osteopenia occurs when it is between -1 and -2.5, and osteoporosis occurs when T is lower than -2.5 (In this state, bone density is 2.5 SD < mean for a 30-year-old male or female) (2).

Osteoporosis is known as a multifactorial disease, such

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↑What is "already known" in this topic:

Osteoporosis is the most common metabolic bone disease and is a public health issue, particularly among the elderly, across the world. Given the significance of osteoporosis in creating disability, particularly the associated risks of the disease in old age, we aimed to investigate the prevalence and determinant factors of osteoporosis among the elderly.

→What this article adds:

The prevalence of osteoporosis was 7.99%, which was higher among women than in men. Based on our findings, aging, low education level, living in urban areas, cigarette smoking, and having a family history of osteoporosis were predictive factors for osteoporosis among the elderly.

that certain diseases, such as hyperthyroidism, gonadal dysfunction, rheumatoid arthritis, Cushing's syndrome, and the long-term use of certain drugs, such as cortisone, can cause it. Other factors also contribute to the development of osteoporosis, such as physical inactivity or being underweight more than 10% compared to the weight in youths or a BMI lower than 19, hereditary factors, and alcohol addiction (3-5).

This silent disease has affected 200 million people around the world, such that in the US alone 5% of the population aged above 50 years have osteoporosis, and 1.5 million cases of osteoporotic fractures occur annually (6). In Iran, in 2001, approximately 15% of the population had osteoporosis, which increased to 34% in 2011. Based on systematic review studies in Iran, the overall prevalence of osteoporosis is 17%. Moreover, according to studies conducted on the Iranian population, there is considerable prevalence of osteoporosis among men and women aged less than 50 years, which perhaps raises the probability of osteoporotic fractures (7, 8). In Iran, approximately 50% of men and 60% of women have varying degrees of mild osteoporosis. Recent findings have shown that the prevalence of osteoporosis is rising more steeply among Iranian men, and since morbidity and mortality associated with fractures are more common among men than in women, the significance of the issue becomes greater (9).

Osteoporosis is an important cause of disease and disability in the elderly and occurs in approximately 55% of women aged over 50 years, and the treatment costs imposed as a result of bone fractures are very high. After the age of 50, the risk of hip and vertebral fractures is thrice as much, and the risk of wrist fracture is 6 times as much in women than in men. Considering the novel knowledge and findings on this disease, it is potentially preventable and can be detected and cured before a fracture occurs. Thus, its timely diagnosis and prevention of progress is the main goal of geriatric medicine (10-12).

Given the significance of the aforementioned disease in creating disability, particularly the associated risks of the disease in old age, we aimed to investigate the prevalence and determinant factors of osteoporosis among the elderly. Also, this study was conducted for the first time in Hamadan province.

Methods

Data

A cross sectional study was conducted from September 2015 to March 2016 in Hamadan province on the entire elderly population covered by the Integrated and Comprehensive Elderly Care Program (ICECP). The elderly's data were collected starting from the beginning of this program. The Comprehensive Elderly Care Program has been designed under the title 'Integrated and Comprehensive Elderly Care Program' for physicians and non-physicians. When an elderly visits a doctor to receive care, the ICECP guideline for non-physicians is used to care for him/her, and cases of referral are referred according to the educational guide.

Then, if the elderly is recognized to have one or more

diseases that require specialized services, based on the educational guide, s/he will receive higher level care and will be included in the referral cycle. If the elderly has a disease that requires health services, s/he will be included in the cycle of follow-ups.

Inclusion criteria

Hamadan residents aged 60 and over, who are covered by the ICECP.

Measurement of outcome

Here, a T-score lower than -2.5 and in the absence of one of the following was considered as a definite diagnosis of osteoporosis: "history of fracture after 40 years following small or average injuries" or "history of documented osteoporosis or use of cortisone drugs for a minimum of 3 months".

Measurement of other variables

Age, gender, education (literate, illiterate), living status (with family, alone), habitat (urban vs rural), BMI (underweight, normal, overweight, obese), smoking status, and family history of osteoporosis were also measured.

Instrument

The data required for this study were collected using the Periodic Elderly Care checklist prepared by Deputy of Health at Hamadan University of Medical Sciences who executes the ICECP in this province. Overall, the data used from the integrated program were as follow: cardiovascular diseases; hypertensive disorders; diabetes; psychological disorders, including depression, sleep disorders, osteoporosis; and urinary incontinence.

Statistical analysis

To estimate the associations of the variables in the model and to achieve the best fitness, we entered the quantitative variables as categorical, and again as continuous quantitative variables by considering other variables in the model. Next, we tested them with the LR-test (Chi-square, $df = 1$). If the test result was significant, then the variable in mind would have been entered as a categorical one in the model.

Data were analyzed using STATA 13 software at 95% confidence interval. The crude odds ratios were extracted from the logistic regression model. The adjusted associations of the potential risk factors and other confounding variables in the occurrence of osteoporosis were extracted from multiple logistic regression model, and maximum likelihood estimator were applied at 5% significance level.

Results

In this cross sectional study, 1779 elderly men and women aged over 60 years, with the mean age of 74.95 ± 18.8 , were studied.

The majority of the participants were male (60.5%), most of them (85.2%) were illiterate, most (90%) lived with their families, and the majority (81%) lived in rural areas (Table 1).

Regarding BMI, almost half of the participants were in

Table 1. Characteristics of the study population

Variables	Controls	Cases	Total
	N (%)	N (%)	N=1779
	1637 (92.01)	142 (7.99)	
Age (mean (SD)) - year	69.83 (7.72)	73.11 (7.08)	70.09 (7.72)
Gender			
Male	674 (39.5)	55 (38.7)	702
Female	990 (60.5)	87 (61.3)	1077
Education			
literate	242 (14.8)	11 (7.8)	253
Illiterate	1395 (85.2)	131 (92.2)	1526
Living			
With Family	1438 (89.9)	116 (82.9)	1554
Alone	160 (10.1)	24 (17.1)	184
Habitat			
Rural	1323 (80.8)	86 (60.6)	1409
Urban	314 (19.2)	56 (39.4)	370
BMI			
Normal	868 (54.6)	82 (58.2)	950
Overweight	492 (31.0)	37 (26.2)	531
Obese	230 (14.4)	22 (15.6)	252
Smoking status			
No	1494 (91.2)	119 (83.8)	1613
Yes	143 (8.8)	23 (16.2)	166
Family history of osteoporosis			
No	1553 (94.9)	126 (88.7)	1679
Yes	84 (5.1)	16 (11.3)	100

Table 2. Risk factors of osteoporosis among elderly people in Hamadan

Variables	Univariate Model			Multiple Model		
	OR _c	p	95% CI	OR _a	p	95% CI
Age (year)	1.05	<0.001	[1.03, 1.07]	1.05	<0.001	[1.02, 1.07]
Gender (Female vs. Males)	1.03	0.850	[0.73, 1.47]	1.08	0.720	[0.71, 1.65]
Education (Literate vs Illiterate)	0.48	0.020	[0.26, 0.91]	0.51	0.040	[0.26, 0.98]
Living (With Family vs. Alone)	0.54	0.010	[0.34, 0.36]	0.69	0.160	[0.41, 1.16]
Habitat (Urban vs. Rural)	2.74	<0.001	[1.92, 3.92]	2.82	<0.001	[1.93, 4.11]
BMI						
Overweight vs. normal	0.79	0.260	[0.23, 1.90]	0.84	0.410	[0.54, 1.28]
Obese vs. normal	1.01	0.050	[0.62, 1.65]	1.03	0.930	[0.60, 1.74]
Smoking (Yes vs. No)	2.02	0.004	[1.25, 3.03]	2.39	<0.001	[1.42, 4.04]
Family history of osteoporosis (Yes vs. No)	2.34	0.0032	[1.33, 4.11]	1.95	0.030	[1.07, 3.54]

OR_c: Crude odds ratioOR_a: Adjusted odds ratio

OR=1.95, 95% CI: 1.07-3.54, p = 0.03

the normal range; 31% were overweight, and only 14.4% were obese. The prevalence of cigarette smoking and family history of osteoporosis was 8.8% and 5.1%, respectively.

The prevalence of osteoporosis was 7.99% (95% CI: 7.79- 8.18). Overall, among the 1779 elderly male and female participants, osteoporosis was reported in 142 (7.99%). The prevalence was greater among females than in males (8.08% vs 7.83%).

We also studied the associations of some variables that potentially affect osteoporosis. Based on the univariate logistic regression results, the association of aging, low education level, high BMI, cigarette smoking, and a positive family history of osteoporosis were directly related to the occurrence of osteoporosis. Moreover, based on the multiple logistic regression result, the adjusted associations of some of the potential risk factors were as follow:

There was a significant direct association between the risk of osteoporosis and aging (OR=1.05, 95% CI:1.02-1.07, p<0.001). The risk of osteoporosis was greater among women; however, it was not statistically significant. The risk was 49% lower among literate men and women compared to illiterate ones and was statistically significant

(OR=0.51, 95% CI:0.26-0.98, p=0.04). The risk of osteoporosis was 2.82 times greater among urban residents, compared to rural residents and was statistically significant (OR=2.82, 95% CI:1.93-4.11, p<0.001) (Table 2).

Moreover, those who smoked were 2.39 times more likely to have osteoporosis than those who did not; this association was statistically significant (OR=2.02, 95% CI:1.25-3.03 p<0.001).

Those elderly individuals who had a family history of osteoporosis were * 1.95 times more likely to have osteoporosis than those who did not, the association was also statistically significant (*OR=1.95, 95% CI:1.07-3.54, p=0.03).

Discussion

In this cross sectional study, the overall prevalence of osteoporosis among the elderly of Hamadan province was 7.99% (95% CI:7.79- 8.18), which was higher among women than in men (8.08% vs 7.83%). Furthermore, we showed the adjusted associations of the potential risk factors affecting the occurrence of osteoporosis. Aging, low education level, living in urban areas, smoking, and a his-

tory of osteoporosis were directly associated with the prevalence of osteoporosis. All these associations were statistically significant.

Although the higher prevalence of osteoporosis among women in our study was consistent with the findings of other studies (13, 14), it was lower than the expected value. Based on the results of a meta-analysis on the prevalence of osteoporosis in Iran, this figure was reported at 17% (8). The considerably low figure observed in this study can be attributed to underreporting and/or inadequate monitoring of the elderly covered by the Elderly Care Program.

Based on the literature, aging increases the possibility of osteoporosis. With aging, bone density gradually decreases, such that after the age of 40 it falls by 0.5–1% annually. Our results are consistent with this finding (15, 16). However, in women, this increase in prevalence is strongly associated with the onset of menopause and drop in sex hormone levels. Thus, one would expect the prevalence to be higher among women than in men. In spite of being higher, this prevalence was not significant, which may be attributed to the inadequate power of our study.

We observed a significant statistical association between cigarette smoking and the risk of osteoporosis; smokers were 2.39 times more likely to have osteoporosis than non-smokers. According to the literature, elderly persons who smoke were 30%–40% more likely to experience hip fractures than their non-smoking peers. Smoking reduces the oxygenation of bony tissue, reduces the activity of osteogenic cells, and decreases the absorption of calcium from food. Eventually, smoking reduces estrogen in women's body, making them prone to osteoporosis (17). This finding is consistent with that of systematic reviews and primary studies (18, 19). Family history had a significant positive association with the occurrence of osteoporosis, such that the risk was almost twice as much. Literature also shows that osteoporosis is transmitted from one generation to another (20–23).

Limitations

Since this was a cross sectional study, it could not show the temporal precedence of some of the risk factors. Moreover, the validity of our results depended on the quality of data entry in urban and rural health care centers and basic health units. We could not show the association of alcohol on osteoporosis, as we were faced with severe underreporting of this variable (only 3 out of 1779 persons had reported it). If we had entered this variable into the model, we would have had severe bias resulting from a low sample size (24).

Conclusion

Based on our findings, aging, low education level, living in urban areas, cigarette smoking, and having a family history of osteoporosis were predictive factors for osteoporosis among the elderly.

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Conflict of Interests

The authors declare that they have no competing interests.

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