

Prevalence of Osteoporosis in Elderly Traumatized Patients in a Tertiary Care Trauma Center

Abstract

Background: Osteoporosis, referred to as a silent epidemic, is a prevalent disorder associated with decreased bone density. Despite being often asymptomatic, the most common consequence is fracture. The prevalence of this disorder in Iran is over 4% in men and over 7% in women, escalating notably beyond the age of 50, reaching over 10% in both genders. To plan prevention and treatment, we investigated the prevalence of osteoporosis in elderly trauma patients at a tertiary trauma center.

Methods: This study examined 113 patients over 65-years old admitted to the emergency department of Sina Hospital. Bone mineral density (BMD) was assessed for osteoporosis, and patients' demographic findings were recorded through interviews and extraction from hospital records and statistically analyzed.

Results: The mean age of the patients under study was 75.8 years, with 67.3% in the over 70 years of age group. Of the study population, 44.2% were female and 55.8% male. Thirty-one patients (27.4%) had a history of previous fractures. Alcohol consumption and smoking were reported in 3.5% and 31.9% of cases, respectively. Additionally, six patients (5.3%) had a history of taking corticosteroids. The fractures were located in the lower extremities in 61 cases (54%) and the upper extremities in 52 cases (46%). Overall, 67.3% of patients had osteoporosis.

Conclusion: This study revealed that approximately two-thirds of elderly patients experiencing limb fractures suffer from osteoporosis.

Keywords: Osteoporosis, Osteopenia, Elderly Hip fractures

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Introduction

Osteoporosis, which is named as silent epidemic event is increasing in the elderly people in societies today, and its dimensions are increasing in society ⁽¹⁾. Osteoporosis is a skeletal disorder with a decrease in bone density, which leads to an increased risk of fractures ^(2, 3). Although bone density loss is often asymptomatic; however, fracture is the most common result, and the most common fracture areas include the hip, wrist, and spine ⁽¹⁾. Osteoporosis is the major cause of distal radius fracture in adults, and this fracture may be the first chance to detect osteoporosis and treat it to prevent future osteoporotic fractures ^(2,3). The major risk factors for bone fractures caused by osteoporosis are such as female gender, elderly age, low bone density, and previous fracture history, often exist in women post-menopause ⁽²⁻⁵⁾. It is predicted that the rate of fractures caused by osteoporosis will reach about 25% in the elderly population in 2030 ⁽⁶⁻⁸⁾. According to the report of the World Health Organization, fracture caused by osteoporosis is ranked ninth among diseases based on the index of life years adjusted for disability, which indicates the burden of the disease ⁽³⁾. 50% of individuals over the age of fifty in the United States are susceptible to osteoporosis-related fractures ⁽⁴⁾.

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The economic burden of osteoporotic fractures was seventeen billion dollars for the United States in 2005 and thirty-seven billion euros for Europe in 2019⁽⁴⁾. Furthermore, a study conducted by Sanchez et al. demonstrated that the societal and economic burden of fractures primarily affects older individuals, stemming from hospitalization, surgeries, chronic disability, and both pharmacological and non-pharmacological interventions⁽⁹⁾.

The Osteoporosis Research Center of the Endocrinology and Metabolism Research Institute at Tehran University of Medical Sciences states that the latest available statistics indicate a high prevalence of osteoporosis (4.8% in men and 7.7% in women) and osteopenia (36.8% in men and 39.3% in women) in Iran. Based on these statistics, osteoporosis has been reported in more than 10.1% of men and 20.7% of women over 50 years old⁽⁵⁾. Sedaghat, et al. demonstrated through a study on menopausal women that factors such as age over 65 years and more than ten years post-menopause are risk factors for osteoporosis⁽⁷⁾.

The increase in population aging and the prevalence of related diseases such as osteoporosis, as well as the problems caused by fractures related to osteoporosis, such as the economic and social burden, length of treatment, complications after surgery, and the resulting disabilities, have caused osteoporosis screening to lead to decisions in this field by health politicians and in addition to changes in the lifestyle of people in the society⁽⁸⁻¹⁴⁾. In this way, we can prevent the spread of osteoporosis at a younger age, and at the same time, at an older age, we can diagnose it in time and treat it. Osteoporosis screening can have significant effects in the long term because it can be prevented, diagnosed and treated. Based on this, in this study, we decided to investigate the prevalence of osteoporosis in people over 65 years old with trauma who referred to the emergency room of Sina Hospital during 2019 and 2020.

Methods

In this case-series study conducted in Sina Hospital during 2019 and 2020. Information related to osteoporosis was collected in 113 patients aged higher than 65 years who were admitted to our hospital emergency room. All patients with a history of using drugs effective in improving bone quality (including calcium, vitamin D and bisphosphonates) were excluded from the study. Also, based on the questionnaire, demographic information and medical history of people were collected by a trained nurse. Data collection was done through interviews, patient records and human samples, and medical records were also examined. Bone Mineral Densitometry (BMD) was measured by central DXA approach, which was the same method and protocol in all cases and using Hologic QDR 4500W densitometer (Hologic, Inc., Bedford, MA, USA) and the results were announced based on T score and Z score.

In the Central DXA method, the test is conducted based on the density of the lumbar spine or hip. In the Peripheral test method, the test is based on the density of the wrist or heel. The results obtained from these two methods are reported as T scores and Z scores.

In the T scoring system, results are compared to a healthy young individual of the same gender. A score of -1 and higher indicates normal bone density, scores ranging from -1 to -2.5 indicate low bone density leading to osteopenia, and scores of -2.5 and lower indicate osteoporosis.

In the Z scoring system, bone density is compared with an individual of the same age, gender, and size who is considered healthy. A Z score of -0.2 or less indicates lower bone density compared to a healthy individual with similar characteristics.

A paper questionnaire was prepared after determining the variables for recording data. A digital scale was used to measure weight in kilograms, and height was measured using appropriate tools and expressed in centimeters.

After collecting the data, the analysis was done in two descriptive and analytical sections using SPSS and Stata statistical software. Descriptive analysis was conducted for quantitative variables using measures of central tendency such as mean and standard deviation. For ordinal and categorical data, absolute and relative frequencies were used. The desired outcome was evaluated among the compared groups in analytical analysis. The chi-square test was utilized to compare the prevalence of osteoporosis among the compared groups. Logistic regression model was used to determine the relationship between exposure and the dependent variable (osteoporosis) by removing the effect of confounding variables.

Results

The average age of the investigated patients was 75.8 with a standard deviation of 8.3 years, and 67.3% were in the group over 70 years old. Also, 50 (44.2%) patients were female. 31 patients (27.4%) had a previous history of fracture. Alcohol consumption and smoking were reported in 3.5 and 31.9 percent of cases, respectively. In addition, 6 patients (5.3%) had a history of using drugs that affect bone density, which in all cases were from the corticosteroid group. The current fracture of the patients was in 61 cases (54%) in the lower limb and in 52 cases (46%) in the upper limb. A total of 76 patients (67.3%) had osteoporosis. Factors affecting osteoporosis in univariate analysis can be

seen in Table 1, which included female gender ($P=0.001$) and age over 70 years ($P=0.037$), which their risk was 1.56 (95% CI=2.02-1.20) and 1.74 (95% CI=1.05 to 2.92) respectively. There was no relationship between smoking, drug and alcohol consumption and fracture history in univariate analysis ($P>0.05$). Height, weight and BMI data of the patients were excluded from the final analysis due to missing more than ten percent in order not to cause systematic defects in the presented results.

In the analysis of multiple variables, only female gender ($P=0.001$) was identified as a significant factor influencing osteoporosis, with a risk ratio of 23.5 (Table 2). There was no significant association found in the analysis of multiple variables concerning smoking, medication, alcohol consumption, or history of fracture ($P > 0.05$).

Discussion

The results of this study showed that the prevalence of osteoporosis in trauma patients over 65 years of age who referred to the emergency room of Sinai Hospital during 2019-2020 was about 67 percent. Upon reviewing 40 studies (comprising 31 studies related to Asia, 5 studies related to Europe, and 4 studies related to America) with a total sample size of 79127 individuals, the prevalence rate of osteoporosis among the elderly worldwide was reported at 21.7% (95% confidence interval: 18.8% to 25%).

Table 1: Effect of Various Factors on Osteoporosis in Patients in Univariate Analysis

| Variable | Category | Osteoporosis (n) | P Value | Risk Ratio (95% Confidence Interval) |
|--------------------|------------|------------------|---------|--------------------------------------|
| Gender | Female | 42 (84%) | 0.001 | 1.56 (1.20 to 2.02) |
| | Male | 34 (54%) | | |
| Age | ≤ 70 years | 20 (54.1%) | 0.037 | 1.74 (1.05 to 2.92) |
| | > 70 years | 56 (73.7%) | | |
| Fracture History | Negative | 56 (68.3%) | 0.703 | 1.06 (0.78 to 1.43) |
| | Positive | 20 (64.5%) | | |
| Fracture Site | Lower Limb | 47 (77%) | 16% | 1.38 (1.05-1.83) |
| | Upper Limb | 29 (55.8%) | | |
| Alcohol Use | Negative | 74 (67.9%) | 0.596 | 1.36 (0.51 to 3.65) |
| | Positive | 2 (50%) | | |
| Smoking | Negative | 54 (70.1%) | 0.341 | 1.15 (0.86 to 1.55) |
| | Positive | 22 (61.1%) | | |
| Medication History | Negative | 73 (68.2%) | 0.391 | 1.36 (0.61 to 3.07) |
| | Positive | 3 (50%) | | |

The overall prevalence of osteoporosis in elderly men and women globally was reported at 35.3% (95% confidence interval: 27.9% to 43.4%) and 12.5% (95% confidence interval: 9.3% to 16.7%), respectively. These figures indicate a significantly higher prevalence in our medical center, serving as a referral center from various regions of Iran⁽¹⁵⁾.

According to the results obtained in our study, 77% of the patients who suffered a fracture of the lower limb had osteoporosis, the importance of which can be examined from two aspects. Firstly, following up and treating osteoporosis can reduce the risk of fractures resulting from it. Secondly, alongside osteoporosis treatment, employing other protective measures to reduce the risk of falls (which in an osteoporotic patient can lead to fractures) can be highly beneficial. These measures include strengthening muscles and engaging in exercises that aid in improving balance, avoiding medications that may make the patient drowsy during the day, utilizing walking aids, making environmental modifications in the living space of elderly individuals to reduce the likelihood of falls, and finally, using protective clothing such as padded vests that can decrease the risk of fractures in case of a fall. In our study, the current fracture of the patients was 54% in the lower limb and 46% in the upper limb, which shows that both limbs are almost equally at risk. In our research, one influential factor on osteoporosis in the multivariate

analysis was the female gender, which exhibited approximately three times the risk. Regarding gender, this issue was not far from expected considering the higher prevalence of osteoporosis in women after menopause.

What was achieved in the present study was the lack of effect of smoking or alcohol consumption on osteoporosis. Although these two factors have been mentioned as risk factors for osteoporosis in many studies in other communities, it seems that based on the analysis and in our study community, these two factors have no effect on osteoporosis. In the upcoming articles by Atik, et al.⁽¹⁶⁾ and Becker, et al.⁽¹⁷⁾, an increase in osteoporosis cases was associated with economic and health-related indicators, which unfortunately, we couldn't address in our study. In the Dempster study⁽¹⁸⁾, osteoporosis was linked to fractures, disability, incapacity, psychological stress, isolation, depression, and mortality. However, due to the cross-sectional nature of our study, these aspects were not investigated.

The study by Borghe, et al.⁽¹⁹⁾ mentioned that fractures are observed in over 70% of cases in women, with the most common areas affected being the vertebral column (27%), wrist (19%), and hip (14%). In our research, most fractures occurred in the lower extremities. The reason for this difference in results could be the variation in entry criteria among studies.

| Variable | Category | Osteoporosis (n) | P Value | Risk Ratio (95% Confidence Interval) |
|---------------------------|------------|------------------|---------|---|
| Gender | Female | 42 (84%) | 0.001 | 5.23 (1.89 to 14.5) |
| | Male | 34 (54%) | | |
| Age | ≤ 70 years | 20 (54.1%) | 0.551 | 1.02 (0.97 to 1.07) |
| | > 70 years | 56 (73.7%) | | |
| Fracture History | Negative | 56 (68.3%) | 0.987 | 0.99 (0.38 to 2.63) |
| | Positive | 20 (64.5%) | | |
| Fracture Site | Lower Limb | 47 (77%) | 0.12 | 3.21 (1.29 to 7.94) |
| | Upper Limb | 29 ((55.8%) | | |
| Alcohol Use | Negative | 74 (67.9%) | 0.831 | 1.29 (0.12 to 13.37) |
| | Positive | 2 (50%) | | |
| Smoking | Negative | 54 (70.1%) | 0.490 | 0.69 (0.25 to 1.94) |
| | Positive | 22 (61.1%) | | |
| Medication History | Negative | 73 (68.2%) | 0.199 | 3.72 (0.50 to 27.72) |
| | Positive | 3 (50%) | | |

Additionally, Cawston, et al noted that postmenopausal women have up to a 20% higher incidence of fractures due to osteoporosis, a finding consistent with our study⁽²⁰⁾.

According to the study by Gauthier et al.⁽²¹⁾, osteoporotic fracture rates increase by up to 15%, with associated mortality rates rising up to 13%. Unfortunately, due to the cross-sectional nature of our study, we were unable to investigate mortality.

Based on the results obtained in this study, it was determined that approximately two-thirds of elderly patients who experienced limb fractures had osteoporosis, with female gender being the most significant factor associated with osteoporosis. However, due to important limitations in this study, such as a relatively small sample size and examining referral hospital samples, the generalizability of the study's results is limited. Therefore, conducting further studies with larger sample sizes and multicenter approaches is recommended to achieve more comprehensive and comparable results to those found in this study.

Moreover, there were numerous other limitations in this study, including the unreliability of certain data such as medication information or anthropometric parameters like weight, height, and body mass index. Additionally, simultaneous data collection during the COVID-19 pandemic led to decreased hospital visits and increased mortality due to the disease, resulting in limited access to patients for subsequent follow-ups. Furthermore, many potentially confounding variables were not investigated, such as levels of physical activity, dietary habits, and lifestyle factors, which could significantly influence the obtained results.

Also, the lack of access to certain information such as patients' height, weight, and the specific type of fractures represents potential limitations that should be considered in future studies.

Conclusion

In general, based on the results obtained in this study, it was determined that about two-

thirds of the patients who suffer limb fractures in old age are suffering from osteoporosis, and the female gender is effective factor that is related to osteoporosis.

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