ABSTRACT

Objectives: To estimate the medical expenditure associated with osteoporotic hip fracture in elderly Korean women from insurer’s perspective.

Methods: All claim records of women aged ≥50 years and diagnosed with hip fracture from 2002 to 2004 were obtained from the Korean National Health Insurance. The first 6 months were considered a “window period” during which patients with fractures were defined as incident cases if their initial records of visit or admission were observed after June 30, 2002. We included only those with claim records showing diagnosis of osteoporosis or prescription for antosteoporosis drugs. For each patient, we calculated the cumulative claims amount related to the initial and follow-up treatment for 2 years after fracture.

Results: A total of 22,247 patients were identified during 2.5 years. During the first year of fracture, an average of 3.28 visits and 0.97 admissions were recorded; during the second year, 0.33 visits and 0.02 admissions were recorded. The 2-year cost per patient was KRW3,175,467, 97.4% of which was incurred during first year.

Conclusion: Exploring the economic burden of osteoporotic hip fracture in the elderly women is expected to motivate policymakers and clinicians to adopt effective treatment options for the disease prevention and expenditure control.

Keywords: claims data, cost of illness, hip fracture, osteoporosis.

Introduction

The availability of advanced medical technologies and the improved economic status has increased life expectancy and the proportion of the aging population. This has increased the prevalence of geriatric diseases, resulting in a corresponding increase in medical expenditure. In particular, the increase in the life expectancy of women is greater than that of men; consequently, there is an increase in the prevalence of osteoporosis, which is a common degenerative disease encountered in elderly women [1]. Osteoporosis leads to fractures, resulting in increased morbidity and an abrupt decrease in the quality of life [2]. Therefore, osteoporosis has been addressed as a major health issue of the elderly female population [1]. Hip fracture is widely recognized as a major sequel of osteoporosis and is associated with high treatment expenses [3,4]. Additionally, hip fracture represents a major cause of disability in the elderly population [5,6] and increases the mortality rate by approximately 12% to 20% within 1 year of onset [7,8].

With the growing prevalence of osteoporotic hip fractures in the elderly female population, studies have been conducted in the developed world to estimate the cost of illness of osteoporotic hip fractures [8]. Although Korea has witnessed an increase in the aging population and the prevalence of osteoporotic fractures parallel to that in developed countries, active diagnosis and treatment of osteoporosis have not been implemented effectively.

Furthermore, there is a lack of epidemiological data on osteoporosis as well as paucity of information on the cost of illness of osteoporosis-related fractures.

Estimating the socioeconomic cost of a disease can facilitate the prioritization of relevant policies by recognizing the relative importance and severity of the disease, allow the establishment of efficient treatment strategies by identifying medical services that impose a high economic burden, and provide basic data for evaluating relatively cost-effective treatment alternatives. Therefore, many countries have generated such information and have been utilizing it for decision-making in resource allocation pertaining to medical services.

The present study was conducted to determine the national health insurance (NHI) perspective of the economic burden of osteoporotic hip fractures by estimating the per patient and total national medical expenditure for hip fracture treatment among Korean women aged ≥50 years. This information is expected to be useful for promoting aggressive treatment of geriatric osteoporosis and to facilitate the decision-making process for identifying health-related priorities by highlighting the relative importance of osteoporosis among other degenerative diseases in elderly women.

Methods

Study Design

This study estimated the direct medical costs of osteoporotic hip fractures based on an “incidence-based approach” [9]. Patients with osteoporotic hip fractures were retrospectively followed for up to 2 years to estimate the additional treatment costs from
the insurer’s perspective. This study adopted a top-down approach to determine the treatment expenses of all cases of hip fracture in Korean women aged ≥50 years and to estimate the average cost of treatment for individual patients [10,11].

**Study Subjects and Data Sources**

Study subjects comprised women aged ≥50 years who suffered osteoporotic hip fractures during the 2.5-year interval (July 2002–December 2004) and were selected. To see the selection process, see Estimating Medical Expenditure Associated with Osteoporotic Hip Fracture in Elderly Korean Women Based on the National Health Insurance Claims Database 2002–2004 Value in Health Supporting Information, Figure S1 at: http://www.ispor.org/Publications/value/ViHsupplementary/ViH12s3_Kang.asp.

**Step 1: identification of prevalent cases.** Women aged ≥50 years with ≥1 insurance claim record bearing the diagnosis code of hip fracture between January 1, 2002 and December 31, 2004 were identified. To see the table, see Estimating Medical Expenditure Associated with Osteoporotic Hip Fracture in Elderly Korean Women Based on the National Health Insurance Claims Database 2002–2004 Value in Health Supporting Information, Table S1 at: http://www.ispor.org/Publications/value/ViHsupplementary/ViH12s3_Kang.asp.

**Step 2: identification of incident cases.** The first 6 months (January 1, 2002 to June 30, 2002) was established as a window period during which patients with ≥1 claim for the use of medical services for hip fracture were excluded from the study. Patients who had not received fracture-related treatment during the previous 6 months but placed such claims subsequently could be considered as incident cases.

**Step 3: exclusion of patients with multiple fractures.** To estimate expenditure related to only hip fractures, patients with claims records of the use of medical services for diagnosis of other fractures in addition to hip fracture were excluded from the study as they were considered as cases of compound fracture.

**Step 4: exclusion of patients with high-cost diseases or drug-induced osteoporosis.** To prevent the erroneous inclusion of medical expenditure related to underlying diseases other than fracture, patients with cancer and end-stage renal failure were excluded because these conditions represent high-cost illnesses, based on consultations with clinicians.

Additionally, to restrict study subjects to patients suffering from fracture due to geriatric osteoporosis, patients with non-osteoporotic fractures derived from traffic accidents, endocrine diseases (International Classification of Diseases-10 codes: E05~, E10~, E21~, E23~, or E24~), or drug-induced osteoporosis (M804~, M814~, or M816~) were excluded.

**Step 5: restriction of study subjects to patients with osteoporotic fractures.** The study included only those patients whose claims records showed at least a single diagnosis of osteoporosis (M80~ or M81~) or at least one prescription for antosteoporosis drugs reimbursed (alendronate, etidronate, raloxifene, risedronate, and salcotonin) during the 3-year observation period.

For each study subject, the first fracture-related hospital admission or visit was defined as the time point of incidence of hip fracture. Follow-up treatments after the incidence were defined as claims satisfying criteria 1 and 2.

**Data Analysis**

The average per capita and total national insurance-covered medical costs for treating incident hip fractures during the first and second years after fracture occurrence were estimated for 5-year age groups. If only patients who survived throughout the 2-year period were included in the estimation of per capita expenditure, the medical expenses immediately before death due to fracture-related complications would not be reflected. To overcome such issues, medical expenses incurred as long as a patient survived during the 2-year period were included while calculating the average expenses. For example, in patients who survived for 6 months after fracture, the expenses up to month 6 were reflected. In other words, the per capita average medical expenses of survivors were calculated for each month, and the monthly expenses were added up for months 1 to 12 and 13 to 24. Finally, the per capita average medical expenditure was estimated for the first and second years after fracture. All costs were expressed in 2006 monetary value.

**Study Results**

A total of 22,247 female patients, aged ≥50 years and with hip fracture, satisfied all the study inclusion and exclusion criteria during the 2.5 years. The annual incidence rate of osteoporotic hip fracture was calculated for each age group, by dividing the annual incidence of hip fracture cases by the total number of population in 2003. The incidence rate for women aged ≥50 years was 15.4 cases per 10,000 populations. It increases with age, from 0.9 for 50 to 54 years of age to 78.4 for ≥85 years of age. To see the table, see Estimating Medical Expenditure Associated with Osteoporotic Hip Fracture in Elderly Korean Women Based on the National Health Insurance Claims Database 2002–2004 Value in Health Supporting Information, Table S2 at: http://www.ispor.org/Publications/value/ViHsupplementary/ViH12s3_Kang.asp. The per capita average number of hospitalizations and outpatient visits was 0.97 and 3.28 during the first year. With increase in age, the proportion of inpatient care increased, although that of outpatient care decreased. During the second year, the average per capita number of hospitalizations and outpatient visits was 0.02 and 0.35. With increase in age, no linear upward or downward trends in the use of medical services was observed during the second year.

The total insurance-covered medical expenditure for treatment of fracture patients across Korea amounted to KRW74.76 billion during the first year; inpatient medical expenses stood at KRW72.20 billion and outpatient expenses were KRW2.56 billion. The total insurance-covered medical expenditure during the second year amounted to KRW1.34 billion (inpatient care, KRW1.06 billion; outpatient care, KRW0.29 billion). The combined expenditure for the first and second years was KRW76.11 billion. The highest combined expenditure was incurred by age groups 75 to 79 (KRW17.76 billion), 80 to 84 (KRW15.81 billion), and 70 to 74 (KRW14.63 billion). To see the table, see Estimating Medical Expenditure Associated with Osteoporotic Hip Fracture in Elderly Korean Women Based on the National Health Insurance Claims Database 2002–2004 Value in Health Supporting Information, Table S3 at: http://www.ispor.org/Publications/value/ViHsupplementary/ViH12s3_Kang.asp.

The average medical expenditure incurred by each patient was KRW3,094,439 during the first year and KRW81,028 during...
the second year, amounting to a cumulative expenditure of KRW3,175,467. During the first year, inpatient medical expenses accounted for 96.0% (KRW2,979,109) of the total costs incurred, although they accounted for 78.6% during the second year. To see the table, see Estimating Medical Expenditure Associated with Osteoporotic Hip Fracture in Elderly Korean Women Based on the National Health Insurance Claims Database 2002–2004 Value in Health Supporting Information, Table S4 at: http://www.ispor.org/Publications/value/ViHsupplementary/ ViH12s3_Kang.asp.

No cost increase was observed between age groups 50 to 54 and 55 to 59 (the youngest age bracket) and between age groups 80 to 84 and ≥85 (the oldest age bracket). In contrast, the middle age groups, i.e., 55 to 59 years to 75 to 79 years, showed a linear increase in the per capita costs with every 5-year increase in age.

Discussion

In this study, insurance-covered medical cost of osteoporotic hip fracture was calculated as KRW3.18 million per patient over a 2-year period after the fracture. Hip fracture patients in Korea incur considerably lower treatment expenses in the second year (only 2.6% of that in the first year) than in the first year after fracture. This is in sharp contrast with the study results from other countries. Wiktrowicz et al. [12] has reported that the medical expenses incurred during the second year after hip fracture were 23% (age group, 65–74 years), 12% (75–84 years), and 0% (≥85 years) of the expenses incurred during the first year of the fracture. In a survey conducted in five European countries, the direct expenses incurred during the second year ranged from 34% to 73% of those in the first year [13]. This result, which is in sharp contrast to our results, could be attributed to the difference in the availability of long-term health-care facilities for fracture patients. In Korea, there is an acute paucity of health-care facilities for treating elderly patients who develop physical disabilities after fracture, and no assured insurance benefits are available. In contrast, most of the elderly fracture patients in other developed countries are accommodated in long-term health-care facilities and receive continuous treatment and care. Another possible explanation could be because of the treatment gap between the guideline and actual practice regarding recommended osteoporosis screening and treatment after fracture. Because older women with prior fractures are at a higher risk for refractures, guidelines recommend pharmacological treatment of osteoporosis and measurement of bone mineral density after fracture [14]. Nevertheless, the very low second-year cost estimated in this study implies that the adherence to the guidelines may not be high among Korean elderly.

It is worth comparing the per capita spending of patients with hip fracture with that due to other diseases to help understand the relative economic impact of hip fracture. The average annual per capita insurance-covered medical expenditure on treatment of hip fracture during the first year of incidence (KRW3.1 million) was comparable to the annual per patient insurance-covered medical costs of all types of cancer (KRW3.4 million) and is higher than the direct medical cost for dementia in Korea (KRW2.6 million) [15,16].

Because this study identified female hip fracture patients and estimated direct medical costs by using NHI claims records, it has an advantage of generalizing the study results to the Korean population. Nevertheless, because the main objective of insurance claims reimbursement of medical expenses, the accuracy of information not directly related to medical reimbursement might be questionable. For example, when claims records are used to identify claims derived from the use of medical services for a specific disease, the disease code documented in the claims record is utilized. Nevertheless, if the study inclusion criteria are based on higher level disease codes, there is a risk of indiscriminate inclusion of claims with lower level disease codes. Nonetheless, because the disease code description in the claims records submitted by health-care institutions in Korea has not been standardized; lower or higher level codes might be recorded depending on the institution or physician in charge, resulting in inconsistencies. This study tried to minimize the chances of excluding fractures that match the inclusion criteria; therefore, in the case of several disease codes, study subjects were selected based on a higher level disease code.

In Korea, osteoporosis disease codes might be omitted from the claims records because of the following reasons. First, osteoporosis may remain undiagnosed, and hence, the patient might not receive treatment. Second, a patient diagnosed with osteoporosis might be treated with drugs not covered by the NHI. Thus, it can be difficult to clearly identify all osteoporosis patients. Therefore, this study attempted to identify osteoporosis patients by utilizing osteoporosis disease codes or from claims records bearing prescriptions for anti-osteoporosis drugs at least once during the 3-year observation period around fracture occurrence.

In this study, “high-cost disease” was defined by consulting the clinicians. For future study, there would be two possible ways to define high-cost diseases more solidly. First, the definition or choice of high-cost diseases may be based on the diseases with the actual highest claims after analyzing the NHI claims databases in Korea. Second, searching the definition of high-cost disease in the databases of PubMed or Medline would be another method.

Conclusion

This study estimated the medical expenses incurred by all elderly female osteoporotic hip fracture patients and by individual patients during the first and second years after fracture occurrence in Korea in the recent past. Exploring the economic burden of osteoporotic hip fracture in the elderly women is expected to motivate policymakers and clinicians to adopt effective treatment options from the viewpoints of disease prevention and expenditure control.

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References