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

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Abstract

Background: Osteoporosis and related fractures are associated with significant morbidity and reduced Health-related Quality of Life (HRQoL). The objective of this study was to measure the HRQoL of osteoporosis patients in Tehran, the capital city of Iran.

Method: We surveyed a sample of 478 patients with osteoporosis aged over 50 years with and without osteoporotic fractures. Patients with osteoporotic fractures (hip, vertebral, and forearm) admitted to the educational hospitals affiliated to the Tehran University of Medical Sciences-Iran, during 2017 were randomly selected. Patients without osteoporotic fractures were also randomly selected among patients with a definite diagnosis of osteoporosis who were referred to three outpatient clinics in Tehran during 2017. Data were collected using the EQ-5D-5L questionnaire. Statistical differences between patients with and without a history of fracture were tested with Pearson's χ^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.

Result: The mean $\pm$ SD age of the patient was 67.3 ± 11.9 years, and 65% were women. A hundred and seventeen (23%) patients had hip fractures, 56 (11%) patients had vertebral fractures, 127 (25%) patients had forearm fractures and 178 (40%) patients 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. According to the result of multiple regression model there was a significant relationship between the HRQoL scores and gender, marital status, employment status, presence of any chronic illness in addition to osteoporosis and type of fracture.

Conclusion: Osteoporosis and related fractures significantly reduced HRQoL. Due to the significant negative impacts of the osteoporosis on HRQoL and healthcare expenditures, Intervention strategies should be tailored to prevent it and to improve the HRQoL of osteoporosis patients.

Introduction

Osteoporosis is a common disease among elders, which is associated with decreased bone density and increased risk of bone 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 is estimated that the prevalence of osteoporosis was nearly 17% (95% confidence interval: 13-22%) in 2012 in Iran, and its prevalence is on the rise. The higher the age, the higher would be its prevalence (3).

Osteoporosis makes the patients prone to bone fractures, so that even partial traumas may result in fracture (4). Most of the fractures occur in hip, spine, and forearm(5). Fractures cause acute pain, impaired daily activity, and reduced Health-related Quality of Life (HRQoL) (6–9). According to the literature, even those osteoporosis patients who don't experience a bone fracture, have lower HRQoL compared to healthy people (10–12).

The HRQoL is a multidimensional concept that measures the impacts of a disease on various aspects of health, such as physical, mental, and social (13), which has become a common concept to assess the effectiveness of therapeutic interventions for diseases, including for osteoporosis. There are two types of HRQoL instruments: generic and specific (14). Although specific instruments may have higher sensitivity in measuring the impacts of interventions, but due to their inability to compare, generic instruments apply more commonly to inform decisions about resource allocations.

EQ-5D is one of the most widely used generic preference-based instruments to measure the HRQoL that contains five dimensions: 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(15).

Due to the aging population, the prevalence of osteoporosis is increasing in many countries, including Iran. However, few studies are conducted to assess the HRQoL of osteoporosis patients in Iran. Therefore, the current study aimed to measure the HRQoL of osteoporosis patients, both with a history of fracture and no fracture in Iran. The results can be used by other researchers to conduct economic evaluation studies as well as making decisions about the allocation of resources for patients with osteoporosis.

Methods

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

Study Participants

The sample consisted of two groups of osteoporosis patients: (a) with a history of common osteoporotic fractures, including hip, vertebral, and forearm fractures, during the previous year before the study; and (b) osteoporosis patients without a history of fracture who were receiving services from outpatient clinics. Subjects of the first group were randomly selected among patients who were referred to the educational hospitals affiliated to Tehran University of Medical Sciences due to common fractures caused by osteoporosis, including hip, vertebral, and forearm fractures. Inclusion criteria were: (1) Fragility fracture of hip, vertebral, or forearm according to the International Classification of Diseases, version 10; (2) Age over 50; (3) a T-score $\leq -2.5SD$ in hip or spine.

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

Data Collection Tools And Methods

Data were collected using a questionnaire with two main parts. The first section included demographic questions (about age, gender, marital status, and education level and employment status) and questions about having health insurance and presence of any chronic illness in addition to osteoporosis. The second part was consisted of the Iranian version of EQ-5D-5L questionnaire. The EQ-5D-5L questionnaire contains five dimensions, including mobility, personal care, usual activity, physical pain/discomfort, and anxiety/depression, that each encompasses five levels: No problems; Slight problems; Moderate problems; Severe problems; and incapacity(15). Subjects of the first group, patients with a history of fracture, were interviewed by telephone at least six months after the fracture. For subjects of the second group, no history of fracture, in-person interviews were conducted at the time of patients' referral to the clinics.

Data Analysis

We made descriptive analysis of our data by calculating frequencies, mean, median, and standard deviation. To calculate the respondents' HRQoL scores according to the EQ-5D-5L questionnaire we used the five level crosswalk-based value set derived from the EQ-5D-3L value set in Iran (16). In order to obtain the Iranian crosswalk-based EQ-5D-5L value set and using a face-to-face time trade-off method, the crosswalk methodology developed by van Hout et al(17) was applied to the Iranian EQ-5D-3L value set (16).

Statistical differences between patients with and without a history of fracture were established with Pearson's χ^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 $p < 0.05$. Data were analyzed with Stata Ver.14 software.

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 vertebrae, and forearms fracture, respectively, and 65%, 60.7%, and 74% were women, respectively. The mean and standard deviation (SD) of participants' age were 68.5)10.7(. For patients with hip fracture, the mean age was 73.5 years and, compared to other types of fractures, they had the highest mean age. Nearly 42% of participants were unmarried and their marital status were single, divorced, and widow. About 96% of participants had basic health insurance. Around 62% 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 ($P < 0.05$).

Table 1
Sociodemographic characteristics of the sample by type of fracture

Categorical variables	Total participants (n=478)		All fractures (n=300)						No fractures (n=178)		P-value*
			Hip Fx (n=117)		Clinical vertebral Fx (n=56)		Forearm Fx (n=127)				
	n	%	n	%	n	%	n	%	n	%	
Sex											
Men	124	25.9	41	35.0	22	39.3	33	26.0	28	15.7	<0.001
Women	354	74.1	76	65.0	34	60.7	94	74.0	150	84.3	
Marital status											
Married	278	58.2	53	45.3	34	60.7	79	62.2	112	62.9	0.10
Unmarried	200	41.8	64	54.7	22	39.3	48	37.8	66	37.1	
Employment status											
Employment	27	5.6	6	5.1	2	3.6	9	7.1	10	5.6	0.001
Householder	281	58.8	57	48.7	26	46.4	82	64.6	116	65.2	
No employment	39	8.2	15	12.8	8	14.3	13	10.2	3	1.7	
Retired	131	27.4	39	33.3	20	35.7	23	18.1	49	27.5	
Having basic health insurance											
Yes	458	95.8	116	99.1	50	89.3	119	93.7	173	97.2	0.247
No	20	4.2	1	0.9	6	10.7	8	6.3	5	2.8	
Having complementary health insurance											
Yes	210	44.0	35	29.9	16	28.6	36	28.3	123	69.5	- <0.001
No	267	56.0	82	70.1	40	71.4	91	71.7	54	30.5	
Presence of any other chronic illness in addition to osteoporosis											
Yes	294	61.5	68	58.1	38	67.9	65	51.2	123	69.1	0.009
No	184	38.5	49	41.9	18	32.1	62	48.8	55	30.9	
Continues variables											

*Between all fractures and no fractures. Student's t-test and Mann–Whitney U-test were used for normal and non-normal distributions, respectively.

Categorical variables	Total participants (n=478)		All fractures (n=300)						No fractures (n=178)		P-value*
			Hip Fx (n=117)		Clinical vertebral Fx (n=56)		Forearm Fx (n=127)				
	n	%	n	%	n	%	n	%	n	%	
Age (year), mean (SD)	68.5	10.7	73.6	11.3	69.7	10.4	66.4	10.5	66.3	9.3	<0.001
Years of education, Median (IQR)	6	12	6	12	6	12	6	9	9	9	<0.001
*Between all fractures and no fractures. Student's t-test and Mann–Whitney U-test were used for normal and non-normal distributions, respectively.											

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, 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 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 vertebral and forearm fractures, respectively, and 0% of patients with no fracture were not able to walk.

In the self-care dimension, 27.4%, 35.7%, and 48% of patients with hip, vertebral, and forearm fractures reported, “no problem” respectively, while 60.1% of patients with no fracture reported “no problem”. Besides, 6%, 1.8%, 1.6%, and 0% were not able to wash themselves or wear clothes, respectively.

Regarding the usual activities dimension, 35.9%, 39.3%, 52.8%, and 60.7% of those with the hip, 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, vertebral, and forearm fracture, and those without a history of fracture reported "no pain and physical discomfort", respectively. Besides, 8.6%, 14.3%, 9.5%, and 9%, respectively, noted that they had infinite pain or physical discomfort.

In terms of anxiety/depression, the percentage of those with a history of hip, vertebral, and forearm fracture and those with no history of fracture who reported "no anxiety or depression" was 35%, 26.8%, 30.7%, and 37.1%, respectively. Furthermore, 6.8%, 5.4%, 5.5%, and 6.2%, respectively, reported extreme anxiety or depression.

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 ($P<0.05$).

Table 2
Frequency of item responses in each EQ-5D-5L dimension by type of fracture

Dimension	All fractures(n=300)						No fracture (n=178)		P-value*
	Hip Fx (n=117)		Clinical vertebral Fx (n=56)		Forearm Fx (n=127)				
	n	%	n	%	n	%	n	%	
Mobility									
No problems	5	4.3	6	10.7	39	30.7	45	25.3	0.001
Slight problems	44	37.6	23	41.1	49	38.6	76	42.7	
Moderate problems	40	34.2	16	28.6	27	21.3	31	17.4	
Severe problems	17	14.5	10	17.9	9	7.1	26	14.6	
Incapacity	11	9.4	1	1.8	3	2.4	0	0.0	
Self-care									
No problems	32	27.4	20	35.7	61	48.0	107	60.1	<0.001
Slight problems	46	39.3	21	37.5	42	33.1	48	27.0	
Moderate problems	21	18.0	10	17.9	19	15.0	19	10.7	
Severe problems	11	9.4	4	7.1	3	2.4	4	2.2	
Incapacity	7	6.0	1	1.8	2	1.6	0	0	
Usual activities									
No problems	42	35.9	22	39.3	67	52.8	108	60.7	<0.001
Slight problems	32	27.4	19	33.9	33	26.0	43	24.2	
Moderate problems	24	20.5	7	12.5	18	14.2	23	12.9	
Severe problems	12	10.3	6	10.7	8	6.3	3	1.7	
Incapacity	7	6.0	2	3.6	1	0.8	1	0.6	

*Between All fractures and no fractures

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) value of HRQoL scores of those with a history of hip, vertebral, and forearm fracture and no history of fracture were 0.53 (0.22), 0.60 (0.28), 0.64 (0.26), and 0.64 (0.27), respectively. The HRQoL scores in women was significantly lower than men (p=0.003).

Dimension	All fractures(n=300)						No fracture (n=178)		P- value*
	Hip Fx (n=117)		Clinical vertebral Fx (n=56)		Forearm Fx (n=127)				
	n	%	n	%	n	%	n	%	
Pain/discomfort									
No	6	5.1	3	5.4	9	7.1	23	12.9	0.056
Slight	41	35.0	16	28.6	37	29.1	43	24.2	
Moderate	40	34.2	18	32.1	40	31.5	54	30.3	
Severe	20	17.1	11	19.6	29	22.8	42	23.6	
Extreme	10	8.6	8	14.3	12	9.5	16	9.0	
Anxiety/depression									
No	41	35.0	15	26.8	39	30.7	66	37.1	0.408
Slight	35	29.9	13	23.2	42	33.1	44	24.7	
Moderate	22	18.8	12	21.4	28	22.1	30	16.9	
Severe	11	9.4	13	23.2	11	8.7	27	15.2	
Extreme	8	6.8	3	5.4	7	5.5	11	6.2	
*Between All fractures and no fractures									
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) value of HRQoL scores of those with a history of hip, vertebral, and forearm fracture and no history of fracture were 0.53 (0.22), 0.60 (0.28), 0.64 (0.26), and 0.64 (0.27), respectively. The HRQoL scores in women was significantly lower than men (p=0.003).									

Table 3
Median (IQR) of EQ-5D-5L scores by type of fracture

Type of fracture	All participants	Men	women	P value
	Median (IQR*)	Median (IQR)	Median (IQR)	
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
*IQR: interquartile range				

The mean of responses in each EQ-5D_5L dimension based on fracture types and sex are presented in figure 2. Almost in all dimension, 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 were higher in women than men.

Table 4 shows the associates of the quality of life in a multiple linear regression analyses. The results showed that compared to the osteoporotic patients without history of fractures, quality of life was significantly lower in patients with hip fracture (beta= -0.077, p-value<0.001) and vertebral fracture (beta= -0.075, p-value= 0.005), but not in patients with forearm fracture (beta= -0.010, p-value: 0.611).

Being married at the time of the study had significant positive association with the quality of life (beta=0.054, p-value=0.002), while a negative association was detected between the presence of a chronic disease and quality of life in patients under study (beta= -0.033, p-value=0.039).

Women with complementary health insurance also tended to have higher quality of life, though not statistically significant (beta = 0.032, p value = 0.071).

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

Independent variables	Dependent variable: utility scores		
	Coefficient	Standard Error	P-value
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

Discussion

In the current study, the HRQoL of those with osteoporotic fractures of the hip, vertebrae, 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, 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.

Compared to other fractures, hip fracture causes the most disability. 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 (18). Almost 40 to 60% of patients with a history of hip fracture regain their full mobility. About 20 - 60% of people who had no problem in doing their personal activities before the fracture needed help in doing their activities for more than one year after the fracture (19, 20).

Based on a study conducted in Russia, the HRQoL of people with a history of hip fractures two weeks after the fracture was -0.22, four months after the fracture was 0.39, 12 months later increased to 0.46, and was 0.64 eighteen months after the fracture (21). Another study that measured the HRQoL of people with a history of hip fracture in Sweden reported that four months after the fracture, the HRQoL was 0.18, and this number increased to 0.62 four months later, and reached 0.67 12 months later (22). 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 (23). Another study reported that the HRQoL of those with hip fractures was 0.64 (24) .

The results of the 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 (23). Besides, a study conducted in Russia revealed that 83% of patients with hip fracture had problems in mobility, 71% in self-care, 73% in doing usual activities, 28% in pain/discomfort, and 15% in anxiety/depression (21).

Vertebral fracture is also common among patients with osteoporosis (5). Various studies found that vertebral fracture decreases HRQoL (25). Hagino et al. conducted a study to estimate the HRQoL changes in patients with vertebral fractures and reported that two weeks after the fracture the HRQoL was 0.53, three months later it increased to 0.75, six months later it was 0.74, and one year after the fracture this number was 0.83 (26). 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, four months later it increased to 0.47, and 12 months later it was 0.49 (22). 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. 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 overserved between two groups (14). 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 was 0.075 less than 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, four months later it was 0.82, and 12 months after the fracture it was 0.86 (22). Another study conducted in Korean reported that the HRQoL of those with a forearm fracture was 0.83(27). In the current study, the median score of HRQoL of patients with forearm fracture was 0.64.

Daroudi et al. 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 (28). 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 indicates that the HRQoL of osteoporosis patients with no history of fracture is lower than healthy individuals. Wilson et al. also reported that osteoporosis alone has negative effects on the HRQoL (12).

In the current study, the EQ-5D-5L questionnaire, which is the most widely used general preference-based instrument to measure the HRQoL, was used to measure the HRQoL of patients with osteoporosis and common fractures in Iran (29). 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, the study also had limitations. In the current study, the HRQoL of patients with osteoporotic fractures was measured between six months and one year after the fracture. Given that the HRQoL of these patients usually changes during the first year after the fracture, therefore the results cannot be generalized to the first six 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

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

Abbreviations

HRQoL

Health-Related Quality of Life

Declarations

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. Verbal consent was obtained from participants who completed the survey over the telephone, and written consent was obtained from patients who were interviewed in person.

Consent for publication: Not applicable.

Availability of data and materials: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing Interests: The authors declare they have no conflict of interests.

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Figures

Figure 1

Distribution of the EQ-5D-5L scores by type of fracture

Figure 2

The mean of responses in each EQ-5D_5L dimension based on fracture types and sex