Osteoporosis: Social and Economic Impact

Juliet Compston, MD, FRCPath, FRCP, FMedSci

KEYWORDS

• osteoporosis • Fracture • Bone mineral density
• Economic cost • Fracture risk assessment

Osteoporosis is characterized by reduced bone mass and disruption of bone architecture, resulting in increased bone fragility and increased fracture risk.[1] These fractures are a major health problem in the elderly population, leading to significant morbidity, mortality, and cost to health care services. One in two women and one in five men over the age of 50 years will suffer a fracture due to osteoporosis during their remaining lifetime.[2] Demographic changes over the next few decades will result in at least a doubling in the number of these fractures. Worldwide, it is estimated that there are around 9 million osteoporotic fractures each year and that over half of these occur in Europe and the Americas.

A classification of osteoporosis based on bone mineral density (BMD) and fracture was proposed by the World Health Organization in 1994.[3] According to this definition, osteoporosis is defined a BMD T-score less than or equal to -2.5 (ie, 2.5 or more standard deviations [SD] below the mean value in healthy young adults), osteopenia as a T-score between -1 and -2.5 and normal BMD as a T-score higher than -1. Established osteoporosis is defined as a T-score less than or equal to -2.5 and the presence of a fragility fracture. Based on these criteria, osteoporosis is present in 30% of all postmenopausal Caucasian women and 70% of those aged 80 years.[4]

EPIDEMIOLOGY

The incidence of osteoporotic fractures increases markedly with age; in women, the median age for Colles fractures is around 65 years and for hip fracture, 80 years. The age at which vertebral fracture incidence reaches a peak is less well defined but in women is thought to be between 65 and 80 years. In men, no age-related increase in forearm fractures is seen, but hip fracture incidence rises exponentially after the age of 75 years. The prevalence of vertebral fractures rises with age in men, although less steeply than in women.[5]

During the latter part of the 20th century, increases in the age-adjusted incidence of osteoporotic fractures, mainly hip fracture, were reported in Europe and the United States.[6,7] This change was attributed to factors such as reduced physical activity, increased risk of falling, and possibly also changes in hip geometry such as longer hip axis length. Over the past decade, however, stabilization or a decrease in the age-adjusted incidence of osteoporotic fractures has been reported in some countries in the western world (for example Switzerland, Denmark and the United States),[8–10] although others have reported an increase (for example Germany and Japan).[11,12] These data mainly relate to hip fractures, since the incidence of other fracture types is not documented accurately in most countries. Notwithstanding secular changes in fracture incidence, the number of fractures will continue to rise as the population ages, and in Asia and Latin America, a five-fold increase in fractures is predicted during the next 40 to 50 years. Worldwide, it is estimated that the number of hip fractures will rise from 1.66 million in 1990 to 6.26 million in 2050.[13]

Geographical variations in the incidence of hip fractures have been reported in Caucasian women, with higher incidence rates in Scandinavia than in other parts of Europe or the United States.[14] Within Europe alone, there is a more than tenfold variation in incidence rates for

Department of Medicine, Addenbrooke's Hospital, Cambridge University Hospitals NHS Foundation Trust, Box 157, Cambridge CB2 0QQ, UK
E-mail address: jec1001@cam.ac.uk

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reasons that have yet to be clarified.[15] Smaller differences in vertebral fractures incidence were noted within Europe in the European Vertebral Osteoporosis Study (EVOS).[16] Overall, fracture incidence is higher in white than in black men and women, possibly because of lower BMD, smaller bone size, and greater rates of bone loss in the former.

Fracture is a major risk factor for further fractures, an effect that is partially independent of BMD.[17] Thus the presence of a prevalent vertebral fracture is associated with a seven- to tenfold increase in the risk of subsequent vertebral fracture,[18] and the risk of a new vertebral fracture approaches 20% in the first 12 months after an incident vertebral fracture.[19] A fragility fracture at any site is a risk factor for subsequent fracture at the same or other sites; for example, the risk of a hip fracture is increased 1.4-and 2.7-fold in women and men respectively following a distal forearm fracture,[20] and the risk of hip fracture increases four- to fivefold in women with a vertebral fracture.[21] These observations emphasize the importance of prompt intervention in patients presenting with a fracture to prevent further fractures.

ECONOMIC COSTS

The economic costs of osteoporotic fractures include direct costs of hospitalization and aftercare and indirect costs attributable to the impact of fracture on daily life activities including working days. Together, these costs impose a huge financial burden on health care and social services. In the United States, the direct costs of osteoporotic fractures are estimated at around $18 billion annually,[22] while in Europe the corresponding figure is around €36 billion.[23] In the absence of a significant treatment impact on the global burden of fractures, these costs are set to increase twofold or more by 2050.

HIP FRACTURE

The incidence of hip fractures increases exponentially with age in both women and men,[24,25] with a female/male ratio of 2:1 to 3:1. Of all osteoporotic fractures, hip fractures have the greatest morbidity and mortality.[26,27] They almost always follow a fall, usually backwards or to the side, and require surgical treatment. Because hip fractures characteristically affect frail elderly people, postoperative morbidity and mortality are high. At 6 months after fracture, mortality rates of 12% to 20% have been reported, and only a minority of surviving patients with hip fracture regain their former level of independence, with up to one-third requiring institutionalized care.[28] Mortality after hip fracture is higher in men than in women and increases with increasing age.[29,30] The risk of death is highest immediately after the fracture has occurred and decreases gradually thereafter. Most deaths are related to existing comorbidities rather than a direct result of the fracture, reflecting the frailty of this population.

VERTEBRAL FRACTURE

Vertebral fractures are the most common of all osteoporotic fractures. The diagnosis of vertebral fracture is based on changes in vertebral shape on standard radiographs or images obtained by dual energy X-ray absorptiometry (DXA). There are several different approaches to the definition of vertebral fracture (see the article by Guglielmi and colleagues elsewhere in this issue for further exploration of this topic), but at present there is no universally adopted gold standard for their diagnosis. Estimates of prevalence and incidence are complicated further by the low proportion of vertebral fractures that come to medical attention (20% to 30%).[31]

Data from EVOS have demonstrated that the age standardized prevalence in the European population is 12.0% for women and 12.2% for men aged 50 to 79 years.[16] The similar prevalence in men and women likely reflects the higher risk of traumatic fractures in younger men; the gradient of increased prevalence with age is steeper in women than in men, with rates of 24% and 18% at age 75 to 79 years, respectively. Prospective data in a US population have shown an overall age-standardized incidence of 10.7 per 1000 person–years in women and 5.7 per person–years in men.[32]

Vertebral fractures may occur spontaneously or as a result of normal activities such as lifting, bending, and coughing. A minority of vertebral fractures (possibly around one third) present with acute and severe pain at the site of the fracture, often radiating around the thorax or abdomen. The natural history of this pain is variable; in general, there is a tendency for improvement with time, but resolution is often incomplete. Multiple vertebral fractures result in spinal deformity (kyphosis), height loss, and corresponding alterations in body shape with protuberance of the abdomen and loss of normal body contours. These changes commonly are associated with loss of self-confidence and self-esteem, difficulty with daily activities, and increased social isolation.[33–36] The clinical impact of vertebral fractures is thus substantial, although often underestimated.

Like hip fracture, vertebral fractures are associated with excess mortality mainly as a result of comorbidities. In contrast to hip fracture, however,