

# Health-Related Quality of Life in Osteoporosis Patients with and without Fractures in Tehran, Iran

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Received: September 6, 2022

Revised: December 16, 2022

Accepted: December 20, 2022

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**Background:** This study aimed to measure the health-related quality of life (HRQOL) of patients with osteoporosis with and without fractures in Tehran, the capital city of Iran.

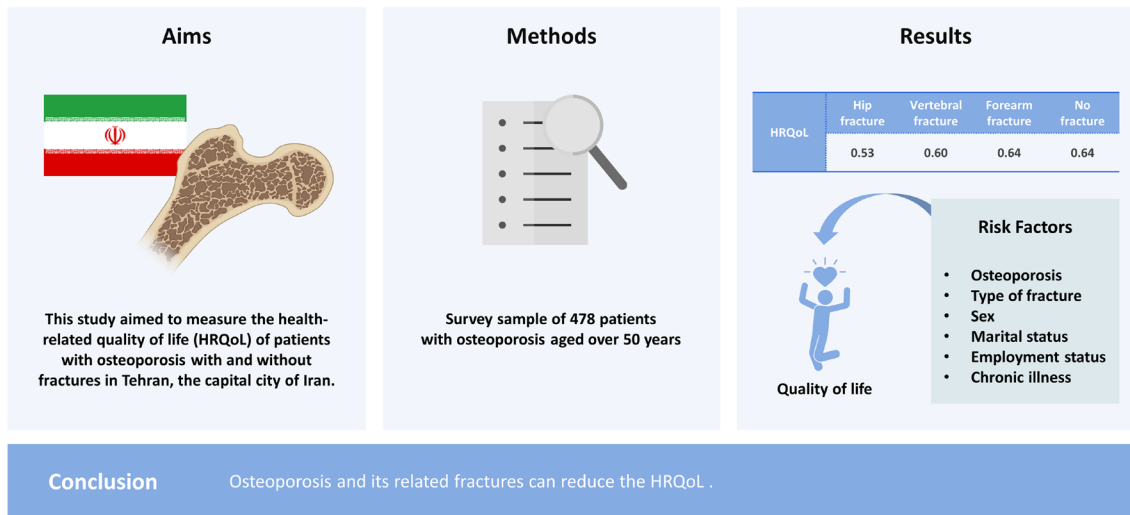
**Methods:** We surveyed a sample of 478 patients with osteoporosis aged over 50 years. Participants with fractures included patients referred to hospitals due to osteoporotic fractures which were alive 6 months after the fracture. Participants without fractures were randomly selected from patients with a definite diagnosis of osteoporosis admitted to 3 outpatient clinics in Tehran. Data were collected using the EuroQol 5-dimensional 5-level questionnaire. Statistical differences between patients with and without fracture were tested with Pearson's  $\chi^2$  test, Student's *t*-test, and the Mann-Whitney U-test. The association between HRQOL and other variables was evaluated using a multiple linear regression model. **Results:** The patients' mean age  $\pm$  standard deviation was  $67.3 \pm 11.9$  years, and 74.1% were women. One hundred and seventeen (23%) patients had hip fractures, 56 (11%) had vertebral fractures, 127 (25%) had forearm fractures, and 178 (40%) had no fractures. The median (interquartile range) values of HRQOL scores of those with hip, vertebral, and forearm fractures and those with no history of fracture were 0.53 (0.22), 0.60 (0.28), 0.64 (0.26), and 0.64 (0.27), respectively. The multiple regression model revealed a significant relationship between the HRQOL scores and sex, marital status, employment status, presence of any chronic illness in addition to osteoporosis, and type of fracture. **Conclusions:** Osteoporosis and its related fractures can reduce the HRQOL.

**Key Words:** Fractures, bone · Health status indicators · Iran · Osteoporosis · Quality of life

## INTRODUCTION

Osteoporosis is a common disease among elders, associated with decreased bone density and increased risk of fractures.[1] More than 200 million people with osteoporosis live all around the world, and more than 9 million osteoporotic fractures occur annually.[2] It was estimated that the prevalence of osteoporosis was nearly 17% (95% confidence interval [CI], 13%-22%) in 2012 in Iran, and its prevalence is on the rise. The higher the age, the higher would be osteoporosis prevalence.[3]

## Graphical Abstract



Based on the results of a systematic review and meta-analysis the age-standardized prevalence of osteoporosis among the Iranian elderly population (aged  $\geq 60$  years) was 62.7% (95% CI, 60.0–65.4) in women, and 24.6% (95% CI, 21.9–27.3) in men.[4]

Osteoporosis makes the patients prone to fragility fractures, so even partial traumas may result in fracture.[5] Most osteoporotic fractures occur in hip, spine, and forearm.[6] A meta-analysis study showed that the annual cumulative incidence of hip fractures in Iran was 138.26 (95% CI, 98.71–193.65) and 157.52 (95% CI, 124.29–199.64) per 100,000 population in men and women, respectively.[7]

The health-related quality of life (HRQOL) is a multidimensional concept that measures the impacts of disease on various aspects of health, such as physical, mental, and social,[8] which has become a common concept to assess the effectiveness of therapeutic interventions diseases, including for osteoporosis. There are 2 types of HRQOL instruments: generic and specific.[9] The EuroQol 5-dimensional (EQ-5D) is one of the most widely used generic preference-based instruments to measure the HRQOL that contains 5D: Mobility; Self-care; Usual activities; Pain/discomfort, and Anxiety/depression. Five levels were identified in each dimension: No problems; Slight problems; Moderate problems; Severe problems; and Incapacity.[10]

Osteoporotic Fractures cause acute pain, impaired daily

activity, and reduced HRQOL.[11-14] According to the literature, even those patients with osteoporosis who don't experience a bone fracture have lower HRQOL compared to healthy people.[15-17]

The prevalence of osteoporosis is increasing in many countries, including Iran. However, few studies have been conducted to assess the HRQOL of osteoporosis patients in Iran. Therefore, the current study aimed to measure the HRQOL of patients with osteoporosis, both with a history of fracture and no fracture in Iran.

## METHODS

This is a cross-sectional descriptive study to measure the HRQOL in osteoporosis patients with and without a history of fracture.

### 1. Study participants

The sample consisted of 2 groups of osteoporosis patients: (1) with a history of common osteoporotic fractures, including hip, clinical vertebral, and forearm (distal forearm, distal radius, wrist) fractures, during the previous year before the study; and (2) osteoporosis patients without a history of fracture who were receiving services from outpatient clinics.

Subjects of the first group were patients who were re-

ferred to the educational hospitals affiliated with the Tehran University of Medical Sciences (including Shariati, Sina, Baharlo, and Ziaeiian Hospitals) in 2017 due to common fractures caused by osteoporosis, including hip, clinical vertebral, and forearm fractures and were alive 6 months after the fracture. Inclusion criteria were: (1) Fragility fracture of hip (International Classification of Diseases, Tenth Revision [ICD-10] code S72), clinical vertebral (ICD-10 code S32), or forearm (ICD-10 code S52); (2) Age over 50; (3) a T-score  $\leq -2.5$  standard deviation (SD) in hip or spine.

Subjects of the second group were randomly selected using simple randomization among patients with a definite diagnosis of osteoporosis admitted to 3 outpatient clinics in Tehran during the year 2017. The inclusion criterion for this group having a T-Score  $\leq -2.5$  SD in hip or spine and age over 50.

Bone mineral density of all patients was measured using dual energy X-ray absorptiometry (DXA) scan.

## 2. Data collection tools and methods

Data were collected using a questionnaire with 2 main parts. The first section included demographic questions (about age, gender, marital status, education level, and employment status) and questions about having health insurance and the presence of any chronic illness in addition to osteoporosis. The second part was consisted of the official Iranian version of EQ-5D-5 level (EQ-5D-5L) questionnaire. The EQ-5D-5L questionnaire contains 5D, including mobility, personal care, usual activity, physical pain/discomfort, and anxiety/depression, each encompasses 5 levels: No problems; Slight problems; Moderate problems; Severe problems; and Incapacity. Subjects of the first group, i.e., patients with a history of fracture, were interviewed by telephone 6 months after the fracture. For subjects of the second group, i.e., those with no history of fracture, in-person interviews were conducted at the time of patients' referral to the clinics.

## 3. Data analysis

We made a descriptive analysis of our data by calculating frequencies, mean, median, and SD. To calculate the respondents' HRQOL scores according to the EQ-5D-5L questionnaire we used the 5L crosswalk-based value set derived from the EQ-5D-3L value set in Iran.[18] In order to obtain the Iranian crosswalk-based EQ-5D-5L value set and use a

face-to-face time trade-off method, the crosswalk methodology developed by van Hout et al.[19] was applied to the Iranian EQ-5D-3L value set.[18]

Statistical differences between patients with and without a history of fracture were established with Pearson's  $\chi^2$  test, Student's *t*-test and Mann-Whitney U-test. The association between HRQOL and other variables was evaluated using a multiple linear regression model that included the EQ-5D-5L scores as the dependent variable and the age, sex, marital status, employment status, having health insurance, presence of any chronic illness in addition to osteoporosis and type of fractures as the explanatory variables. Statistical significance level was set at *P* value of less than 0.05. Data were analyzed with the STATA 14.0 software (Stata Corp., College Station, TX, USA).

## RESULTS

The demographic characteristics of the participants by the type of fracture are described in Table 1. In total, 478 patients were sampled, among which 178 had no history of any osteoporotic fracture. Among participants, 117, 56, and 127 patients had hip, clinical vertebral, and forearms fracture, respectively, and 65%, 60.7%, and 74% were women, respectively. The mean and SD of participants' age was 68.5 (10.7). Nearly 41.8% of participants were unmarried and their marital status was single, divorced, and widow. About 95.8% of participants had basic health insurance. Around 61.5% of participants had at least one chronic illness in addition to osteoporosis. The mean (SD) of years of education was 6.9 (5.7). There were statistical differences between patients with and without a history of fracture in terms of sex, age, employment status, having complementary health insurance, presence of any other chronic illness in addition to osteoporosis, and years of education ( $P < 0.05$ ).

Distribution of participants based on their answers to the EQ-5D-5L questionnaire, separated by the type of fracture, is provided in Table 2. For those with hip, clinical vertebral, and forearm fractures, the percentage of those with "no problems" in the mobility dimension was 4.3%, 10.7%, and 30.7%, respectively. This figure for a patient with no fracture was 25.3%. About 9.4% of patients with hip fractures were unable to walk. While 1.8% and 2.4% of patients with clinical vertebral and forearm fractures, respectively, and 0% of patients with no fracture were not able to walk.

**Table 1.** Sociodemographic characteristics of the sample by type of fracture

Categorical variables	Total participants (N=478)	Type of Fx			All Fx (N=300)	No Fx (N=178)	P-value <sup>a)</sup>
		Hip Fx (N=117)	Clinical vertebral Fx (N=56)	Forearm Fx (N=127)			
Sex							<0.001
Men	124 (25.9)	41 (35.0)	22 (39.3)	33 (26.0)	96 (32.0)	28 (15.7)	
Women	354 (74.1)	76 (65.0)	34 (60.7)	94 (74.0)	204 (68.0)	150 (84.3)	
Marital status							0.10
Married	278 (58.2)	53 (45.3)	34 (60.7)	79 (62.2)	166 (55.3)	112 (62.9)	
Unmarried	200 (41.8)	64 (54.7)	22 (39.3)	48 (37.8)	134 (44.7)	66 (37.1)	
Employment status							0.001
Employment	27 (5.6)	6 (5.1)	2 (3.6)	9 (7.1)	17 (5.7)	10 (5.6)	
Householder	281 (58.8)	57 (48.7)	26 (46.4)	82 (64.6)	165 (55.0)	116 (65.2)	
No employment	39 (8.2)	15 (12.8)	8 (14.3)	13 (10.2)	36 (12.0)	3 (1.7)	
Retired	131 (27.4)	39 (33.3)	20 (35.7)	23 (18.1)	82 (27.3)	49 (27.5)	
Having basic health insurance							0.247
Yes	458 (95.8)	116 (99.1)	50 (89.3)	119 (93.7)	285 (95.0)	173 (97.2)	
No	20 (4.2)	1 (0.9)	6 (10.7)	8 (6.3)	15 (5.0)	5 (2.8)	
Having complementary health insurance							<0.001
Yes	210 (44.0)	35 (29.9)	16 (28.6)	36 (28.3)	87 (29.0)	123 (69.1)	
No	267 (56.0)	82 (70.1)	40 (71.4)	91 (71.7)	213 (71.0)	54 (30.3)	
Presence of any other chronic illness in addition to osteoporosis							0.009
Yes	294 (61.5)	68 (58.1)	38 (67.9)	65 (51.2)	171 (57.0)	123 (69.1)	
No	184 (38.5)	49 (41.9)	18 (32.1)	62 (48.8)	129 (43.0)	55 (30.9)	
Continuous variables							
Age (yr)	68.5±10.7	73.6±11.3	69.7±10.4	66.4±10.5	69.8±11.2	66.3±9.3	<0.001
Years of education	6 [12]	6 [12]	6 [12]	6 [9]	6 [12]	9 [9]	<0.001

The data is presented as N (%), mean ± standard deviation, or median [interquartile range].

<sup>a)</sup>Between all fractures and no fractures. Student's *t*-test and Mann–Whitney U test were used for normal and non-normal distributions, respectively. Fx, fracture.

In the self-care dimension, 27.4%, 35.7%, and 48% of patients with hip, clinical vertebral, and forearm fractures reported, "no problem", respectively. This is while 60.1% of patients with no fracture reported "no problem". Besides, 6%, 1.8%, 1.6%, and 0% were not able to wash or wear clothes, respectively. Regarding the usual activities dimension, 35.9%, 39.3%, 52.8%, and 60.7% of those with the hip, clinical vertebral, forearms fractures and those without a history of fracture had "no problem" in doing their usual activities, respectively. Besides, 6.0%, 3.6%, 0.8%, and 0.6% were unable to perform usual activities. In the pain/discomfort dimension, 5.1%, 5.4%, 7.1%, and 12.9% of those with a history of hip, clinical vertebral, and forearm fracture, and those without a history of fracture reported "no pain and physical discomfort", respectively. Besides, 8.6%, 14.3%, 9.4%, and 9% of participants, respectively, noted that they had infinite pain or physical discomfort. In terms of anxiety/depression, the percentages of those with a history of

hip, clinical vertebral, and forearm fracture and those with no history of fracture who reported "no anxiety or depression" were 35%, 26.8%, 30.7%, and 37.1%, respectively. Furthermore, 6.8%, 5.4%, 5.5%, and 6.2% of participants reported extreme anxiety or depression, respectively. There were statistical differences between patients with a history of fracture and those without a history of fracture in terms of distribution of their answers to the EQ-5D-5L questions in the mobility, self-care and usual activities dimensions ( $P < 0.05$ ).

The median, interquartile range (IQR), and distribution of HRQOL, measured using the EQ-5D-5L and separated by the type of fracture and sex, are provided in Table 3 and Figure 1, respectively. The median (IQR) values of HRQOL scores of those with a history of hip, clinical vertebral, and forearm fracture and no history of fracture were 0.53 (0.22),

**Table 2.** Frequency of item responses in each the EuroQoL 5-dimensional 5-level 5-level dimension by type of fracture

Dimension	Type of Fx			All Fx (N=300)	No Fx (N=178)	P-value <sup>a)</sup>
	Hip Fx (N=117)	Clinical vertebral Fx (N=56)	Forearm Fx (N=127)			
Mobility						0.001
No problems	5 (4.3)	6 (10.7)	39 (30.7)	50 (16.7)	45 (25.3)	
Slight problems	44 (37.6)	23 (41.1)	49 (38.6)	116 (38.7)	76 (42.7)	
Moderate problems	40 (34.2)	16 (28.6)	27 (21.3)	83 (27.7)	31 (17.4)	
Severe problems	17 (14.5)	10 (17.9)	9 (7.1)	36 (12.0)	26 (14.6)	
Incapacity	11 (9.4)	1 (1.8)	3 (2.4)	15 (5.0)	0 (0.0)	
Self-care						<0.001
No problems	32 (27.4)	20 (35.7)	61 (48.0)	113 (37.7)	107 (60.1)	
Slight problems	46 (39.3)	21 (37.5)	42 (33.1)	109 (36.3)	48 (27.0)	
Moderate problems	21 (17.9)	10 (17.9)	19 (15.0)	50 (16.7)	19 (10.7)	
Severe problems	11 (9.4)	4 (7.1)	3 (2.4)	18 (6.0)	4 (2.2)	
Incapacity	7 (6.0)	1 (1.8)	2 (1.6)	10 (3.3)	0 (0.0)	
Usual activities						<0.001
No problems	42 (35.9)	22 (39.3)	67 (52.8)	131 (43.7)	108 (60.7)	
Slight problems	32 (27.4)	19 (33.9)	33 (26.0)	84 (28.0)	43 (24.2)	
Moderate problems	24 (20.5)	7 (12.5)	18 (14.2)	49 (16.3)	23 (12.9)	
Severe problems	12 (10.3)	6 (10.7)	8 (6.3)	26 (8.7)	3 (1.7)	
Incapacity	7 (6.0)	2 (3.6)	1 (0.8)	10 (3.3)	1 (0.6)	
Pain/discomfort						0.056
No	6 (5.1)	3 (5.4)	9 (7.1)	18 (6.0)	23 (12.9)	
Slight	41 (35.0)	16 (28.6)	37 (29.1)	94 (31.3)	43 (24.2)	
Moderate	40 (34.2)	18 (32.1)	40 (31.5)	98 (32.7)	54 (30.3)	
Severe	20 (17.1)	11 (19.6)	29 (22.8)	60 (20.0)	42 (23.6)	
Extreme	10 (8.6)	8 (14.3)	12 (9.4)	30 (10.0)	16 (9.0)	
Anxiety/depression						0.408
No	41 (35.0)	15 (26.8)	39 (30.7)	95 (31.7)	66 (37.1)	
Slight	35 (29.9)	13 (23.2)	42 (33.1)	90 (30.0)	44 (24.7)	
Moderate	22 (18.8)	12 (21.4)	28 (22.0)	62 (20.7)	30 (16.9)	
Severe	11 (9.4)	13 (23.2)	11 (8.7)	35 (11.7)	27 (15.2)	
Extreme	8 (6.8)	3 (5.4)	7 (5.5)	18 (6.0)	11 (6.2)	

The data is presented as N (%).

<sup>a)</sup>Between all fractures and no fractures.

Fx, fracture.

0.60 (0.28), 0.64 (0.26), and 0.64 (0.27), respectively. The HRQOL scores in women were significantly lower than in men ( $P=0.003$ ).

The mean of responses in each EQ-5D-5L dimension based on fracture types and sex are presented in Figure 2. Almost in all dimensions, the patients with a history of hip fracture had the highest and those without a history of fracture had the lowest mean. Furthermore, in all dimension the mean of responses was higher in women than in men.

Table 4 shows the associates of the quality of life (QOL)

in multiple linear regression analyses. The results showed that compared to the osteoporotic patients without a history of fractures, QOL was significantly lower in patients with hip fracture ( $\beta=-0.077$ ,  $P<0.001$ ) and clinical vertebral fracture ( $\beta=-0.075$ ,  $P=0.005$ ), but not in patients with forearm fracture ( $\beta=-0.010$ ,  $P=0.611$ ). Being married at the time of the study had a significant positive association with the QOL ( $\beta=0.054$ ,  $P=0.002$ ), while a negative association was detected between the presence of chronic disease and QOL in patients under study ( $\beta=-0.033$ ,  $P=0.039$ ).

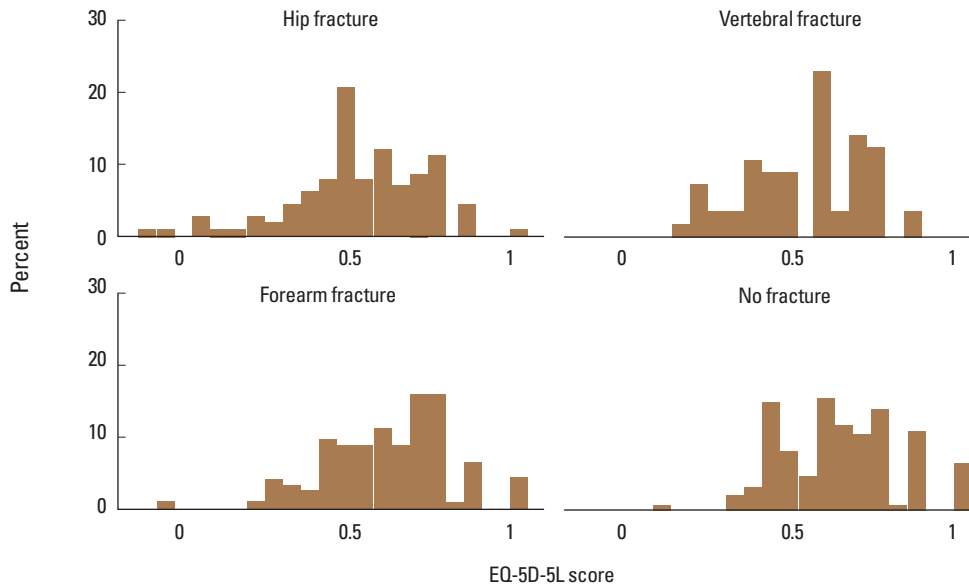


Fig. 1. Distribution of the EuroQol 5-dimensional 5-level (EQ-5D-5L) scores by type of fracture.

Table 3. Median (interquartile range) of the EuroQol 5-dimensional 5-level scores by type of fracture

Type of fracture	All participants	Men	Women	P-value
Hip	0.53 [0.22]	0.60 [0.28]	0.52 [0.21]	0.034
Clinical vertebral	0.60 [0.28]	0.62 [0.12]	0.50 [0.30]	0.064
Forearm	0.64 [0.26]	0.67 [0.25]	0.62 [0.24]	0.448
No fracture	0.64 [0.27]	0.74 [0.16]	0.62 [0.27]	0.002
Total	0.61 [0.24]	0.68 [0.25]	0.59 [0.24]	0.003

The data is presented as median [interquartile range].

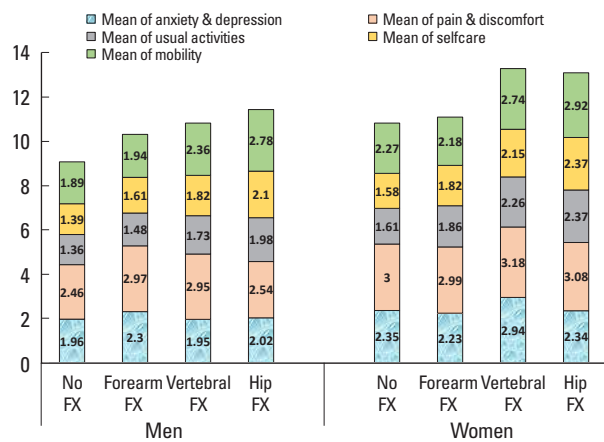


Fig. 2. The mean of responses in each the EuroQol 5-dimensional 5-level (EQ-5D-5L) dimension based on fracture types and sex. Fx, fracture.

Table 4. The associates of quality of life in the linear regression model

Independent variables	Dependent variable (utility scores)		P-value
	Coefficient	Standard error	
Age	-0.001	0.001	0.098
Gender			
Male	Ref		
Female	-0.059	0.026	0.023
Marital status			
Never married, divorced, or widowed	Ref		
Married	0.054	0.018	0.002
Employment status			
Unemployed	Ref		
Employed	0.088	0.043	0.042
Home maker	0.098	0.036	0.007
Retired	0.137	0.033	<0.001
Having basic health insurance	-0.010	0.040	0.801
Having complementary health insurance	0.032	0.017	0.071
Presence of any other chronic illness	-0.033	0.016	0.039
Type of fracture			
No fracture	Ref		
Hip	-0.077	0.022	<0.001
Clinical vertebral	-0.075	0.027	0.005
Forearm	-0.010	0.020	0.611

Women with complementary health insurance also tended to have a higher QOL, though not statistically significant

(β=0.032, P=0.071).

## DISCUSSION

In the current study, the HRQOL of those with osteoporotic fractures of the hip, clinical vertebral, and forearms as well as patients suffering osteoporosis with no history of fractures was measured using the EQ-5D questionnaire. The median (IQR) values of HRQOL scores of those with hip, clinical vertebral, and forearm fractures and those with no history of fracture were 0.53 (0.22), 0.60 (0.28), 0.64 (0.26), and 0.64 (0.27), respectively. According to the result of multiple regression model, there was a significant association between the HRQOL scores and gender, marital status, employment status, presence of any chronic illness, and type of fracture.

Almost 95.7% of patients with hip fracture had mobility problems, 72.6% had self-care problems, 64.1% had problems with usual activities, 94.9% had pain/discomfort, and 65% had anxiety/depression.

Worse mobility was reported by hip fracture survivors in comparison with other fractures. After a hip fracture, nearly 10% to 20% of people who have a hip fracture die within the next year and about half of them lose their ability to perform usual activities.[20] Almost 40% to 60% of patients with a history of hip fracture regain their full mobility within 1 year.[21]

Based on a study conducted in Russia, the HRQOL of people with a history of hip fractures 2 weeks, 4 months, and 12 months after the fracture was -0.22, 0.39, and 0.46, and this value increased to 0.64 eighteen months after the fracture.[22] Another study that measured the HRQOL of people with a history of hip fracture in Sweden reported that the HRQOL after fracture was 0.18, and this number increased to 0.62 4 months later and reached 0.67, 12 months later.[23] Besides, the results of a new study in Spain reported that HRQOL of people over the age of 65, a month after the fracture was 0.16.[24] Another study reported that the HRQOL of postmenopausal women with hip fractures was 0.64.[25]

In the present study almost 95.7% of patients with hip fracture had mobility problems, 72.6% had self-care problems, 64.1% had problems with usual activities, 94.9% had pain/discomfort, and 65% had anxiety/depression. The results of one study in Spain on elderly patients with a history of hip fracture showed that one month after fracture 99.5% of patients had problems in mobility, 98.2% in self-

care, 99.1% in doing usual activities, 85.4% in pain/discomfort, and 53% in anxiety/depression.[24] Besides, a study conducted in Russia revealed that 83% of patients with hip fracture had problems with mobility, 71% in self-care, 73% in doing usual activities, 28% in pain/discomfort, and 15% in anxiety/depression.[22]

Vertebral fracture is also common among patients with osteoporosis.[6] Various studies found that vertebral fracture decreases HRQOL.[26] Hagino et al.[27] conducted a study to estimate the HRQOL changes in patients with vertebral fractures and reported that 2 weeks after the fracture the HRQOL was 0.53, 3 months later it increased to 0.75, 6 months later it was 0.74, and one year after the fracture this number reached to 0.83. Another study that estimated HRQOL of patients with a history of vertebral fracture in Sweden reported that after the fracture, the HRQOL was 0.18, 4 months later it increased to 0.47, and 12 months later it was 0.49.[23] In the current study, the HRQOL of patients with vertebral fracture was 0.55. A systematic review and meta-analysis conducted by Al-Sari et al.[9] revealed that the physical dimension of HRQOL of osteoporosis patients with vertebral fracture was significantly lower than HRQOL of osteoporosis patients without a history of vertebral fracture. However, in terms of the mental dimension of HRQOL, no significant difference was observed between 2 groups.[9] In the current study also the HRQOL of patients with a history of vertebral fracture was significantly lower than patients with no history of fracture. For example, 89.4% of patients with vertebral fracture had problems in mobility, while 72% of patients with no history of fracture had such a problem. Moreover, 64.3 and 37.5% of patients with vertebral fracture and without a history of fracture had problems in self-care, respectively. According to the result of the multiple regression model in our study, the HRQOL scores in patients with clinical vertebral fractures were 0.075 less than in patients without a history of fracture.

Among the most common osteoporotic fractures, patients with a forearm fracture have the highest HRQOL. In a Swedish study, the HRQOL of people with a forearm fracture was 0.56 after the fracture, 4 months later it was 0.82, and 12 months after the fracture it was 0.86.[23] Another study conducted in Korean reported that the HRQOL of those with a forearm fracture was 0.83.[28] In the current study, the median score of HRQOL of patients with forearm fracture was 0.64.

Emrani et al.[29] measured the HRQOL of the general population aged 60 to 69 years using the EQ-5D-5L questionnaire in Iran and reported that the mean score of HRQOL was 0.74. In the current study, the mean age of patients with no history of fracture was nearly 66.3 years, and the median value of HRQOL score was 0.64, which can indicate that the HRQOL of osteoporosis patients with no history of fracture is lower than healthy individuals. Wilson et al. [17] also reported that osteoporosis alone has negative effects on the HRQOL.

In the current study, the EQ-5D-5L questionnaire, the most widely used general preference-based instrument to measure the HRQOL,[30] was used to measure the HRQOL of patients with osteoporosis and common fractures in Iran. Other researchers and/or policymakers can use the results of this study to conduct economic evaluation studies and to provide information for decision-making regarding resource allocations. However, this study also had some limitations. In the current study, the HRQOL of patients with osteoporotic fractures was measured 6 months after the fracture. Given that the HRQOL of these patients usually changes during the first year after the fracture, the results cannot be generalized to the first 6 months after the fracture. Besides, patients with osteoporotic fractures were sampled from hospitals and therefore the results cannot be generalized to outpatients. Although this limitation was more for vertebral and forearm fractures, as almost all patients with hip fractures are hospitalized.

## CONCLUSION

Osteoporosis and its related fractures can reduce the HRQOL. Since Iran's population is aging, age-related health conditions such as osteoporosis are increasing. Due to the significant negative impacts of osteoporotic fractures on HRQOL and healthcare expenditures, it is necessary to design interventions to prevent and improve the HRQOL of patients with osteoporosis.

## DECLARATIONS

### Funding

This study was funded by Tehran University of Medical Sciences (grant no. 9611119004).

### Authors' contributions

Conceptualization: MR, NF, and RD; Data curation: RD, MR, AO, AS, SMS-J, AM, BL, and NF; Formal analysis: RD, MR, AO, AS, SMS-J, AM, BL, and NF; Methodology: RD, MR, AO, AS, SMS-J, AM, BL, and NF; Writing - original draft: MR, NF, and RD; Writing - review & editing: RD, MR, AO, AS, SMS-J, AM, BL, and NF; All authors read and approved the final manuscript.

### Ethics approval and consent to participate

This study was approved by the ethics committee of the Deputy of Research and Technology of the Tehran University of Medical Sciences (IR.TUMS.EMRI.REC.1396.0016). The participants were assured that their information would remain confidential. Informed consent was obtained from all individual participants included in the study.

### Conflict of interest

No potential conflict of interest relevant to this article was reported.

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