Fracture risk prediction in post-menopausal women with osteopenia and osteoporosis: preliminary findings

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Abstract
Objective: The study aims to identify the risk of obtaining a fracture among post-menopausal women with osteopenia and osteoporosis.

Method: This work was a cross-sectional study involving a purposive sample of 87 post-menopausal women who attended the orthopedic and menopause clinics of Hospital Tengku Ampuan Afzan, Kuantan. The data were entered into the WHO fracture risk assessment tool (FRAX®) to predict major fracture and risk for hip fracture in 10 years’ time.

Results: The mean age of the respondents was 61.6 years (SD = 7.9). Among the respondents, 50.6% had osteopenia and nearly half (48.3%) had osteoporosis. The mean number of menopausal years of the respondents was 11.9 (SD = 8.5), ranging between 1 and 44 years. The FRAX findings indicated 9.7% major osteoporotic fracture probability and 3.5% hip fracture probability, which were denoted as high risk. A Pearson correlation coefficient was computed to assess the relationship between menopausal years and the FRAX major osteoporotic fracture probability. A significant positive correlation was found between the two, but the correlation was weak (r = 0.581, n = 87, p < 0.001).

Conclusions: The present findings indicate that menopausal years have a positive correlation with the risk of obtaining a fracture.

Introduction
Osteopenia and osteoporosis are conditions of metabolic bone disorders. According to the World Health Organization (WHO), osteoporosis in post-menopausal women is defined as bone mineral density (BMD) T scores ≤ –2.5 of the young adult mean, and osteopenia, or low bone density, is defined as BMD T score between –1.0 SD and –2.5 SD. These conditions are known as primary osteoporosis as they occur among the elderly and post-menopausal women. The risk of osteoporosis and osteopenia increases as people age. Recent findings have shown that progressive fracture risk is correlated with advancing age. This silent disease is alarming for post-menopausal women because no specific sign or symptom is evident before the occurrence of fracture. Frailty fracture is a nightmare to all post-menopausal women because it leads to serious complications and even death.
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Method

This study applied a cross-sectional method involving 87 respondents from the orthopedic and menopause clinics of Hospital Tengku Ampuan Afzan Kuantan, Pahang, Malaysia, between April 2016 and October 2016. A purposive sample of the respondents’ age of 50 and above and post-menopausal women was utilized. The criteria in selecting respondents were based on the BMD result of the osteopenic range (T-score of less than −1 and greater than −2.5 SD). Data collection was performed after obtaining approval from the Research Ethics Committee of the International Islamic University and National Medical Research Registry. The respondents were evaluated using a questionnaire on various independent risk factors for osteoporosis, including parental hip fractures, previous fractures, current cigarette smoking habit, glucocorticoid usage, alcohol consumption, rheumatoid arthritis, caffeinated drinks, and years of menopause. Physical examinations included weight and height measurement using the BC541 Innerscan Body Composition Scale Tanita and the Body Scale M-400 (Table 1).

The WHO fracture risk assessment tool (FRAX®) was used to calculate the risk for major and hip fracture probability in 10 years’ time. The selection of an appropriate country for the FRAX tool was conducted because no FRAX tool was available for the Malaysian population. In the absence of a FRAX® model for a specific country, a surrogate country is chosen based on the likelihood that it is a representative of the index country in terms of life expectancy and fracture incidence. Therefore, the calculation for Singapore was chosen because the population comprised of three major races (Malay, Indian, and Chinese) similar to the ethnic distribution in Malaysia. FRAX® is a computer-based algorithm developed by the WHO Collaborating Center for Metabolic Bone Diseases and was first released in 2008.

Descriptive data were generated for all the variables. The Pearson correlation test was conducted to determine the relationship between the independent variables and the FRAX 10-year probability of fracture. Correlation was considered significant at a p value < 0.05. Data management and analysis were performed using SPSS version 20.0 (2011).

Results

Out of the 87 post-menopausal women recruited, 50.6% were osteopenic and nearly half (48.3%) had osteoporosis (Figure 1). The mean age of the respondents was 61.6 years.
old (SD = 7.9). Among the respondents, 34 were Malay and 46 were Chinese. The mean year of menopause of the respondents was 11.9 (SD=8.5), ranging from 1 to 44 years. The FRAX findings indicated a 9.7% major osteoporotic fracture probability and a 3.5% hip fracture probability, which were denoted as high risk (Table 2).

Table 3 presents the fracture risk factors of the respondents. More than 80% of the respondents had none of the risk factors, thus indicating that they were not at risk for fracture. Majority (80.5%) of the respondents had no previous fractures. A positive family history (having parents with hip fracture) was observed in 16.1% of the respondents.

The Pearson correlation coefficient showed a significant positive but weak correlation between year of menopause and FRAX major osteoporotic and hip fracture probability (r = 0.581, p < 0.001) and (r = 0.495, p < 0.001), as shown in Figures 2 and 3.

Discussion

Previous studies reported a higher risk of fractures among women than men, with post-menopausal women living a sedentary lifestyle being the most affected\textsuperscript{11,13}. The present study found a 9.7% major osteoporotic fracture probability and a 3.5% hip fracture probability, which both indicate a high risk for hip fracture based on the age intervention threshold for Malaysia adopted by the Malaysian Osteoporosis Society (MOS)\textsuperscript{14}, as revealed by the FRAX findings. MOS utilized a threshold probability of 20% for major osteoporotic fracture and 3% for hip fracture probability. The risk score of 3.5% for hip fracture among post-menopausal women in this study indicates that this population is at a high risk of obtaining a hip fracture in 10 years’ time. There is increasing concern that a considerable number of research findings have revealed an exponential increment of hip fracture incidences\textsuperscript{7,15}. This study highlighted the importance of fracture risk assessment among post-menopausal women for the early detection of fracture risk and thus the prevention of fragility fracture.

The correlation between years of menopause and the probability of major osteoporotic and hip fractures is among the remarkable findings of the present study. The pathogenesis of osteoporosis in women involves augmented bone resorption by osteoclasts in relation to changes in the estrogen levels at menopause. The increase in bone resorption appears to be
the most important stimulus for bone loss in the situation of acute estrogen deficiency that occurs in menopausal women. Osteoblasts, osteocytes, and osteoclasts express functional estrogen receptors. Deficiency in estrogen increases bone resorption and impairs bone formation, thus leading to bone loss. This information is essential in understanding why the risk of osteoporosis and fragility fracture exponentially increases with years of menopause. Therefore, the present study strongly recommends the use of a fracture risk assessment to identify the common factors related to fracture risks with or without bone density results among post-menopausal women as early preventive measures. The early detection of the risk factors will provide the post-menopausal population the knowledge required to prevent fragility fractures.

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References

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