Perspective

Burden of Osteoporosis in Thailand

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Osteoporosis is the most common metabolic bone disease in humans. It is characterized by low bone mass, microarchitectural deterioration, compromised bone strength, and an increase in the risk of fracture[1]. With an aging global population, osteoporosis has fast become a worldwide concern because of its age-associated, exponentially increased prevalence, costs, morbidity and mortality[2]. Osteoporosis is sometimes called "the silent disease" because by the time pain and fractures arise, the disease process is well advanced. From a population-based perspective, osteoporosis may be preventable, as a number of environmental factors are open to intervention by effective pharmacological agents in parallel with non-pharmacological modality. Adding to the clinical and economic perspectives, aggressive measures to detect osteoporosis at earlier stages may be warranted. This reality calls for major steps, including operational research, to identify the mechanisms of risk factors, and to remove barriers to more effective preventive measures.

Prevalence of osteoporosis in Thailand

It is important to calculate the prevalence of osteoporosis to address the overall magnitude of the problem in Thai population particularly women who are considered to be the risk group. In a nation-wide survey during 2000-2001, the age-adjusted prevalence of osteoporosis in Thai women ranging in age from 40-80 years was 13.6% and 19.8% for femoral neck and lumbar spine, respectively[3]. The age-specific prevalence of osteoporosis among Thai women below 50 years of age was less than 5% and the prevalence increased with advancing age, i.e., more than 50% found after the age of 70. Comparatively, a study from Khon Kaen province, a rural area of Thailand reported the prevalence of osteoporosis showing a bit higher than the aforementioned study. The prevalence of osteoporosis in the latter report was found to be 19.3 and 24.7% at the femoral neck and lumbar spine, respectively[4]. Differences in the disease prevalence are probably due to the dissimilarity of the reference database of the mean peak bone mass used for the WHO measurable criteria. The study in Khon Kaen province used the mean peak bone mass developed from rural women that was higher than the one developed mainly from an urban area. For men, the age-adjusted prevalence of osteoporosis was 12.6, 4.6 and 3.9% at the femoral neck, lumbar spine and both sites, respectively[5]. These figures of prevalence in both men and women are comparable with previous studies in Western countries and in some other Asian countries[6].

Incidence of fractures in Thailand

The public health and clinical importance of osteoporosis lies in the fractures associated with the disease. According to conservative estimates, a 50 year old Caucasian woman has a remaining lifetime risk of 40% for hip, vertebral, or wrist fracture[7]. Although white women are primarily affected, African, Hispanic, and Asian women, as well as men, are also at signifi-

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cant risk. It is projected that by the end of this century, 50% of all hip fractures in the world will occur in Asia[8]. Prevention of osteoporotic fractures in Asia is therefore of paramount importance.

In 1994, a multicenter study on hip fractures in Thailand was reported. The age-adjusted incidence of hip fractures was 7.45 per 100,000 populations. The incidence was higher in women (14.93 per 100,000) than in men (6.68 per 100,000). In 2001, the Asian Osteoporosis Study (AOS), a multi-national research survey was documented the incidence of hip fracture in Thailand[10]. The age-adjusted rates (per 100,000) were 114 and 289, in men and women, respectively. These were lower than the incidence for men and women of hip fracture in Hong Kong, (180 and 459), Singapore (164 and 442) and US White (187 and535) but comparable with Malaysia, (88 and 218). The higher rate of hip fracture was associated with urbanization[11-16]. However, the incidence of hip fracture in both men and women was higher in a community based survey compared with hospital based survey (185.2 vs. 151.2 per 100,000)[17].

While the incidence of hip fracture in Thai population has been well documented, there is a dearth data on morphometric, clinical vertebral fracture and non-vertebral fracture in Thai population that need more research to explore the occurrence. Recently, the community based study in Khon Kaen province demonstrated that the prevalence of morphometric vertebral fracture in elderly men and women was comparable (15%); however, the prevalence increased with advancing age (unpublished data).

Osteoporosis related mortality, morbidity and quality of life

The hallmark of osteoporosis is fractures sustained with little or no antecedent trauma. Osteoporotic fracture causes considerable disability, morbidity, and mortality. It incurs significant costs[2] and the incidence increases exponentially with advancing age. Hip fractures are related to bone mineral density (BMD) and to mechanical factors. Wrist fractures (Colles' fracture), common in 50- to 60-year-old women, are associated with falls or other trauma. Vertebral fractures may manifest as mild wedges to complete compression. These fractures usually occur unnoticeable with no obvious history of trauma so that approximately 60% of compression fractures in women are not recognized. Symptoms vary and the degree of compression is not necessarily related to the amount of pain. Notwithstanding, vertebral fractures are associated with considerable morbidity and increased risk of mortality[18-20]. Furthermore, kyphosis, caused by vertebral compression fractures, is a feature of osteoporosis that can be identified in most patients. Height loss, which is commonly found with advancing age, is mainly a result of an osteoporosis-induced fracture.

The sequelae of osteoporotic hip fractures are often severe or even devastating. Mortality is a frequent outcome following a hip fracture as a report in a white population revealed that up to 20% of patients die within one year of their fracture[18,19]. The survivors are at an increased risk of dependency as it has been shown that after one year following a hip fracture, over 30% of patients have permanent disability, 40% are unable to walk independently, 60% cannot carry out at least one activity of daily living, and 80% or more are unable to carry out at least one independent activity of daily living. In addition, some 50% need help with daily living activities, and 15 to 20 percent need long-term care[21]. Indeed, all major osteoporotic fractures are associated with a two- to three-fold increase in mortality in both men and women[19].

In Thailand, the mortality rate after hip fracture during hospitalization was 2.1%, which was shown to increase to 9, 12 and 17% in 3, 6, and 12 month respectively[22]. In Khon Kaen, the mortality rate after hip fracture was 29% in a 60-month follow up (unpublished data). Men with hip fracture were found to have a shorter survival period than women at a corresponding time. Furthermore, patients who were treated conservatively had a nearly double mortality risk compared to those who were treated operatively. The other major risks of mortality were age over 80 years old, presence of chronic illnesses, poor pre-fracture walking ability[22]. Moreover, the mortality rate in women with aged 50 years and over with hip fracture was higher than those without hip fracture[23].

Quality of life impact of osteoporosis

A growing number of studies show that fractures do have a considerable impact on health-related quality of life. Previous studies have shown more or less severe impairment of quality of life after hip, vertebral, or forearm fractures[24-34]. Duration of quality of life impairment after fracture varies markedly between various studies and different fractures. Osteoporotic fractures, particularly vertebral fractures, often cause disability, deformity and chronic pain. More than 50% of hip fracture patients over 60 years of age need more assistance with activities of daily living

after fracture than before[35]. Furthermore, osteoporosis-related fractures will cause 6.7% of women to become dependent in basic activities of daily living during the remaining lifetime[36].

A previous study in a Thai population demonstrated clearly the deterioration in quality of life after fracture. Hip fracture patients required more help with every task, socialize less, and walk more slowly with diminished balance and confidence[37]. All patients suffered a certain degree of deficits in health perception, mental health, emotional, physical, social function and experiencing bodily pain as measured by modified SF-12 health survey[38]. The present report showed that one fifth of patients (22.1%) could not walk after hip fracture. Moreover, hip fracture patients needed a wheel chair (23.2%), transferring assistance (11.2%), bathing assistance (11.2%), tooth-brush assistance (4%), dressing assistance (10%), feeding assistance (4.8%), and toileting assistance (21.6%)[38]. Likewise, the study in Khon Kaen demonstrated that the quality of life in surviving hip fractured patients was disturbed (~60%) and less than 5% of patients remained healthy (unpublished data).

Health economic aspect related with osteoporosis and fracture

Osteoporosis and its direct consequences, fractures, are a major concern for public health, as they represent a significant cost to health care systems. The morbidity burden has considerable medical, social and financial implications that are evident worldwide. In the United Kingdom, osteoporosis costs the National Health Service (NHS) and the government approximately □1.8 billion each year[39]. According to the International Osteoporosis Foundation (IOF) audit report "Osteoporosis in European Community: Action Plan" published in 2003, the annual cost of treating all osteoporotic fractures in Europe is estimated to be € 25 billion[40]. Likewise, in the United States (US), it has been estimated that osteoporotic fractures cost US$ 17 billion each year[41]. In Thailand, the medical charge per case was 36,563 Baht, nearly a third of the national GDP per capita[9]. Median total cost of hip fracture treatment in 1 year was 116,459 Baht and a median direct cost was 59,881 Baht. Moreover, the direct cost per live-year saved was 118,168 Baht[42]. In addition to morbidity and mortality, osteoporotic fractures are associated with significant use of health care resources relating to hospitalization, outpatient care and long-term care. In Thailand, the average length of stay in hospital was 22.7 days with a median of 17 days[9].

Problem of osteoporosis management in Thailand

Individuals with low BMD (osteoporosis by WHO criteria), or with a history of fracture (regardless of BMD) should be considered for treatment. However, recent epidemiological surveys revealed that high-risk individuals have not received proper diagnosis and treatment. Among hospitalized women, aged $\geq$ 60 with spine radiographs showing severe vertebral deformities, only 17% had been mentioned of fractures in their medical records or discharge summary[43]. A study in a managed-care setting reported that only 5% had a BMD scan and 23% were started on hormone replacement therapy (HRT), calcitonin or bisphosphonates[44]. In a study of 502 hip fracture patients in a hospital setting, only 14% underwent a BMD scan, 13% received calcium/vitamin D, and 18% received HRT, calcitonin, or bisphosphonates[45]. Other studies report that only 5% of patients with recent hip fractures left hospital with a medication to reduce any subsequent fracture-risk[46,47]. In Thailand, there are some limitations in both diagnosis and treatment. Dual Energy X-ray Absorptiomters (DXA) machines are not widely available in Thailand. From a survey in 2006, there have been 50 machines all over the country being used so far and most of the machines have been used only in tertiary care centers, university and private hospitals. A DXA machine is being available in every province particularly in rural regions of the country. Therefore, the diagnosis of osteoporosis using DXA is not considered the practical measure, at least, now. On the same token, despite anti-osteoporotic agents well established for the treatment of patients with high risk for fractures, most hip fracture patients in Thailand have been under-diagnosed and under-treated. Less than 1% of hip fracture patients received BMD measurement by DXA machine and only 7% of the patients were diagnosed as osteoporosis. Moreover, less than 50% of patients received calcium alone or calcium plus vitamin D and only 4.2% of patients were treated with calcium, vitamin D and antiresorptive agents[48]. Thus, despite the magnitude of the problem and the development of osteoporosis treatment guidelines, most high-risk individuals and fracture patients are not being identified, and not being treated properly.

Rethinking the burden of osteoporosis

The current information on osteoporosis and its consequences incurs an alarming fact that the disease can pose devastating effects on physical and mental health, family and work life, and dramatically

putting a burden on the socio-economics of the nation. It is generally perceived that osteoporosis can bring about these debilitating effects on both the Caucasians and non-Caucasians. Previous worldwide estimation revealed that osteoporosis and fractures would become more prevalent in Asia within the first half of this century[8]. This has been associated with a sharp rise of aging population in this region[49]. Nevertheless, Japan, being the country with the highest percentage of aging population and centenarian, has a lower incidence of hip fracture when compared to their American counterparts, though the average BMD of Japanese is relatively lower[50-52]. To rationalize the contradiction, there are various assumptions that still need to be confirmed i.e., the differences among the Caucasians and non-Caucasians of genetic expression such as vitamin D receptor gene, estrogen receptor polymorphism, collagen 1A1 polymorphism[53-55]; bone geometry i.e., longer hip axis length in the Caucasians, which is associated with higher hip fracture incidence[57]; arbitrarily reasoning on differences in nutritional composition with higher amount of phytoestrogen in Asian diet. On the contrary, Hong Kong and Singapore, where most of the population are Chinese, are reported to have a comparable incidence of hip fracture as the United States[10]. Ironically, these countries may have to trade-off their fast-pacing modernization and economical affluence with the increasing prevalence and burden of osteoporosis. As it is reported that 54% of fractures occurred in non-osteoporotic patients[58] and 80-90% of hip fractures took place after a fall[59]. The non-pharmacological modality of fall prevention may be a key issue for people in Asia where lifestyle and cultural milieu are supportive of fall prevention. It is well known that Asians are acquainted with the outlook and attitude that focus mentally inward, seek peace of mind, keep mental awakening, practice mind-body exercise i.e., Yoga, Tai-Chi, Qi-gong, live in a multi-generation, big family, and have seniority reverence. This mindset may have a significant influence on reducing the risk of fall, and consequently decreasing the risk of fracture. The Asian distinctive mindset may stem from the unique living philosophy and religion such as Hindu and Islam in South Asia, Tao, Confucian and Zen in East Asia and Buddhism in South East Asian countries. Hence, it is probably beneficial to keep this healthy culture and mindset in reducing fracture risk and looking for a cost-effective medication for a real indicated person who will benefit the most from anti-fracture medication.

Conclusions

Over the past decade, osteoporosis has emerged as one of the most common diseases in the elderly population and has represented as one of the most significant public health problems due to its morbidity, mortality, and financial cost related to fractures, particularly hip fractures. From the studies in a Thai population, osteoporosis may be preventable, as a number of environmental factors are open to intervention by effective pharmacological agents in parallel with appropriate non-medical modality. At present, ~80-90% of individuals at high risk are not identified or treated. From both clinical and economic perspectives, aggressive measures to detect osteoporosis in its early stage are warranted. This reality calls for major steps, including operational research, to identify the mechanisms of risk factors, to remove barriers and to seek for more effective preventive measures.

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ภาระของโรคกระดูกพรุนในประเทศไทย

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เนื่องจากจำนวนประชากรสูงอายุในประเทศไทยเพิ่มขึ้นมากในปัจจุบัน ทำให้ความชุกของโรคกระดูกพรุนมีแนวโน้มสูงขึ้นอย่างรวดเร็ว โรคกระดูกพรุนเป็นสาเหตุสำคัญของการเกิดกระดูกหัก ซึ่งส่งผลต่ออัตราการเสียชีวิต ความเจ็บป่วย คุณภาพชีวิต รวมทั้งทำให้เกิดการสูญเสียทางเศรษฐกิจของประเทศ จากการศึกษาพบว่าความชุกของโรคกระดูกพรุนในสตรีเท่ากับร้อยละ 19.8-24.7 ที่กระดูกสันหลังส่วนเอวและร้อยละ 13.6-19.3 ที่กระดูกคอสะโพก ในขณะที่บุรุษพบความชุกของโรคกระดูกพรุนเท่ากับร้อยละ 4.6 และ 12.6 ที่กระดูกสันหลังส่วนเอวและกระดูกคอสะโพก ตามลำดับ จากการสำรวจในปี พ.ศ. 2537 พบว่าอุบัติการณ์ของกระดูกสะโพกหักคิดเป็น 7.45 ต่อประชากร 100,000 ราย และมีจำนวนเพิ่มขึ้นในปี พ.ศ. 2544 โดยพบอุบัติการณ์ของกระดูกสะโพกหักในบุรุษและสตรีเท่ากับ 114 และ 289 ต่อประชากร 100,000 ราย ตามลำดับ อัตราการเสียชีวิตหลังเกิดกระดูกสะโพกหักใน 3, 6, 12 และ 60 เดือนเท่ากับร้อยละ 9,12,17 และ 29 ตามลำดับ รวมทั้งส่งผลกระทบต่อคุณภาพชีวิตของผู้ป่วยเป็นอย่างมาก โดยพบถึง 1 ใน 5 ของผู้ป่วยกระดูกสะโพกหักจะไม่สามารถเดินได้ สำหรับค่ารักษาผู้ป่วยกระดูกสะโพกหักในประเทศไทยพบว่าเท่ากับ 116,459 บาทใน 1 ปี โดยเป็นค่าใช้จ่ายตรงเท่ากับ 59,881 บาทต่อผู้ป่วย 1 ราย

ในปัจจุบันสถานการณ์ของประเทศไทยในการดูแลรักษาโรคกระดูกพรุนยังมีข้อจำกัดหลายประการ ทั้งด้านการวินิจฉัยโรค เนื่องจากเครื่องตรวจวัดความหนาแน่นของกระดูกยังมีไม่แพร่หลาย และด้านการรักษา ซึ่งพบว่าผู้ป่วยส่วนใหญ่ยังได้รับการรักษาไม่เพียงพอ ดังนั้นจึงมีความจำเป็นอย่างยิ่งที่บุคลากรทางการแพทย์จะต้องตระหนักถึงความสำคัญของโรคกระดูกพรุน ผลเสียจากการเกิดกระดูกหัก เพื่อลดภาระที่จะเกิดต่อผู้ป่วย ญาติผู้ดูแล และเศรษฐกิจของประเทศ