Original Article

The relationship between fracture and quality of life in Korean adults receiving treatment for osteoporosis based on the 2010 Korean Community Health Survey

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Abstract. [Purpose] The purpose of this study was to investigate the relationship between fracture and quality of life in Korean adults receiving treatment for osteoporosis based on the 2010 Korean Community Health Survey (KCHS). [Subjects and Methods] This study utilized the raw data of the 2010 KCHS. In the survey, osteoporosis was assessed in 228,903 subjects, excluding 326 for whom there was insufficient data. There were 17,387 subjects with osteoporosis confirmed by a doctor's diagnosis and 9,419 of them were being treated for osteoporosis at the time of the survey. [Results] Among the patients being treated, those with fractures had a significantly lower QOL than patients who did not experience fractures. The lower QOL scores were caused by hip, vertebral and wrist fractures, and in all cases, QOL was significantly lower. Greater numbers of fractures significantly lowered QOL scores compared to participants without fractures. [Conclusion] Fractures in patients receiving treatment for osteoporosis have a direct impact on QOL. Among the different types of fractures, hip fractures resulted in the lowest scores. Therefore, to avoid additional fractures caused by inappropriate management of osteoporosis, we suggest that there is a need to improve fall related self-efficacy and prevention programs.
Key words: Oseteoporosis, Quality of life, Korean Community Health Survey

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INTRODUCTION

Osteoporosis is the most common non-infectious metabolic disease that causes disability and diminished quality of life[1–4]. Characteristics of osteoporosis include decreased bone mass and bone change, and women are four times more likely than men to develop osteoporosis[5, 6]. In addition, among non-infectious diseases osteoporosis is ranked as an important health issue by the World Health Organization[7].

The most common treatment method is to use drug therapy to prevent osteoporosis, which may increase bone density and reduce fracture risk, but can be expensive. It has long been established that these treatments are effective. However, diagnosed patients are not being actively managed over the long term[8]. Therefore, consideration of the various interventions and the surrounding environment is required for patients with osteoporosis.

For several decades, orthopedic surgeons have focused on the quality of surgery and early mobilization of fracture patients. However, after satisfactory surgery, many patients still have long-term disability, and the mortality rate is 14–36% after one year[9, 10]. In patients with hip joint fractures, this is only 15%, with treatment for osteoporosis[11]. When considering these points, we need to evaluate the fractures of patients receiving treatment for osteoporosis.

The treatment of osteoporosis, according to a study by Makridis et al.[11] is an important predictor of quality of life (QOL). Many hip fracture patients die within a year, and 30% have reduced activity of daily living as compared with before fracture[12]. Numerous high-quality studies have addressed the incidence of new fractures after medical treatments for patients with osteoporosis. Nevertheless, given the fact that these new fractures are closely associated with osteoporosis, the role of medical treatment for osteoporosis as a predictor of clinical outcomes and QOL is not clearly understood[9].

The Korean Community Health Survey (KCHS) is a nationwide health survey carried out by the Korea Centers for Disease Control and Prevention to evaluate regional health and medical plans, as well as to understand the personal

Table 1. Characteristics of the subjects with osteoporosis

Parameters	n*	%†	Parameters	n*	%†
Total osteoporosis			Gender		
Yes	17387	5.0	Male	575	5.8
No	211516	95.0	Female	8844	94.2
Fracture			Residential area		
Yes	3452	36.0	Urban	3498	68.1
No	5745	64.0	Rural	5921	31.9
Receiving treatment for osteoporosis			Age		
Yes	9419	49.1	19–64	2443	32.2
No	7958	50.9	65 ≤	6976	67.8
Number of fractures			Physical activity‡		
0	5745	64.0	Yes	4418	47.6
1	2314	25.6	No	5001	52.4
2	756	7.3	Living with family		
3	382	3.2	No (alone)	2514	20.5
Fracture site			Yes	6905	79.4
Hip			Educational level		
Yes	1598	15.7	Elementary school or less	7535	69.6
No	7603	84.3	Middle school	863	12.0
Vertebral			High school and over	1006	18.4
Yes	2319	22.9	Monthly household income (10,000 won)		
No	6886	77.1	≤100	5412	52.5
Wrist			101–200	1477	18.7
Yes	1066	11.1	201–300	780	11.9
No	8138	88.9	≥301	964	16.9

* n: sample size. †%: estimated percent of the population. ‡: Physical activity: above more than moderate levels of physical activities activity (strenuous physical activity more than three times a week, strenuous physical activity for more than 20 minutes a day or moderate levels of physical activity more than five times a week, strenuous physical activity for more than 30 minutes per time), or walking activities for more than 30 minutes five times a week or over 30 minutes per time

lifestyles and health behaviors of adults aged 19 years and over[13, 14]. The survey has been conducted annually since 2008, and stroke, myocardial infarction, arthritis, and osteoporosis are among the items investigated[15].

The relationship between osteoporosis and fractures has been the subject of many research studies. However, only a few studies have investigated patients receiving treatment for osteoporosis. In addition, complex challenges still exist concerning the epidemiology, prevention and QOL of osteoporosis. Therefore, the purpose of this study was to investigate the relationship between patients receiving treatment for osteoporosis and QOL using the KCHS.

SUBJECTS AND METHODS

This study utilized the raw data in the 2010 KCHS which surveyed a total of 260 items, including health type, health examination, immunizations, morbidity, health care utilization, accident, activity limitations, QOL, health institutions, etc. The KCHS is a partnership of the Korea Centers for Disease Control and Prevention, 16 cities and provinces, 253 health centers, and 36 universities. It is supported by an operating committee, specialized subcommittees, and an administration office. Trained surveyors visited households

selected in the sample and conduct one-on-one electronic surveys using a computer notebook loaded with a survey program. The completed survey data is transmitted to a central server daily. The 2010 survey took place from August 16, 2010 to October 31, 2010. The Korea Centers for Disease Control and Prevention conducted phone checks through third-party institutions to verify the data of 5% of the survey subjects[13, 15–17]. Osteoporosis was assessed for 228,903 subjects, excluding 326 for whom there was insufficient data. There were 17,387 subjects with osteoporosis confirmed by a doctor's diagnosis and 9,419 were being treated for osteoporosis at the time of the survey. The protocol of the KCHS was reviewed and approved by the institutional review board of the Korea Centers for Disease Control and Prevention (2010-02CON-22-P). Written informed consent was obtained from all participants in the KCHS. The general characteristics of the subjects are presented in Table 1.

The relationships between osteoporosis fracture occurrence and QOL were investigated in patients receiving treatment for osteoporosis and the fracture sites were the hip, vertebra, and wrist. QOL measurements were performed using the EQ-5D evaluation tool developed by the EuroQol group. The subjects were instructed to respond to five items on mobility, self-care, usual activity, pain/discomfort, and

Table 2. Associations of factors of patients being treated for osteoporosis and quality of life

	M±SD
Fracture occurrence (/No)	0.805±0.002
Yes	0.736±0.004*
Fracture site	
Hip (/No fracture)	0.794±0.002
Yes	0.704±0.007*
Vertebral (/No fracture)	0.796±0.002
Yes	0.726±0.005*
Wrist (/No fracture)	0.783±0.002
Yes	0.754±0.007*

*$p \leq 0.05$. Tested by simple linear regression

Table 3. Results of multiple regression analysis of the number of fractures and quality of life

	R^2	B	SE
Number of fracture (/0)			
1	0.156	−0.030	0.005*
2		−0.089	0.008*
3		−0.087	0.014*

*$p \leq 0.05$, adjusted for gender, age, educational level, living with family, monthly household income, residential area, physical activity

anxiety/depression and rate the items as not a problem, a minor problem, or a serious problem using a 3-point Likert scale. The EQ-5D was calculated using the following equation.

$$EQ\text{-}5D = 1 - (0.05 + 0.096*M2 + 0.418*M3 + 0.046*SC2 + 0.136*SC3 + 0.051*UA2 + 0.208*UA3 + 0.037*PD2 + 0.151*PD3 + 0.043*AD2 + 0.158*AD3 + 0.05*N3)$$

The collected data were analyzed using IBM SPSS Statistics 21.0 and a complex sampling design. Individual weights were applied to the population estimates. A frequency analysis was performed to determine the distribution of the subjects. Presence or absence of fracture and the fracture sites were compared with average QOL using a simple linear regression analysis. To identify the correlation between the number of fractures and QOL, multiple linear regression analysis was performed controlling for gender, age, education level, living with family, monthly household income, residential area, and physical activity, using a significance level of $\alpha = 0.05$.

RESULTS

Among the patients being treated for osteoporosis, those with fractures had a significantly lower QOL (0.736±0.004 points) than the patients without fractures (0.805±0.002 points) ($p<0.001$). The lower QOL scores were caused by hip (0.704±0.007 points), vertebral (0.726±0.005 points), and wrist (0.754±0.007 points) fractures, and in all cases, QOL was significantly lower ($p<0.001$) (Table 2). Participants with one (B=−0.030, $p<0.001$), two (B=−0.089, $p<0.001$), and three (B=−0.087, $p<0.001$) fractures had significantly lower QOL scores than participants without fractures (Table 3).

DISCUSSION

According to our findings, 3,452 patients being treated for osteoporosis (36%) had experienced a fracture, and their QOL was significantly lower than that of the patients who had no experience of fracture. According to Makridis et al.[11] the mortality rate after hip joint surgery is 23.6% at two years, and they suggested that even if a patient is being treated for osteoporosis, intervention is needed, such as balance training or education, to prevent fracture.

QOL was significantly lower in the patients who had suffered a hip fracture as compared to the patients who had not. In the present study, the EQ-5D score was 0.704 for hip joint fractures, 0.726 for spine fractures, and 0.754 for wrist fractures. Therefore, the QOL scores of hip joint fracture patients were lower than those of patients who had suffered spine and wrist fractures. Wiles et al.[18] reported that multidisciplinary postoperative intervention programs can enhance patient performance and functional movement after hip fracture surgery. It is therefore important for there to be weight-bearing and ambulation as soon as it can be tolerated in order to improve the QOL of patients with hip fractures.

According to the study of Bliuc et al.[19], when women show bone loss of greater than 1.31% a year, or men show bone loss of more than 1.35%, the mortality rate increases by 44–77%. Thus, vertebral fractures can severely affect osteoporosis patients. In this study, QOL was significantly lower in patients who had suffered vertebral fractures compared with those with no history of fracture. In addition, fractures of the spine in patients being treated for osteoporosis occurred in 2,319 people (22.9%). This is higher than the number of hip joint fractures (1,598 people, 15.7%) and the number of wrist fractures (1,066 people, 11.1%). Therefore, continuous national attention is needed to reduce the incidence of vertebral fractures and to develop fall prevention programs.

About 70–80% of wrist fractures are associated with osteoporosis, and they occur frequently[20–23]. In addition, wrist fractures have greater implications because they are sentinel events which often precede fractures of the spine and hip joint in the next 10 to 20 years[24–26]. In the present study, QOL was lower for patients who had experienced a wrist fracture. In order to avoid larger fractures in different parts of the body in the future, it will be necessary to increase awareness and fall-related self-efficacy for subjects with fractures of the wrist joint[27].

Among the subjects being treated for osteoporosis, 2,314 (25.6%) had experienced a single fracture, 756 patients (7.3%) had two fractures, and 382 people (3.2%) had three. When multiple fractures are present the QOL is even poorer. In another study, osteoporotic vertebral fractures were found to have occurred in 1,549 (31.79%) patients in a survey of 5,000 women over 45 years of age[28]. Among them, 528 (34.08%) had simple fractures, and 1,021 had multiple fractures (65.92%). We think the reason for the difference in these findings is due to the limitations of the prior study

regarding the age of the person and type of fracture.

A limitation of this study was that it did not analyze differences between urban and rural environments and it was not geographically divided. Analyzing these issues in future studies could be complementary. In conclusion, fractures in patients receiving treatment for osteoporosis have a direct impact on QOL. Among the different types of fractures, hip fractures resulted in the lowest QOL scores. To prevent additional fractures caused by inappropriate management of osteoporosis, we suggest that there is a need to improve fall related self-efficacy and prevention programs.

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