Depression and Associated Factors in Patients with Osteoporosis

Abstract

Introduction: Osteoporosis is currently a public health problem and is known as the silent disease of the century. The complications of osteoporosis affect people's lives and lead to anxiety and depression. The main purpose of our study is to determine the frequency of depressive symptoms and related factors in patients with osteoporosis.

Materials & Methods: The present study is an analytical cross-sectional study that was conducted on 35 patients with osteoporosis who referred to the osteoporosis clinic of a teaching hospital between March 2024 and March 2025. Patient information was gathered using a researcher-made checklist and the Hospital Anxiety and Depression (HADS) questionnaire. All statistical analyses were performed using SPSS 20 software at a significance level of 0.05.

Results & Discussion: Out of the 35 patients studied, 24(68.57%) exhibited depressive symptoms. Of these, 32(91.40%) were female, and 3(8.60%) were male. Depressive symptoms were observed in 65.60% of women and in all men. The overall mean age of the patients was 63.86±6.80 years. Among the patients, 7(46.70%) with diabetes and 17(85.00%) without diabetes had depressive symptoms, showing a statistically significant link between diabetes and depressive symptoms in osteoporosis patients (P<0.05). However, no statistically significant association was found between other variables and depressive symptoms in patients with osteoporosis (P>0.05).

Conclusion: The findings of the present study suggests that the frequency of depressive symptoms is high in patients with osteoporosis; therefore, it should be considered as an important factor in the treatment of osteoporosis.

Keywords: Osteoporosis, Depression, Densitometry.

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Introduction

Osteoporosis is one of the major diseases that affected ten percent of women and twenty percent of men older than 50 years of age in the world[(1)]. It is a systemic skeletal disorder by reducing the bone mass and qualitative changes (in macro- and micro-architecture as well as the material properties of bone), also increasing the fractures risk will be the result. Given its prevalence and global spread, osteoporosis now is a difficult problem in public health[(2,3)].

Primary osteoporosis occurs after menopause (postmenopausal osteoporosis) or with aging (senile osteoporosis), whereas secondary osteoporosis results from a range of diseases or the use of certain medications[(4)]. The World Health Organization (WHO), defined the osteoporosis by a bone mineral density (BMD) with a T-score of ≤ −2.5[(5)]. It is appraised that 200 million women are affected by osteoporosis in the world—about 10% at age 60, 20% at age 70, 40% at age 80, and 75% at age 90. Moreover, people with osteoporosis in Europe, the United States, and Japan is estimated at 75 million[(6)]. Studies have shown that Asians have the lowest BMD compared to other racial groups[(7)]. The prevalence of osteoporosis in patients in Gorgan city -Iran was estimated at 33.7% in lumbar and 16.7% in femoral area[(8)]. In Iran, statistics indicate that one in every four Iranian women over the age of 50 is affected by osteoporosis[(9)].

Previous investigations have pointed to an association between depression and osteoporosis, suggesting a possible causal relationship between the two conditions[(10,11)].

Evidence also indicates that common pro-inflammatory cytokines, such as IL-1B, INF, TNFα, and IL-6, act as key mediators between depression and increased medical complications, including osteoporosis[12]. Treatment of depression with Selective Serotonin Reuptake Inhibitors (SSRIs) implicated as a contributing factor to osteoporosis[13]. According to the guidelines of the Canadian Network for Mood and Anxiety Treatments (CANMAT), patients with depression who are over 40 years of age or have used antidepressants for more than two years, as well as individuals who smoke, should undergo BMD screening[14,15].

Findings from a study by Wei-Sheng Lee et al.[16] conducted in Taiwan indicated that the odds of developing osteoporosis among the depressed patients are higher 1.3 times more than in non-depressed individuals. Another study also reported a significant relation between depression and reduced bone density[17]. Sepehrmanesh et al. reported a depression prevalence of 57.3% among patients with osteoporosis in Iran and found a significant association between depressive symptoms and family history of depression also use of psychiatric medications[18].

Given the considerable and direct impact of both conditions on patients' quality of life—and in light of the conflicting results across studies examining the relationship between depression and osteoporosis—this study was designed for finding the prevalence of the symptoms of depression and associated factors in osteoporotic patients.

Materials & Methods

This study was a cross-sectional analytical study was designed on 35 cases that was diagnosed with osteoporosis who visited the osteoporosis clinic at Imam Khomeini Hospital in Sari in 2024. These patients' data were registered in the Osteoporosis Registry at Mazandaran University of Medical Sciences. At this center, patients presenting with low-energy fractures and suspected osteoporosis undergo definitive diagnosis via BMD testing and are then registered for further specialized treatment.

Patients were selected using convenience sampling. Inclusion criteria were:

(1) A confirmed diagnosis of osteoporosis;

(2) Informed consent;

(3) The presence of a low-energy fracture.

Exclusion criteria included:

(1) missing values in registry data;

(2) incomplete questionnaires;

(3) refusal to participate.

Data Collection Instruments

Patient data included two main sources:

(1) registry records from the OSTEOPAD (FLS) system and the Osteoporosis Registry of the Orthopedic Research Center

(2) the Hospital Anxiety and Depression Scale (HADS) questionnaire.

A researcher-designed checklist was used to collect demographic and clinical information, including age, gender, substance use, smoking, corticosteroid use, current fracture site, BMD test results (T-scores of Total Hip, Spine and Femoral Neck), and comorbidities such as diabetes, hypertension, thyroid disease, heart disease, and rheumatoid arthritis.

Hospital Anxiety and Depression Scale (HADS)

This self-report 14-item tool evaluates the presence and severity of depression and symptoms of anxiety in patients. It comprises two 7-item subscales: one for depression and one for anxiety. To reduce false positives, somatic symptoms are excluded. Each item has four response options scored from 0 to 3. A cut-off score of 11 or higher is considered clinically significant. Kaviani et al. confirmed the reliability and validity of the Persian version[19], with Cronbach's alpha of 0.91 for the full scale, and 0.70 for the depression subscale, also 0.85 for the anxiety subscale.

Statistical Analysis

The statistical analysis included mean and standard deviation for quantitative and frequency (percent) for qualitative variables. To assess normality, The Kolmogorov-Smirnov test was used. Depending on distribution, comparisons between patients with and without depressive symptoms were conducted using the independent t-test or the non-parametric Mann–Whitney U test.

For analyzing the associations between categorical variables, Chi-square or Fisher's exact tests were used. All analyses were performed using SPSS version 20 at a significance level of 0.05.

Results

In this study, 35 patients with osteoporosis were examined for any sign of depressive symptoms. Depressive symptoms were found in 24 patients (68.57%). The demographic and clinical characteristics of the patients are presented in Table 1 and 2. As shown, 32 patients (91.40%) were female, and 3 patients (8.60%) were male. Depressive symptoms were identified in 65.60% of women and all male participants. However, with Fisher's exact test, there was no statistically significant association between gender and the presence of depressive symptoms (P > 0.05).

The overall mean age of patients was 63.86 ± 6.80 years and that was 63.67 ± 6.67 years in depress patients with and 64.27 ± 7.40 years in no symptomatic cases, and results from the Mann-Whitney test showed that there is no statistically significant difference in mean age between the two groups (P > 0.05).

Similarly, substance use (67.70% vs. 75.00%) and smoking (67.60% vs. 100.00%) did not show a statistically significant association with the presence of depressive symptoms (P > 0.05). Moreover, based on the results of Fisher's exact test, no statistically significant association was found between the corticosteroid use and presence of current fractures with depressive symptoms in osteoporotic patients (P > 0.05) (Tables 1 and 2).

Among patients with diabetes, 7 individuals (46.70%) exhibited depressive symptoms, while among non-diabetic patients, 17 individuals (85.00%) had depressive symptoms. There was a statistically significant association between diabetes and the presence of depressive symptoms in patients with osteoporosis according to Chi-square test results (P < 0.05).

Furthermore, depressive symptoms were observed in 73.10% of patients who were not taking antidepressants and in 55.60% of those who were. However, according to Fisher's exact test, no statistically significant association was found between antidepressant use and depressive symptoms in patients with osteoporosis (P > 0.05). Additionally, the results of statistical analyses indicated no significant associations between the presence of depressive symptoms and comorbidities such as hypertension, thyroid disorders, cardiovascular diseases, and rheumatoid arthritis (P > 0.05).

The prevalence of depressive symptoms based on the site of current fracture is presented in Table 3. Depressive symptoms were observed in 60% of patients with current fractures in the radius, 50% of those with fractures in the wrist or ankle, 70% of those with lumbar vertebra fractures, and in all patients with fractures in other regions. However, statistical analysis showed no significant association between the location of the current fracture and depressive symptoms (P > 0.05).

The results of bone mineral density assessments, including T-score values for the total hip (TH), spine, and femoral neck (FN), based on the depressive symptoms, are illustrated in Figure 1. As shown, the mean T-scores for TH, spine, and FN were lower in cases with depressive symptoms, but without any statistically significant differences (P > 0.05).

Table 1: Assessment of the Association Between Patients' Demographic Characteristics and the Presence of Depressive Symptoms

Variable		Total	Depression Symptom		P-value
			No	Yes	
Age	mean ±SD	63.86± 6.80	64.27± 7.40	63.67± 6.67	0.78
Sex	Female	32 (100)	11 (34.40)	21 (65.60)	0.53
	Male	3 (100)	0 (0.00)	3 (100.00)	
Substance Use	No	31 (100)	10 (32.30)	21 (67.70)	0.99
	Yes	4 (100)	1 (25.00)	3 (75.00)	
Cigarette Smoking	No	34 (100)	11 (32.40)	23 (67.60)	0.99
	Yes	1 (100)	0 (0.00)	1 (100.00)	
Corticosteroid use	No	30 (100)	8 (26.70)	22 (73.30)	0.29
	Yes	5 (100)	3 (60.00)	2 (40.00)	
Current fracture	No	19 (100)	5 (26.30)	14 (73.70)	0.71
	Yes	16 (100)	6 (37.50)	10 (62.50)	

Significant at the 0.05 level. Values are reported as frequency (percentage).

Table 2: The Distribution of Clinical Characteristics in Osteoporotic cases based on Depressive Symptoms

Variable		Total	Depression Symptom		P-value
			No	Yes	
Anti-depression Drugs	No	26 (100)	7 (26.90)	19 (73.10)	0.32
	Yes	9 (100)	4 (44.40)	5 (55.60)	
Diabetes	No	20 (100)	3 (15.00)	17 (85.00)	0.02*
	Yes	15 (100)	8 (53.30)	7 (46.70)	
Hypertension	No	10 (100)	4 (40.00)	6 (60.00)	0.68
	Yes	25 (100)	7 (28.00)	18 (72.00)	
Thyroid disease	No	28 (100)	10 (35.70)	18 (64.30)	0.39
	Yes	7 (100)	1 (14.30)	6 (85.70)	
Cardiovascular disease	No	26 (100)	9 (34.60)	17 (65.40)	0.68
	Yes	9 (100)	2 (22.20)	7 (77.80)	
Rheumatoid arthritis	No	18 (100)	7 (38.90)	11 (61.10)	0.27
	Yes	17 (100)	4 (23.50)	13 (76.50)	

Significant at the 0.05 level. Values are reported as frequency (percentage).

Table 3: Evaluation of the Association Between Current Fracture Site and Depressive Symptoms in osteoporotic Patients

Variable		Total	Depression Symptom		P-value
			No	Yes	
Current fracture site	Radius	5 (100)	2 (40.00)	3 (60.00)	0.09
	Wrist or ankle	10 (100)	5 (50.00)	5 (50.00)	
	Lumbar vertebra	10 (100)	3 (30.00)	7 (70.00)	
	Other	9 (100)	0 (0.00)	9 (100.00)	

Significant at the 0.05 level. Values are reported as frequency (percentage)

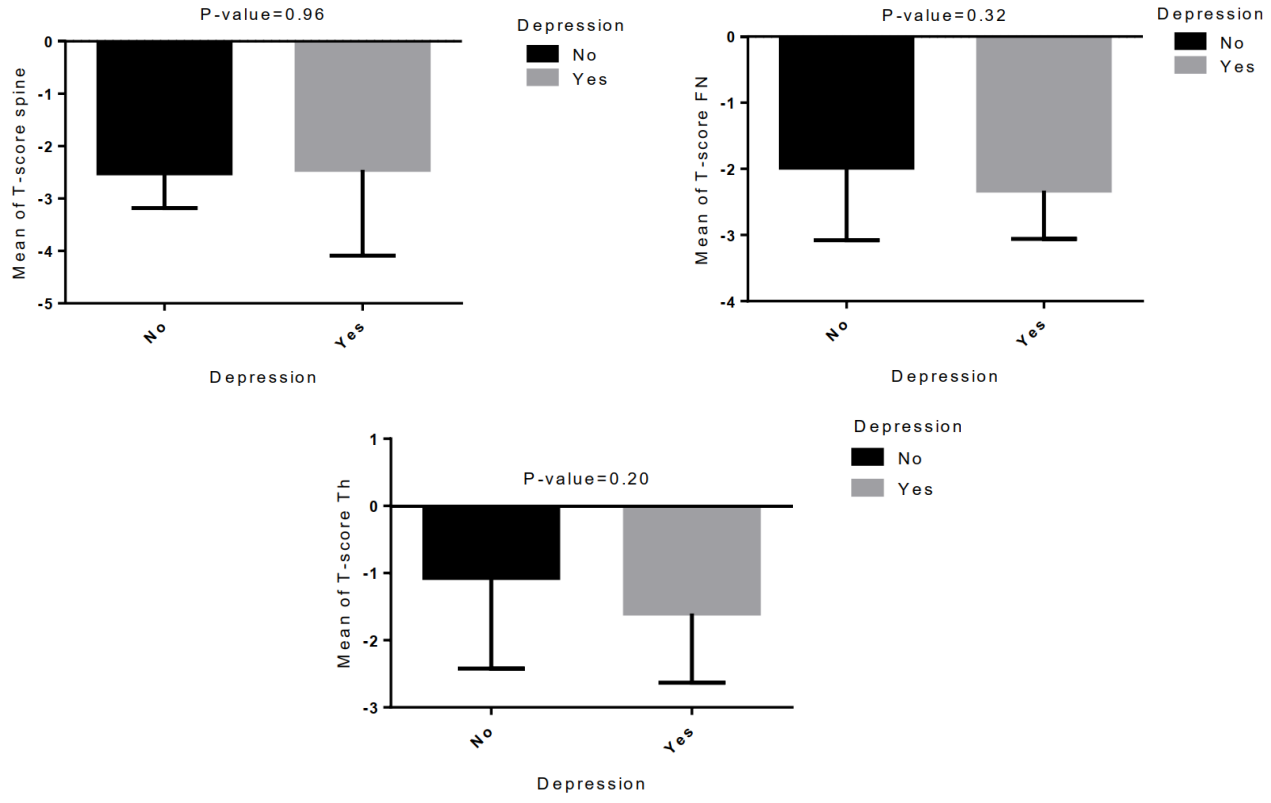

Figure 1: Comparison of Mean T-Score Values of Osteoporotic Patients regarding Depressive Symptoms

Discussion

The present study conducted to find the prevalence of the symptoms of depression and associated factors in patients with osteoporosis. This study indicated that 68.57% of the patients exhibited symptoms of depression. The overall mean age of participants was 63.86 ± 6.80 years. Among them, 91.4% were female, and the remaining were male. Depressive symptoms were observed in 65.60% of women and in all male patients. The mean age among patients with and without depressive symptoms was 63.67 ± 6.67 and 64.27 ± 7.40 years, respectively.

Among patients with diabetes, 46.70% exhibited depressive symptoms, while depressive symptoms were observed in 85.00% of non-diabetic patients. Additionally, depressive symptoms were present in 73.10% of patients not using antidepressants and in 55.60% of those who were.

Statistical analysis revealed a single significant inverse relationship: patients with diabetes were significantly less likely to present with depressive symptoms compared to those without diabetes ($P < 0.05$). However, no statistically significant associations were found between depressive symptoms and variables such as age, gender, substance use, smoking, corticosteroid use, current fracture status, use of antidepressant medications, or comorbidities including hypertension, thyroid disease, cardiovascular disease, and rheumatoid arthritis ($P > 0.05$).

Sepehrmanesh et al.[18], in a study conducted on 150 patients with osteoporosis, reported a prevalence of depressive symptoms of 86%. Among these individuals, 19 (12.7%) had mild depression, 47 (31.3%) had moderate depression, and 63 (42.0%) experienced severe depression. The overall mean age of participants was 55.50 ± 9.50 years. The study also confirmed a statistically significant association between the symptoms severity and both psychiatric medication and a family history of depression. However, there was no significant associations between the depression severity and gender, level of education, marital status, smoking, and history of diabetes. These findings were incoherent with our results, a discrepancy that could be attributed to differences in the populations and the relatively small sample size of our investigation.

Bazrafshan et al.[8] examined the incidence of osteoporosis and its association with certain demographic indicators in patients referred to densitometry centers in Gorgan. Their findings revealed a statistically significant relationship between age and bone mineral density (BMD) in both the femur lumbar spine. Specifically, for each unit increase in age, BMD decreased by 0.32 in the lumbar and 0.42 in the femur. A statistically significant association was also observed between BMD and body mass index (BMI) in the lumbar, whereas the corresponding relationship in the femoral region was not statistically significant. Moreover, no statistically significant associations were identified between variables such as age, gender, education level, marital status, regular physical activity, history of diabetes, or smoking and BMD in femur or lumbar spine. These findings were in line with those of the present study.

Additionally, our study found that the mean values of T-score Th, T-score spine, and T-score FN in patients with depressive symptoms were lower than those without. However, no statistically significant association was found between the presence of symptoms of depression and the bone densitometry results (T-score Th, T-score spine, and T-score FN) ($P > 0.05$).

Kashfi et al.[20] evaluated the relationship between osteoporosis and depression by comparing levels of depression in osteoporotic patients and healthy individuals.

Their results showed that depression levels were significantly higher in osteoporotic patient. In recent years, many studies have found the relationship between the depression and osteoporosis, often yielding contradictory findings. According to a study by Kizza[21], patients with major depressive disorder had less bone mineral density and a more osteoporosis prevalence. Similarly in study of Eskandari et al.[22], on premenopausal women, reported the association of depression with reduced bone density. Another study also indicated that depressive disorder was linked to decreased BMD in femur and spine[23].

The findings of all these studies contrast with our results. These discrepancies could be due to factors such as the relatively small sample size of the present study, differences in study populations, and other influential behavioral and biological variables such as culture, style of life, hormone therapy, and genetic predispositions. Nonetheless, some researchers have reported results consistent with those of our study[24–26].

The power of our study were: (1) including the patients with a confirmed diagnosis of osteoporosis;

(2) the examination of various variables related to osteoporosis; and (3) the use of data recorded in the Osteoporosis Registry System of Mazandaran University of Medical Sciences, which serves as one of the World Health Organization's designated databases in Iran.

One of the main limitations of the present study is its relatively small sample size and limited generalizability. This is due to the fact that the study population consisted solely of individuals who visited the osteoporosis clinic, which may not be fully representative of the broader population. As a result, there is a potential concern regarding the practicality of the findings to the general population.

Conclusion

The findings of our study indicate that the prevalence of symptoms of depression in osteoporotic patients was high. Therefore, depression as a significant factor should be considered in the management of osteoporosis. In addition, the results of this study may serve as a basis for implementing educational programs targeted at individuals with osteoporosis, aiming to support improving mental health in patients and families, particularly in managing and reducing depression.

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