Osteoporosis is a common disease, responsible for most of the fractures which occur after the age of 50 years. It is a worldwide health problem of great magnitude which increases with the aging and the lifestyles of the population, especially in Western countries. The main complication is fracture which carries with it a high health and social cost. In spite of the fact that it is a preventable and treatable disease, to date, policies developed to deal with it so far have not managed to reduce the problem. Osteoporosis is defined as a general disorder of the skeleton characterised by low bone mass and deterioration in the microarchitecture of the bone tissue, which is translated into a diminution of bone resistance which predisposes it to fracture. Bone resistance is made up of two components – bone density and bone quality. In turn, the concept of quality attempts to integrate all those factors, apart from bone mass, which contribute to bone fragility, and which include among others, the microarchitecture, the degree of bone turnover, the accumulation of lesions or microfractures and degree of mineralisation.

According to the definition, the most significant clinical fact is fragility fracture. The absence of manifestations of osteoporosis without fracture makes diagnosis difficult. Without methods of evaluating quality, or its components, the diagnosis is based on the confirmation of low bone mineral density (BMD). Thus, in 1994 the WHO agreed an operative definition based on levels or cut-off points of BMD for white postmenopausal women. Thus, it was proposed that normal levels for BMD be set at a value higher than a -1 standard deviation (SD) in relation to the average for young adults (T-Score > -1); for osteopenia, values of BMD between -1 and -2.5 SD (T-Score between -1 and -2.5); for osteoporosis, values of BMD lower than -2.5 SD (T-Score lower than -2.5) and established osteoporosis, when, along with these conditions, are associated one or more osteoporotic fractures (Table 1). It has recently been recommended that these same cut-off points be used for osteoporosis in males.

In the epidemiology of osteoporosis it is necessary to distinguish between the concepts of osteoporosis and osteoporotic fracture. The available data are limited by problems due to the definition of osteoporosis, diagnostic methods, the existence of asymptomatic fractures and the characteristics of the population studied.

**Epidemiology of osteoporotic fractures: vertebral and non-vertebral fractures**

Osteoporosis is estimated to affect 75 million people who suffer from osteoporosis in the US, Europe and Japan. In accord with the WHO criteria, it has been estimated that at least 15% of white women over 50 years of age is osteoporosis, 15% when one of the three usual locations (spine, hip or wrist) is measured, and 30% when measured in all of them. The prevalence increases with age from 15% for the period between 50 and 59 years of age, up to more than 80% in ages over 80 years. In males, the prevalence of osteoporosis is lower, 8% according to the NHANES study.
Nearly 2 million women and 800,000 men have osteoporosis in Spain. Díaz Curriel et al. found a prevalence of densitometric osteoporosis of 26.07% (95% CI, 22.57-29.57%) in women over 50 years of age. As expected, the prevalence in males was less, 8.1% in those older than 50 years and 11.3% in those over 79 years of age.

**Epidemiology of fractures**

Bone fractures have a bimodal distribution, the first stage occurring during adolescence and youth, with the second peak of frequency in old age. The first fractures are traumatic, predominantly in the large bones and affect males more. In the later stage the fractures are more frequent in women, occurring with minimal trauma and are predominantly in the vertebrae, hip and wrist. These are the complications of osteoporosis and are responsible for its serious clinical consequences and socioeconomic costs. Johnell et al. studied the consequences of incapacity produced by osteoporosis in Europe which exceeds the overall impact of many cancers and other chronic diseases such as rheumatoid arthritis, asthma or the cardiac repercussions of hypertension.

Osteoporotic fractures are classified as vertebral or non-vertebral. Those of the hip, wrist and humerus are the most common, but many others are related to bone fragility. Only fractures of the face or the ankle have no clear relationship with a reduction in BMD, and thus are not considered as osteoporotic. Neither, among vertebral fractures, are cervical or thoracic fractures above T5 considered to be osteoporotic.

It has been calculated, using data from 2000, that there were more than 9 million osteoporotic fractures worldwide, of which more than half were in Europe and the US, with the following distribution: hip, 1.6 million; forearm, 1.7 million; and clinical vertebral (symptomatic), 1.4 million. The current data have been projected into the future and it is estimated that fractures will increase in the next few decades. There are no direct overall data on the number of fractures in Spain, it is likely that it could amount to 25,000 fractures per year, with direct costs higher than 126 million euros and indirect costs of more than 420 million euros.

**Vertebral fracture**

The prevalence of vertebral fractures is difficult to quantify. More than two thirds are asymptomatic and can only be diagnosed by imaging methods, generally lateral radiography of the lumbar and dorsal spine. There are various methods proposed for the radiological recognition of vertebral fractures, which limits the uniformity of the results. The presence of a previous fracture in women of over 65 years of age multiplies by 7-10 times the risk of suffering another new fracture in the next 5 years. It also increases the probability of suffering non-vertebral fractures, which is estimated to have a risk quotient of 2.8 – 4.5, and this increases with the number vertebral deformities.

Vertebral fractures are infrequent before the age of 50 and, as with other fractures, increase with age. Various studies have indicated that their prevalence in women over 50 years of age is between 18 and 28%. In Europe, the data on prevalence come mainly from the “European Vertebral Osteoporosis Study” (EVOS), in which a prevalence of 12.2% for males, and 12% for ages between 50 and 79 years, was observed. The individuals from this study were subsequently included in a prospective study “European Prospective Osteoporosis Study” (EPOS). The annual incidence is considered to be 1% in women of 65 years of age, 2% in those of 75 years and 3% on those over 85 years of age. In males over 50 years of age it is from 5.7 to 6.8/1,000 person/years, which is equivalent to approximately half that seen in women.

**Hip fracture**

Hip fractures are considered, from the point of view of their prognosis, the most important fractures due to their associated high morbimortality. Fewer than half patients return to their previous state, with 25% requiring home care and 20% remaining in a state of dependency after the fracture.
The incidence of hip fractures increases exponentially with age and in women is twice that in men. The majority occur after a fall from a height equal to or lower than the patient’s height. The overall risk of hip fracture from 50 years of age in the United Kingdom is 11.4% and 3.1% for women and men respectively. The incidence varies substantially from one population to another, and is usually higher in white Caucasian individuals. In Europe, the proportion of hip fractures varies by a factor of up to 7 across different countries. Spain is considered to be a low incidence zone, while in Norway, Sweden, Iceland, Denmark and the US, the incidence is high. In this country, the annual incidence is highly variable and varies between 301/100,000 and 897/100,000 patients over 65 years of age.

Wrist fracture
Distal cubital and radius fractures, or Colles fractures, have a presentation profile different from the abovementioned fractures. Data on this fracture is more scarce than with hip or vertebral fractures. Most of the incidence data comes from the Northern hemisphere, principally the Scandinavian countries, the United Kingdom and the US. There is an increase in the incidence in Caucasian women over 40 and 65 years, followed by a plateau which continues over the later years, which has been related with a change in neuromuscular reflexes caused by aging, and by a tendency to suffer falls, whose impact individuals automatically attempt to cushion with outstretched arms. This type of fracture appears mainly in women and, largely, after 65 years of age. In the United Kingdom, the risk of fracture over their life-time for women of 50 years of age is 16.6%, while at 70 years this risk falls to 10.4%. The incidence in males is significantly lower and does not change much with age (risk over the rest of their life-time is 2.9% at 50 years and 1.4% at 70 years).

Risk factors for fractures
There are various factors which facilitate the development of osteoporotic fractures. The most significant of all these is low BMD, which accounts for 70% of bone fragility. However, there are other factors, independent of BMD, probably related to bone quality. It should also be taken into account that the mechanism related to the mechanical impact of falls also has a role in the development of fractures. A number of these factors interact in a complex way in each individual. The principal risk factors are listed and summarised in Table 2.

Fractures and mortality
The available data indicate, without a doubt, that one of the consequences of fractures is an increase in mortality, which depends on the type of fracture. This is especially high in hip and vertebral...
In the cohort from Rochester, USA, it was found that the survival rate at 5 years from suffering a vertebral or hip fracture was 80% of that expected in men and women without fracture of a similar age. In more recent studies coming from the cohort from Dubbo, Australia, it has been found that there is an increase in mortality in all types of fracture, including after minor fractures in patients older than 75 years of age. Mortality is higher immediately after the fracture and reduces over time. In the case of a hip fracture, the increase in mortality remains high during at least 10 years, while for the remaining fractures it starts to reduce after 5 years. The causes of the mortality are not always directly related to the fractures, with associated diseases, disability, and immobility due to pain which may facilitate infections, appearing to be additional determinants.

In hip fractures, mortality is higher in men than in women and increases with age. As was expected, it is higher in patients with other concurrent diseases, with worse functional capacity before the fractures and with an increase in fragility. Approximately 8% of men and 3% of women over 50 years of age die during hospitalisation. In the United Kingdom, survival after suffering a hip fracture is 63.3% in men against an expected 90.0%, and 74.9% in women against an expected 91.1%. The risk of death is highest immediately after the fracture and reduces gradually with time, although it remains raised for 10 years after the fracture. The cause of death is not usually attributed directly to the fracture, but to other concomitant diseases and to the fragile state of the patient. One of the factors which influences a poor prognosis is the period of time which passes until a surgical intervention, since mortality increases when this is delayed beyond the second day. In Spain, using data from the Ministry of Health, mortality during hospital admission due to a hip fracture is 8.4% for men and 4.8% for women. Curiously, the mortality is higher in regions with cold climates.

Vertebral fracture is also associated with an increase in mortality. In the American cohort of the “Study of Osteoporotic Fractures” (SOF) it was found that women with vertebral fractures were 1.26 times more likely to die. In other studies such as EVOS, the risk was raised to 2.4 times, without a difference between the sexes. Mortality increases with the number of crushed vertebrae by 32% for each new vertebra. Mortality remains raised for at least 5 years, subsequently declining. Among the causes were pulmonary problems and cancers, especially of the breast.

In terms of the influence of other types of fractures on survival, there are contradictory results. Some authors did not find a relationship between wrist fracture and other non-vertebral fractures. But in very recent data it has been found that those patients with any type of osteoporotic fracture had a diminished rate of survival. Non-vertebral fractures other than those of the hip are responsible for an increase in mortality, especially in patients older than 75 years of age.

Conclusions
Osteoporosis is a worldwide health problem of considerable magnitude. The frequency of the disease and, above all, of fractures, has a very high socioeconomic cost. The fractures have serious consequences, with repercussions on the person who suffers them since they reduce survival and quality of life, and aggravate concurrent diseases. It is estimated that this situation will worsen in the next few years. Therefore, it is essential to design therapeutic and preventative strategies to limit their consequences.

Bibliography


