Mini Review

Review of the Risk Factor of Osteoporosis in the Malaysian Population

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ABSTRACT
Osteoporosis is a threat to our population especially to the elderly and postmenopausal women. The number of osteoporosis cases was reported to be increasing year by year worldwide, including Malaysia. There are several risk factors of osteoporosis, which can be divided into modifiable and non-modifiable risk factor. These factors include low body mass index, sedentary lifestyle, smoking, alcohol consumption, low calcium and vitamin D intake, old age, race and ethnicity, gender and genetic/family history. This mini-review highlighted the risk factors of osteoporosis in the Malaysian population.

Keywords: Osteoporosis; Risk factor; Malaysian population

1. Introduction

Osteoporosis is defined as low bone mass with microarchitectural deteriorations, leading to increased risk of fracture (WHO). It is a silent disease which poses a major threat to elderly population by causing disability, morbidity and morbidity. The incidence of osteoporosis is on the increase every year worldwide. It was estimated that around 25 to 28 million Americans were affected by osteoporosis [1]. Caucasian and Asians can be classified as those who are at high risk of getting osteoporosis [2]. In the Malaysian context, the Chinese community is at the highest risk of getting osteoporosis, followed by the Malays and Indians.

The main age group affected is those more than 50 years old, especially female who are already menopause. There are many risk factors of osteoporosis, which include age, gender, race, Body Mass Index (BMI), genetics, diet, lifestyle and family history. All of these risk factors must be taken seriously by the Malaysian population for the prevention of osteoporosis [3].

The majority of people do not really understand or have any knowledge about osteoporosis. Most of the osteoporotic sufferers were unaware of the risk factors of the disease and were not diagnosed early for osteoporosis. Therefore, they failed to get an early treatment and were not really concern about the complications of osteoporosis. A study has shown that, osteoporotic patients who did not get an early treatment were at greater risk of getting fractures [4]. This paper aimed to give a brief review on the risk factors of osteoporosis for the Malaysian population by referring to published studies on osteoporosis.
2. Risk Factor of Osteoporosis

The risk factors of osteoporosis are divided into modifiable and non-modifiable risk factor.

Modifiable Risk Factor:

i) Low BMI

Low BMI or low body weight is associated with osteoporosis as it was found to be associated with low bone mass. Low BMI, especially if less than 19, was associated with low bone mass with an increased risk of osteoporosis [5]. BMI values were closely related with BMD scores and serum 25-hydroxy vitamin D levels in the trabecular and cortical bone [6]. Based on previous studies, it was reported that low BMI is one of the risk factor for osteoporosis and low body weight is one of the many factors that may influence the incidence of osteoporotic fracture [7, 8]. Asian population was found to have lower BMI and shorter height when compared to the western population. Therefore, Asian population which includes Malaysian, are at higher risk of getting osteoporosis. In order to lower the risks of osteoporosis, Malaysian would have to be more concerned about ideal range of BMI [9].

Table 1 showed the recommended BMI cut-off points for body weight classification and public health action for Malaysia [10].

<table>
<thead>
<tr>
<th>Body Weight Classification</th>
<th>BMI cut-off points for definition (kg/m²)</th>
<th>BMI cut-off points for public health action (kg/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>&lt; 18.5</td>
<td>&lt; 18.5</td>
</tr>
<tr>
<td>Normal range</td>
<td>18.5 to 24.9</td>
<td>18.5 to 22.9</td>
</tr>
<tr>
<td>Overweight</td>
<td>≥ 25.0</td>
<td>23.0 to 27.4</td>
</tr>
<tr>
<td>Pre-obese</td>
<td>25.0 to 29.9</td>
<td>27.5 to 32.4</td>
</tr>
<tr>
<td>Obese class 1</td>
<td>30.0 to 34.9</td>
<td>32.5 to 37.4</td>
</tr>
<tr>
<td>Obese class 2</td>
<td>35.0 to 39.9</td>
<td>≥ 35.0</td>
</tr>
<tr>
<td>Obese class 3</td>
<td>≥ 40.0</td>
<td></td>
</tr>
</tbody>
</table>

ii) Sedentary Lifestyle

Practicing healthy lifestyle and doing regular exercise were proven to enhance the quality of life. More than 60% of adults worldwide were not practicing healthy lifestyle [11]. Physical exercise, simple exercise and activities such as weight-bearing and resistance training improved bone strength, encouraged bone growth and preserved bone mass. Regular exercise may also increase bone mineral density (BMD) [12]. Lack of exercise or sedentary lifestyle is a risk factor for osteoporosis. Women who remain sedentary for more than nine hours per days have greater chance of getting hip fracture compared to women who remain sedentary less than six hours a day [13]. Women who exercise regularly had higher bone mineral density compared to sedentary women [14]. Chandrashekar et al., (2012) reported that the physical activity of young adults in Malaysia has not reached a satisfactory level [15]. The majority of Malaysian was not active and did not exercise adequately for healthy lifestyle. Thus, most of them did not meet the recommended physical activity level [16]. Malaysians was recommended to be more active everyday by doing at least 30 minutes of moderate physical activity for at least five days a week. They must avoid sedentary lifestyle to lower the risk of getting osteoporosis [10].

iii) Smoking Behavior

Smoking has been identified to be one of the risk factor for osteoporosis since 20 years ago. Some studies have shown that there is a strong relationship between tobacco use and low bone density [17]. Smoking is also an established risk factor for osteoporotic fracture. Current and former smokers have higher risk of low BMD [18]. Therefore, smoking has been recognized to cause poor bone health [19]. Female smokers lost around 5 to 10 % of bone tissue more than female non-smokers when they reach menopause [20]. Tawima et al. (2011) have conducted a study on the smoking behavior of Malaysian adolescent and reported that around 5% of adolescent in Malaysia were current smokers and around 8.1 % of Malaysian adolescent were beginning to smoke [21]. It was estimated that around 46.4% of Malaysian adult male were smokers, which was among the highest in the region [22]. Global Adult Tobacco Survey (2011) reported that in Malaysia, 43.9% of men, 1.0% of women, and 23.1% overall (4.7 million adults) were smokers [23]. Based on these reports, it could be concluded that the number of smokers in Malaysian was high, especially among men. This unhealthy behavior needs to be controlled as it is one of risk factor for osteoporosis.
iv) Alcohol Consumption

Alcohol consumption is another unhealthy lifestyle which is identified as the modifiable risk factor of osteoporosis. The risk of osteoporosis is dependent on the amount of alcohol consumption, frequency and duration of intake. Chronic alcohol consumption could be destructive to bone development and bone mass maintenance. Alcohol intake was found to reduce peak bone mass and weaken bone until it is prone to fracture [24]. It was reported that women aged around 67 to 90 years who took six drinks per day had greater bone loss compared to women who took minimal amount of alcohol. Alcohol consumption seemed to cause more harm on bone formation rather than promoting bone breakdown [25]. Alcohol intake of more than 207 mL per week was found to be a risk factor for bone loss which could lead to osteoporosis [26]. Based on the survey by World Health Organization (2004), the prevalence of alcohol drinking was estimated to be around 23% of non-Muslim adults in Malaysia. About 32.5% of them were categorized with high alcohol intake. Teenagers in Malaysia, under the age of 18 were reported to start taking alcohol regularly, which accounted for 45% of the Malaysian youth [27]. Since alcohol intake is one of the modifiable risk factor of osteoporosis, it is best to avoid this unhealthy lifestyle.

v) Low Calcium and Vitamin D Intake

Insufficient intake of supplement and nutrition is another modifiable risk factor for osteoporosis. Calcium, vitamin D, phosphorus, magnesium, protein and other nutrients are essential for bone development and prevention of osteoporosis. Therefore, adequate intake of these supplements and nutrients is essential to prevent osteoporosis [28]. Studies have shown that calcium and vitamin D are important nutrients for bone health and its maintenance. Sufficient intake of calcium and Vitamin D is important for healthy bone and prevention of osteoporosis. This was supported by findings that adequate calcium intake was associated with lower risk of osteoporotic fracture [29, 30]. This is especially important for postmenopausal women who are prone to bone loss. High intake of vitamin D was found to lower the risk of hip fracture in postmenopausal women. Similarly, sufficient intake of calcium was proven to reduce the risk of osteoporosis in postmenopausal women [31]. Arfah et al. (2010) conducted a nutrition study among 70 healthy male and female students of a public university in Malaysia and reported that only 1.4% of the subjects met the daily requirement of calcium intake. The authors recommended that consumption of high skim milk is effective in reducing bone loss [32]. It is a fact is that calcium intake into the body is dependent on vitamin D as it is required for normal calcium absorption and metabolism. Maintaining an adequate vitamin D level in a tropical country like Malaysia should not be a problem as exposure to sunlight is a major source of vitamin D [9]. Although vitamin D deficiency is uncommon in Malaysian men, a significant proportion of them are suffering from vitamin D insufficiency [33]. It is recommended for those living in tropical countries such as Malaysian to expose their skin to sunlight for 30 minutes per day. This would provide the daily requirement of vitamin D for the body. There are also foods with high vitamin D content such as butter, cream, egg, yolk and fish liver oils. There are many other sources of calcium in the Malaysian food besides milk and dairy product such as tofu, shrimp paste, tempeh, cincaluk, budu, and others. It is hope that the health authority would take proactive steps in making sure that Malaysians would have sufficient calcium and vitamin D intake to prevent osteoporosis [34].

Non-Modifiable Risk Factor

Although these risks are not modifiable, it is important for Malaysians to be aware of them so that necessary steps and lifestyle changes could be taken to prevent osteoporosis.

i) Age

Age is one of the non-modifiable risk factors of osteoporosis. Elderly are at high risk of getting osteoporosis and osteoporotic fracture. Age was reported to be the main factor that contributes to osteoporosis, especially with the age of 70 years and above [39]. The BMD reduces with age, resulting in thinning of the bone. Low BMD was associated with higher incidence of osteoporotic fracture in elderly more than 50 years old. Around 90% of patients suffering from hip fracture were above 50 years old. The high incidence was believed to be related to deterioration of the bone mineral density with advancing age [13]. Elderly people at these ages also have higher risk of falls, which may lead to osteoporotic fracture [37]. In a study by Manish & Chad (2002), it was reported that osteoporosis is a threat to elderly women and men around the age of 50 years and above [40]. Prevalence of osteoporosis in United States showed that 15% of women around the age 50 to 59 years old and 70% of women at age 80 years old were diagnosed with osteoporosis. It is estimated that around 900 million men and women above 65 years of age in Asia, will suffer from osteoporosis by the year 2050 [41]. Based on the study by Joon and Amir (2007), the mean age of Malaysia population with hip fracture in 1997 was 74.5 years. In terms of gender, the mean age of getting a hip fracture for female and male was 75.5 and 72.3 years old, respectively [42]. It is very important to make sure that our elderly population are screened for osteoporosis and necessary actions taken if they are diagnosed with osteoporosis.

ii) Race and Ethnicity

Demographic factors such as race and ethnicity are the non-modifiable risk factors of osteoporosis. It is reported that Asian and Caucasian women are at higher risk of getting osteoporosis compared to African and Hispanic women [43]. The prevalence of osteoporosis or low bone mass in United States differed according to race, age and ethnicity. The prevalence of male osteoporosis in Mexican American was 6%, non-Hispanic white 4% and
other races was 9%. Meanwhile, the prevalence of osteoporosis among women of Mexican American was the highest, at 24%, followed by other races at 19%, non-Hispanic white at 15% and non-Hispanic black at 9% [44].

Malaysia is a multiracial country which consisted of Malay, Chinese, Indian and others ethnic groups. Malay is the major race followed by Chinese, Indians and others. There are differences in the incidence of hip fracture between the different races [45]. In Malaysia, the Chinese has the highest incidence of osteoporosis, followed by the Malay and Indians. The total hip fracture cases reported in 1996 were 1353 cases in Chinese, 424 cases in Malay, 294 cases in Indians and 95 cases in other races. Meanwhile, in 1997, the hip fracture cases for Chinese, Malay, Indians and other races were reported to be 1442, 478, 280 and 94 cases, respectively [42].

iii) Gender

Gender can be categorized as one of the non-modifiable risk factor for osteoporosis. Based on the gender factor, women are at higher risk of osteoporosis compared to men. Based on a study by Dontas & Yiannakopoulus (2007), women have lower peak bone mass compared to men. There is an increasing trend of bone loss in women after menopause. The mortality rate for women is lower than men, which mean that they live longer. Elderly women have high risk of falls which may lead to osteoporotic fracture. Due to these reasons, women have high risk of getting osteoporotic fracture compared to men [46]. About 40% of white women and 13% of white man above 50 year of age in the United State were at risk of fragility fracture [47]. The life expectancy for Malaysian women is also higher than men. The percentage of female population in Malaysia over 70 years recorded in 1990 was 54.2% and estimated to increase up to 56.7% by 2020 [48]. According to the annual report of National Orthopaedic Registry of Malaysia (NORM), in 2009, out of the 510 hip fracture cases recorded, 345 patients were female [49].

iv) Genetic / Family History

Osteoporosis can be categorized as a genetic disease. Therefore, genetic make-up can be one of the non-modifiable risk factors for osteoporosis and osteoporotic fracture. This is because BMD is highly correlated with heredity [50]. Genetic factors accounted for 50% of the variance in BMD across the populations [51]. Based on the study on factors influencing BMD in postmenopausal Malaysian women, it was showed that women with family history of osteoporosis are at higher risk of developing osteoporosis compared to women without family history of osteoporosis [52].

3. Conclusion

The risk factors of osteoporosis need to be given attention and publicised to gain public awareness and increase their knowledge on osteoporosis. It may be possible to reduce the incidence of osteoporosis by controlling risk factors, especially the modifiable risk factors.

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