



Estimation of annual per capita treatment in osteoporosis

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Abstract

Osteoporosis is a major health problem, especially in elderly populations, and is associated with fragility fractures mostly in hip and spine. These fractures have high costs consist of hospitalization, outpatient hospital, physician services, prescriptions (not available for those in long-term nursing or hospice) and labs and radiology so that direct financial expenditures for the management of osteoporotic fractures are estimated to be \$10-15 billion annually and can be risen as \$3 to 7 billion in one year without considering inflammation in each country.

Keywords: Osteoporosis, Bone mineral density, Vitamin D, Parathyroid hormone, Calcium

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Introduction

Osteoporosis is one of the most common diseases between adults and old people, being associated with some risk factors such as age and menopause which are the 2 main determinants in osteoporosis. Other risk factors include a family history of alcohol consumption, fracture and estrogen deficiency (1).

Osteoporotic fractures are major contributor to medical care costs in many regions of the world as a frequent cause of disability (2).

Materials and Methods

For this mini-review, we used a variety of sources by searching through PubMed/Medline, Scopus, EMBASE, EBSCO and directory of open access journals (DOAJ). The search was conducted, using combination of the following key words and or their equivalents; osteoporosis, bone mineral density, vitamin D, parathyroid hormone and calcium.

Osteoporosis as a chronic disorder

Osteoporosis as a chronic disorder, has no associated symptoms or warning signs prior to fracture. Also it is one of the disasters of the century. In 1991 osteoporosis was introduced as the main enemy of human associate with cancer, heart attack and stroke. This disease is the most common metabolic bone disorder with decreased bone mass and deterioration of bone tissue (1,2).

In 1994 the World Health Organization (WHO) offered a clinical description of osteoporosis based on measurements of bone mineral density (BMD). According to the WHO explanation, an osteoporotic patient is a person who has BMD measurement that has 2.5 standard deviations (SDs)

under normal peak bone mass of young and healthy white women. This amount of SD from peak mass named the T score.

Assigning the T score permits the early recognition of osteoporosis and so decreases the risk of either hip or spine fractures. But the WHO had not established T score as a standard score for osteoporosis in men, children, and persons of ethnic groups (1,2).

Adequate calcium intake is important to preserve normal calcium homeostasis and to protect the bones from inordinate calcium loss. If calcium intake is low, mechanisms that increase secretion of parathyroid hormone (PTH) are brought into play, resulting in a high-turnover state and possible negative effects on bone mass. The minimum calcium intake necessary to maintain skeletal health is difficult to define. Nutrition may affect peak bone mass. Calcium intake must be highest during adolescence, pregnancy, and old age due to diminish the risk of osteoporosis (1-3). The main difference between osteoporotic women and non-osteoporotic women is defective bone formation. Osteoporotic women without fractures have significantly thinner bone structural units compared with age-matched controls. Genetic and hormonal factors besides aging may also contribute to osteoblastic insufficiency (3). Fractures caused by osteoporosis may lead to chronic pain, deformity and disability. Protecting people against disease costs is the main target of the health system. However, there have been no controlled studies which show importance of osteoporosis and the growing elderly population, therefore, the present study carried out the policies for osteoporosis prevention and estimated annual per capita treatment. The aim of this study was the estimation of

■ Implication for health policy/practice/research/medical education

Osteoporosis is described as a progressive systemic skeletal disorder characterized by low bone mineral density (BMD) and also named as a costly disease. Direct financial expenditures for the management of osteoporotic fractures are estimated to be \$10-15 billion annually.

annual per capita treatment in osteoporosis (2,3).

An estimate of the worldwide prevalence

In 2000, 9.0 million fractures caused by osteoporosis were fractures at the hip (1.6 million), at the forearm (1.7 million) and clinical vertebral fractures (1.4 million). The highest ratio of osteoporotic fractures happened in Europe (34.8%). The total disability-adjusted life year (DALY) lost was 5.8 million of which 51% were arranged for fractures in Europe and the Americas. For chronic muscular and skeletal disorders the DALYs lost in Europe due to osteoporosis (2.0 million) were less than osteoarthritis (3.1 million) but more than for rheumatoid arthritis (1.0 million) (2).

Wright et al in 2014 operated prevalence of osteoporosis or low bone mass at the femoral neck or lumbar spine for the noninstitutionalized people with 50 years old and even older from the national health and nutrition examination survey 2005-2010 to 2010 US Census population counts to control the total number of older US residents with osteoporosis and low bone mass. They found that more than 99 million adults aged 50 years and older were in the United States in 2010. According to an overall 10.3% prevalence of osteoporosis, they estimate that in 2010, 10.2 million older adults had osteoporosis. The overall low bone mass prevalence was 43.9%, from which Wright et al estimated that 43.4 million older adults had low bone mass. Although high ratio of persons with osteoporosis or low bone mass were non-Hispanic white women, a substantial number of men and women from other national groups similarly had osteoporotic BMD or low bone mass (3,4).

In the other investigation based on demographics of world populations Dhanwal et al estimated that by 2050 half of hip fractures will occur in Asia (4).

High cost best reason for prevention

Prior national cost estimates of osteoporosis and fractures in the United States have been based on selected insurance demands. Based on a random population-based sample of older adults, the US medical cost of osteoporosis and fractures is estimated at \$22 billion in 2008 and in European Union, fragility fractures led to costs of €37 billion in 2010 alone. These costs were consisted of hospitalization, outpatient hospital, physician services, prescriptions, radiology, supplier services, skilled nursing facility (SNF), long term nursing care, hospice care and home health care (5).

A report by International Osteoporosis Foundation (IOF) and the European federation of pharmaceutical industry associations showed that the growing burden of osteoporosis would increase (25%) in health economic

costs by 2025.

Blume and Curtis in their survey in 2011 indicated that of 30.2 million aged Medicare recipients in 2002, 5% were cured for a fracture that year, and 24% have osteoporosis without a fracture. Finally mean of fractures on annual medical cost was \$8600 proposed a US cost near \$14 billion. Half of the non-fracture osteoporosis patients received drug treatment, averaging \$500 per treated patient. The annual cost of osteoporosis and fractures in the United States elderly using a national 2002 population-based sample was about \$16 billion. Also the national cost of osteoporosis and fractures in 2008 was \$22 billion (5). Buckley and Hillner in 2003 proposed that, calcium and vitamin D supplements reduced fracture rates by 30%-50% at a minimal cost US\$800. Etidronate and alendronate are most cost-effective in women with T scores of -1.5 and -2 during 10 year analysis. In the life-time assay, calcium and vitamin D treatment led to a cost savings in comparison with no treatment for all groups with osteopenia. Etidronate decreased fracture rates in all groups with less than \$2000 cost per fracture prevented. Alendronate reduced the fracture risk further at cost of \$3000-7000 per fracture avoided (6).

Primary prevention aims at reaching at adolescent age a peak bone mass as high as possible. While secondary prevention determined to decrease bone loss peri- and postmenopausal. The tertiary prevention aims at preventing fractures with manifest osteoporosis. Emphasis of the primary prevention is, besides a sufficient calcium intake, to omit risk factors; with secondary prevention the use of medical treatments such as estrogens, bisphosphonates. The tertiary prevention tries mostly to reduce the femur fractures. In addition to drugs such as vitamin D/calcium, vitamin D metabolites and bisphosphonates, it is very important to create 'a fall-proof home'. Also hip protectors are very useful (7,8).

A recent cost-effectiveness analysis by Miller in 2008 from Sweden proposed that teriparatide which is an anabolic therapy, improves bone density, reduces vertebral and non-vertebral fracture occurrence, and recovers geometric properties of bone, approved for the treatment of osteoporosis in men and post-menopause women disposed to fracture. It should be considered as first line therapy in patients at high risk for fracture, or in patients for whom the physician is not satisfied with the effectiveness of other registered therapies may be cost-effective compared with no treatment. Teriparatide may inhibit fractures in comparison to alendronate in women with acute osteoporosis, while it is more expensive (9). The cost of primary prevention and the number of hip fractures inhibited was investigated by Vestergaard and Mosekilde (9) in 1999. They evaluated primary prevention with hormonal replacement therapy in over 50 years old women and secondary prevention with hormone replacement therapy

(HRT) in same group but with low BMD, use of external hip protectors in nursing home residents, use of calcium and vitamin D in nursing home residents and tertiary

prevention with bisphosphonates (alendronate) or external hip guards. Alendronate or calcium plus vitamin D were cheap in nursing home residents and concluded that the economic cost of bisphosphonate treatment was high even in the third type of prevention in the high risk group with prior hip fracture (10).

Conclusion

Osteoporosis is described as a progressive systemic skeletal disorder characterized by low BMD and also named as a costly disease. Fracture due to osteoporosis is the main cause of disability and lead to high hospital costs all over the world. We conclude that osteoporotic fractures are a significant cause of morbidity and mortality, particularly in the developed countries so that cost of treatment can be risen as \$3 to \$7 billion in one year without considering inflammation in each country.

Osteoporosis causes considerable economic and social costs and increases morbidity and mortality ratio. Direct financial expenditures for the management of osteoporotic fractures are estimated to be \$10-\$15 billion annually.

Authors' contribution

All authors contributed equally to data acquisition.

Conflicts of interest

Authors declare that they have no competing interests.

Ethical considerations

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

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