Biomedical Research 2018; 29 (): *ISSN 0970-938X*
www.biomedres.info

The impact of osteoporosis on health-related quality of life in elderly women.

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Abstract

Objective of this study was to assess the impact of osteoporosis on health-related quality of life (HRQoL) in elderly Korean women. Sociodemographic characteristics, medical history of osteoporosis, and the EuroQol-5 dimension questionnaire scores for 1,000 female participants aged 60 years or older were obtained from the 2015 Korean National Health and Nutrition Examination Survey (KNHANES). Demographic variables, including age, educational level and income, were significantly associated with HRQoL. Furthermore, osteoporosis had a significant effect on HRQoL in elderly Korean women. In the osteoporosis group, the adjusted odds ratios for disability on the ED-5Q dimensions were 1.92 (95% confidence interval (CI)=1.44-2.58, p<0.001) for mobility, 1.90 (95% CI=1.45-2.51, p<0.001) for pain/ discomfort, and 1.89 (95% CI=1.36-2.61, p=0.001) for usual activities. These findings indicate that osteoporosis has a significant impact on HRQoL and suggest that the prevention and treatment of osteoporosis may significantly improve quality of life in elderly women.

Keywords: KNHANES, EuroQol-5 dimension questionnaire, Health-related quality of life, Osteoporosis.

Accepted on August 24, 2018

Introduction

Osteoporosis is a skeletal disease characterized by low bone mass, structural deterioration of bone tissue, and increased susceptibility to bone fractures [1,2]. Osteoporosis is one of the most common metabolic bone disorders and a leading cause of morbidity and mortality in the elderly [3]. The incidence of hip fractures, the most serious complication of osteoporosis, has been shown to increase exponentially with age in several countries [4]. Furthermore, women are at higher risk of osteoporosis than men because they experience a greater decrease in bone density, particularly during and after menopause [4]. Thus, osteoporosis emerges as a significant health problem in women as they age [5].

Osteoporosis is linked to poor quality of life [6-8]. The condition may cause significant functional impairment leading to prolonged immobilisation and restrictions in activities of daily living resulting in reduced health-related quality of life (HRQoL) [9]. Given that life expectancy and economic status are increasing among elderly adults, the focus of osteoporosis research has shifted from physical aspects of the disease, such as survival, to its impact on HRQoL [10,11]. For example, an investigation of HRQoL in postmenopausal Spanish women with osteoporosis found that the women had a poor quality of life [12]. However, few studies have investigated the association between osteoporosis and quality of life in elderly Korean women. Previous studies have shown that HRQoL is affected by chronic diseases, such as osteoporosis, as well as by demographic factors including sex, age, education, and income [13,14]. Therefore, assessment of the impact of osteoporosis on HRQoL in women is essential for the improvement of HRQoL through the prevention and management of osteoporosis.

The EuroQol-5 dimension (EQ-5D), Medical Outcome Study Short Form-36, and Health Utility Index Mark 3 are commonly used measures of HRQoL [15]. The EQ-5D is a standardized self-report questionnaire developed in Europe to assess five domains of HRQoL [16]. Because of its high validity and reliability, the EQ-5D is widely used to assess HRQoL in patients with various diseases including osteoporosis.

This study used data acquired from the Korean National Health and Nutrition Examination Survey (KNHANES) dataset to investigate the association between osteoporosis and HRQoL according to sociodemographic characteristics in women aged 60 y and older and assessed the effect of osteoporosis on the five dimensions of the ED-5Q questionnaire.

Methods

This study was based on data obtained from the KNHANES 2015, which comprises data from surveys on health and nutrition and a medical examination. This study used a stratified multistage cluster-sampling design with proportional allocation to select women ≥ 60 y of age from the KNHANES dataset. Participants from selected census blocks were asked their age, educational level, income, and current diagnosis of osteoporosis. The protocol of this study was approved by the Korean Ministry of Health and Welfare and was conducted in accordance with the Ethical Principles for Medical Research Involving Human Subjects as defined by the Helsinki Declaration. The study participants provided written informed

consent. Of the selected subjects in the census blocks, 1,000 individuals without missing values for the outcome variables were included in this analysis.

Body mass index (BMI), calculated as weight (kg) divided by height squared (m^2), was used to classify participants as underweight (BMI<18.5), normal (18.5 ≤ BMI<22.9), overweight (23.0 ≤ BMI<24.9), and obese (BMI ≥ 25.0) according to the World Health Organization (WHO) criteria for Asian populations. The presence of osteoporosis was based on self-report of a current diagnosis of osteoporosis. Education was used as a covariate and categorized as elementary school or less, middle school and high school or above. Income was calculated according to the Organization for Economic Cooperation and Development method by dividing the square root of the household size by the monthly household income and stratifying it into quartiles according to age group.

HRQoL was assessed using the EQ-5D questionnaire. The EQ-5D is a self-report descriptive system comprising five health dimensions (mobility, self-care, pain/discomfort, usual activities, and anxiety/depression) each divided into three levels of severity: no problems, some/moderate problems, and severe/extreme problems [17]. The ED-5Q scores were used as an overall measure of perceived HRQoL in this study.

The Mantel-Haenszel chi-square test was used to compare categorical variables between groups. The presence of a linear trend was determined by calculating a linear contrast in each of the linear regression models. Logistic regression models were used to estimate the odds ratio (OR) and 95% confidence level (CI) for abnormal (disability) versus normal (no problem) in each ED-5Q health dimension in participants who reported having osteoporosis compared with the reference group (reported not having osteoporosis). All statistical tests were conducted using SAS version 9.4 (SAS Institute, Cary, NC, USA).

Results

Table 1 shows the prevalence of osteoporosis according to the demographic characteristics (age, BMI, education, and income). The overall prevalence of osteoporosis was 32.3% and ranged from 26.6 to 43.5%. Age and education were significantly associated with the prevalence of osteoporosis (p<0.05).

Table 1. *Prevalence of osteoporosis in elderly Korean women according to demographic characteristics.*

Variable	N	Osteoporosis (%)	p[a]
Age (y)			
60-69	499	137 (27.5)	0.037
70-79	397	156 (39.3)	
≥ 80	104	30 (28.9)	
BMI (kg/m^2)			
<18.5	23	10 (43.5)	0.100
18.5-22.9	303	103 (34.0)	
23.0-24.9	267	90 (33.7)	
≥ 25.0	407	120 (29.5)	
Education			
≤ Elementary school	674	234 (34.7)	0.021
Middle school	138	39 (28.3)	
≥ High school	188	50 (26.6)	
Income			
Quartile 1 (lowest)	242	83 (34.3)	0.822
Quartile 2	255	71 (27.8)	
Quartile 3	251	93 (37.1)	
Quartile 4 (highest)	252	76 (30.2)	

p[a] determined by Mantel-Haenszel chi-square test.

The mean EQ-5D scores for the demographic characteristics are shown in Table 2. The EQ-5D score decreased as age increased (p for trend<0.001). Higher educational and income levels were significantly positively associated with higher EQ-5D scores (p for trend<0.001 or 0.001). However, this study found no association between BMI and HRQoL with EQ-5D scores of 0.75, 0.88, 0.89, and 0.84 for underweight, normal, overweight, and obese women, respectively.

Table 2. *Mean EQ-5D scores according to demographic characteristics in elderly Korean women.*

Variable	N	EQ-5D score	p for trend
Age (y)			
60-69	499	0.90 ± 0.14	<0.001
70-79	397	0.82 ± 0.20	
≥ 80	104	0.80 ± 0.22	
BMI (kg/m^2)			
<18.5	23	0.75 ± 0.34	0.014
18.5-22.9	303	0.88 ± 0.17	
23.0-24.9	267	0.89 ± 0.14	
≥ 25.0	407	0.84 ± 0.19	
Education			
≤ Elementary school	674	0.83 ± 0.20	<0.001
Middle school	138	0.92 ± 0.10	
≥ High school	188	0.92 ± 0.11	
Income			
Quartile 1 (lowest)	242	0.83 ± 0.20	0.001
Quartile 2	255	0.87 ± 0.17	
Quartile 3	251	0.86 ± 0.17	

Quartile 4 (highest)	252	0.90 ± 0.16

Table 3 shows the ORs for the level of disability associated with osteoporosis. Compared with the non-osteoporosis reference group, the adjusted ORs for mobility, self-care, usual activities, pain/discomfort, and anxiety/depression in the osteoporosis group were 1.92 (95% CI: 1.44-2.58), 1.63 (95% CI: 1.09-2.46), 1.89 (95% CI: 1.36-2.61), 1.90 (95% CI: 1.45-2.51), and 1.46 (95% CI: 1.05-2.03), respectively ($p<0.01$, model 2). After adjusting for age, (Model 1) and all covariates (age, BMI, education, and income; model 2), the order of adjusted ORs for disability was: mobility>pain/discomfort>usual activities>self-care>anxiety/depression.

Table 3. *Adjusted odds ratios (95% CI) for disability on the ED-5Q dimensions in elderly Korean women with osteoporosis.*

	Non-osteoporosis (n=677)	Osteoporosis (n=323)	p
Mobility			
Model 1	1.00 (reference)	1.92 (1.45-2.54)	<0.001
Model 2	1.00 (reference)	1.92 (1.44-2.58)	<0.001
Self-care			
Model 1	1.00 (reference)	1.66 (1.11-2.48)	0.013
Model 2	1.00 (reference)	1.63 (1.09-2.46)	0.019
Usual activities			
Model 1	1.00 (reference)	1.86 (1.36-2.54)	0.001
Model 2	1.00 (reference)	1.89 (1.36-2.61)	0.001
Pain/discomfort			
Model 1	1.00 (reference)	1.91 (1.46-2.51)	<0.001
Model 2	1.00 (reference)	1.90 (1.45-2.51)	<0.001
Anxiety/depression			
Model 1	1.00 (reference)	1.47 (1.07-2.03)	0.018
Model 2	1.00 (reference)	1.46 (1.05-2.03)	0.024

Model 1 was adjusted for age. Model 2 was adjusted for age, body mass index, education, and income.

Discussion

This study investigated the association between HRQoL and osteoporosis in elderly women using the EQ-5D questionnaire, which is a reliable measure of HRQoL. The prevalence of osteoporosis is closely related to aging, and osteoporosis has a high morbidity rate in women. Furthermore, osteoporosis has been shown to have an adverse effect on quality of life as well as physical health in women [18]. The overall prevalence of osteoporosis was 32.3% among Korean women aged 60 y and older in this sample. According to the WHO, 30% of women over the age of 50 have osteoporosis [19]. Similarly, a recent study estimated that 29.9% of postmenopausal women in the United States had osteoporosis [20], and a study conducted in Slovenia found that the prevalence of osteoporosis increased with age from 24.9% in patients aged 60-64 y to 37.4% in patients aged 70-75 y [21]. However, the reported prevalence of osteoporosis in women varies widely across countries with 9% reported in the United Kingdom, 15% in France and Germany, 16% in the United States, and a prevalence of 38% reported in Japan [22]. This disparity may be explained by racial or ethnic differences. Indeed, a previous study found that the age-adjusted prevalence of osteoporosis was higher in non-Hispanic Asian women than in all other race/Hispanic origin groups [23]. Furthermore, the diagnostic criteria and/or definition of osteoporosis may influence the prevalence findings. For example, a previous study of osteoporosis in nursing home residents in the United States found a prevalence of 13.5%; however, when an expanded definition of osteoporosis was used, the prevalence increased to 24.2% [24].

Interestingly, BMI did not have a significant effect on the prevalence of osteoporosis. Although obesity is a major risk factor for osteoarthritis, a degenerative joint disease [25], findings of this study suggest that obesity is not directly associated with the prevalence of osteoporosis in elderly Korean women.

The findings of this study that sociodemographic characteristics, including age, BMI, education, and income, had a significant effect on HRQoL are consistent with those of several previous studies. HRQoL has been shown to decrease with age [26,27], and Kvamme et al. [28] reported that, within the BMI categories, moderately overweight individuals had the highest HRQoL. Furthermore, the finding that higher educational and income levels were associated with a high HRQoL is consistent with that of a previous study in middle-aged and elderly adults showing that individuals in the higher education and income groups had a higher HRQoL than those in the lower education and income groups [29-32].

The findings of this study indicate that osteoporosis has a significant impact on HRQoL in elderly Korean women. The multiple logistic regression analysis revealed that the ORs for disability were significantly increased in all five ED-5Q dimensions. In particular, poor mobility had the greatest impact on HRQoL in this study population. These findings suggest that the preservation of mobility is essential for the improvement of HRQoL in elderly patients with osteoporosis.

This study had several limitations. A major limitation was potential misclassification and reporting bias resulting from the use of self-report information for the presence of osteoporosis. Moreover, the use of a cross-sectional design allowed us to provide associations but not establish causal relationships. Finally, there may have been limitations related to the reliability and objectivity of the EQ-5D as a measure of quality of life.

Conclusion

This population-based cross-sectional study of elderly women found that HRQoL was associated with several demographic characteristics, including age, educational level, and income.

Furthermore, women in the osteoporosis group reported a significantly higher level of disability in the ED-5Q dimensions than did those in the non-osteoporosis group, particularly in the mobility, pain/discomfort, and usual activities dimensions. The finding of a significant association between osteoporosis and HRQoL in Korean women aged 60 y and older suggests that the prevention and treatment of osteoporosis is essential for good HRQoL in elderly women.

Acknowledgments

This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (No. NRF-2018R1D1A1B07050009,
NRF-2015R1D1A1A01056617).

Conflict of Interests

Author has none to declare.

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