Assessment of Osteoporosis Knowledge Among Warfarin Users and Healthy People in the State of Penang

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ABSTRACT

BACKGROUND: Knowledge of osteoporosis plays an important role in developing attitudes toward the disease which in turn affects health care behaviors of both public and patients.

OBJECTIVE: Despite the increasing incidence of osteoporosis in Malaysia, many people still have limited information about the risks of this disease. This information includes knowledge of physical activity, adequate calcium intake, and adequate vitamin D intake. This study aims to assess the osteoporosis knowledge using osteoporosis knowledge test and to find the associated factors influencing osteoporosis knowledge of the users and nonusers of warfarin.

METHODS: A case-control study was used to assess the osteoporosis knowledge from the study sample. A self-administered questionnaire was used for data collection.

RESULTS: A total of 140 controls and 130 patients using warfarin were included in this study. This study indicated that most of the participants (84.2%) have a low score of knowledge of osteoporosis, and only 15.8% of the study sample was found to have a high score of knowledge. Patients using warfarin were more knowledgeable about osteoporosis compared with controls.

CONCLUSIONS: The findings of this study revealed that most people have inadequate knowledge about osteoporosis. The health care professionals should play an active role in educating their patients and community about the risk factors of osteoporosis.

KEYWORDS: Knowledge, osteoporosis, warfarin

Introduction

The ways that people take to manage their health are influenced by their knowledge and attitude toward osteoporosis. Knowledge is the basics of understanding and reacting toward health issues. In terms of disease prevention, knowledge of osteoporosis is integral to patients in preventing and reducing risk of fractures. The knowledge involved those with suitable physical activities, sufficient dietary requirement of calcium and vitamin D, fall prevention, and osteoporosis test.[1] The prevalence of osteoporosis-related fractures has increased in many countries around the world, and this trend is expected to continue as the population ages.[2] A study in Malaysia reported that the incidence of hip fracture in Malaysia among people aged 50 years and older was 90 per 100 000. There was a marked increase in the incidence among the older age group and women. In addition, Chinese people had the highest incidence of hip fractures compared with Malays and Indians.[3] Patients' knowledge and osteoporosis preventive behavior could be increased with the help of health care professionals[4] and screening programs.[5] Some behaviors associated with the lifestyle indeed influenced the level of osteoporosis knowledge.[6]

Lack of awareness is the main reason for high prevalence of low bone mass.[7] However, few studies have focused on patients with chronic diseases or use of such medicines that may lead to risk of secondary osteoporosis.[8] It is important to explore patients' knowledge of osteoporosis by identifying the source of information. However, numerous measures have been taken to improve bone health and osteoporosis management through published Malaysian guideline.[9] Therefore, education is necessary to increase the level of knowledge of patients to improve their bone health. This study aimed to assess the osteoporosis knowledge in users and nonusers of warfarin and to find the associated factors that affect the total score of osteoporosis knowledge.

Methods

Study design

A case-control study was conducted on the users and nonusers of warfarin to assess their osteoporosis knowledge. This study design will be helpful to find the incidence of osteoporosis

between patients and healthy people. This study was approved by the Clinical Research Centre of Hospital Pulau Pinang (HPP), and ethical approval was granted from the National Institutes of Health, Ministry of Health Malaysia NMRR-13-1281-18077 (Investigator-Initiated Research). This study was conducted from November 2013 to August 2014. This study included participants who are more than 18 years old for both groups. All respondents must be able to read and write in Bahasa Malaysia to answer the questionnaire. For both men and women, the exclusion criteria were as follows: prolonged immobility, chronic disease, nursing or pregnant women, patients with a history of osteoporosis and/or use of medications for osteoporosis, and participants unlike to share this study.

Study sampling and sample size

A convenience sampling method was used to recruit the required sample for this study. This study included participants who are more than 18 years old of both sexes. All respondents must be able to read and write in Malay language to answer the questionnaire. The sample size was calculated based on the sample size of unmatched case-control studies.[10] According to the previous studies, the prevalence of osteoporosis in warfarin users was 13.9% and 9.2% for nonusers.[11] Furthermore, the estimation of hip fracture in Iran in 2003 was 16% for women and 6% for men,[12] which is similar to that in Malaysia in 2005 which was 24%.[13] The level of statistical significance (α) and power of the study ($1 - \beta$) used were 0.05 and 0.8, respectively. The sample size was calculated according to unmatched case-control sample size calculator which indicated that the required sample size is 128 in each group. In addition, 20% was added to the study sample in case of missing or incomplete data. In total, the sample size was 151 in each group.

Osteoporosis knowledge test

The original osteoporosis knowledge test (OKT) is a 24-item tool with multiple choice questions assessing general knowledge of osteoporosis. The instrument has 3 subscales: OKT risk of osteoporosis scale (items 1-9), OKT exercise scale (items 10-16), and OKT calcium scale (items 17-24). The OKT has a possible score of 0 to 24. A higher score represents a higher level of knowledge. The OKT will take approximately 10 minutes to complete.

The tool has been used successfully in studies with many populations and has been translated into several languages. It was designed to determine the knowledge of osteoporosis risk factors and the way to prevent the disease according to exercise and calcium intake. Therefore, the instrument has 2 subscales: OKT exercise and OKT calcium. The total possible score of the OKT ranges from 0 to 24. Higher scores indicate a better knowledge level of osteoporosis.[14] This study was conducted using the OKT. After obtaining permission for using the OKT questionnaire from the original author, forward translation to

the Malay language was done by language experts in the School of Languages, Literacies and Translation, Universiti Sains Malaysia. The questionnaire comprised 2 sections. The first section was used to obtain the sociodemographic information of the participants, including sex, age, employment, family history of fracture, education level, and financial status. The second section was used to assess osteoporosis knowledge. A pilot study was conducted among 30 subjects from controls and patients at the community and outpatient clinic of HPP in Penang State. An acceptable reliability value of this questionnaire was obtained after statistical analysis (Cronbach α = 0.705).

Data collection method

A self-administered questionnaire was used for data collection after screening the bone mineral density (BMD) of the participants using quantitative ultrasound (QUS). The calcaneus was the first site to be investigated with QUS.[15] The speed of sound (SOS), in meters per second, and broadband ultrasound attenuation (BUA), in decibels per megahertz, were used as a measure of frequency-dependent attenuation of the ultrasound wave passing through the heel[16]—methods used to detect the status of the osteoporosis condition.[17] For the patient group, users of warfarin for more than 1 year were invited from the outpatient clinic in HPP. In addition, the control group included healthy adult volunteers (nonwarfarin user) from the community in the State of Penang. All participants provided written consent prior to participation, and all the personal information collected was considered confidential in this study. A total of 270 questionnaires were successfully completed and returned to the researcher on the spot. The time taken to fill the questionnaire was approximately 10 minutes.

Data analysis

The data were analyzed by SPSS.[18] The results were expressed using descriptive and inferential statistics with 95% confidence level and P value of less than .05 which was considered significant. For the purpose of the analysis, both groups were combined to find the factors that affect the osteoporosis knowledge in the study sample. However, the Kruskal-Wallis test was used to find the differences between race, education levels, and monthly income, whereas the Mann-Whitney test was used to find the differences between 2 groups, such as sex, age group, family history of osteoporosis, family history of fracture, smoking status, alcohol habit, employment status, living place, and use of warfarin. A cutoff point of 14 was used to categorize the osteoporosis knowledge scores into low and high levels. The best cutoff was chosen according to the agreement between the total OKT-M score and the QUS parameter.[19] For the incidence of osteoporosis, the T score was measured to identify BMD. This measurement was based on World Health Organization criteria, which had been standardized by the manufacturer for the Asian population. In addition, the

osteoporotic condition was stratified into 2 groups: low risk of abnormal BMD (*T* score >−1) and high risk of abnormal BMD (*T* score ≤−1).[17]

Results

Sociodemographic information of the respondents

A total of 270 participants were recruited, of which 130 were patients (68 women and 62 men) with a mean age (±SD) of 65.06 ± 11.37 years who were long-term warfarin users (Table 1) and 140 were controls (nonwarfarin users) (81 women and 59 men) with a mean age (±SD) of 46.56 ± 14.55 years.

Osteoporosis incidence

The incidence of osteoporosis risk was determined based on the *T*-score value of QUS which indicated that 82% of warfarin users were at high risk of osteoporosis. In addition, most of the control group participants (71%) were at high risk of osteoporosis (Figure 1).

Knowledge of osteoporosis

Most of the respondents have incorrectly answered the questions relating to risk factors of osteoporosis, such as the impact of ovary surgically removed (89.3%), taking cortisone (85.2%), having a mother or grandmother diagnosed of osteoporosis (78.1%), being menopausal (73.7%), and having big bone (61.5%) (Table 2). In addition, most of the respondents did not know that hard exercise makes bone strong (74.8%), the required time for exercise (66.7%), the best type of exercise that reduces the chance of getting osteoporosis (63%), and the frequency of such exercise a week (60%). However, most of the respondents knew the foods that have a good source of calcium, such as cheese (78.1%), broccoli (63.7%), and yogurt (55.6%), whereas most of them (76.3%) did not know the recommended daily amount of calcium intake for adults.

According to Table 3, the average mean of total score was low (10.46 ± 2.918). The distribution of 2 levels of osteoporosis knowledge indicated that most of the respondents (84.2%) had a low level of knowledge and only 15.8% had a high level of knowledge.

According to the level of osteoporosis knowledge in both groups, Figure 2 shows that most of the patients (76%) and 92% of the control group have a low score of osteoporosis knowledge.

It can be seen from Table 4 that the total score of osteoporosis knowledge was significantly affected by the sociodemographic data of the respondents. Indian respondents have lower score of knowledge compared with Malay and Chinese respondents (*P* = .001). However, respondents with high education level and high monthly income were more knowledgeable compared with respondents with low education level and low monthly income (*P* < .05). In addition, family history of osteoporosis and fracture, nonalcoholic drink, employed people, living in urban places, and warfarin users were significantly associated with high score of knowledge about osteoporosis and bone health.

Discussion

This study showed that the incidence of osteoporosis in Malaysia was high in users and nonusers of warfarin compared with Western countries. This might be due to the fact that Asian people have lower body mass index, and lack of good bone health management.[20]

This study showed that many people have inadequate knowledge related to risk factors of osteoporosis, physical activity, and calcium intake. In Asia, lower calcium intake has been reported as one of the risk factors for developing osteoporosis.[21] Malaysian studies reported a lower consumption of calcium intake of less than 500 mg/day.[22] Most people had low osteoporosis knowledge and lower calcium intake because they were unaware of the value of calcium intake. Previous community-based studies using OKT or other tests of knowledge indicated that many people still have limited osteoporosis knowledge.[6,23-25] Improving people's behavior toward healthy lifestyle is required in both sexes to increase their knowledge about bone health and prevent the incidence of osteoporosis.[26] However, osteoporosis knowledge in this study appears to be affected by socioeconomic factors, such as race, education, monthly income, family history of osteoporosis and fracture, alcohol habit, employment status, living place, and use of warfarin, which were significant factors in determining the level of the OKT exercise and calcium subscales. According to race, Indian people have lower knowledge compared with Chinese and Malays, whereas other studies demonstrated that ethnicity factor had no effect on the OKT level.[19] This might be because most Indians came from low socioeconomic families that are less likely to obtain health care information and have less access to health care services. Furthermore, the knowledge of osteoporosis was associated with people with high education level and high monthly income. Similar results showed that a higher educational level may be related to a higher income, and therefore, choosing better sources of calcium intake, such as milk and dairy products, leads to a healthier diet.[27] Previous research indicated that there was a positive correlation between knowledge of osteoporosis and higher education levels.[28] However, having a family history of osteoporosis and fracture increases knowledge about osteoporosis. This may increase the degree of knowledge about osteoporosis toward significant views by changing their lifestyle and behavior because they believed that osteoporosis has a serious impact on their personal and social life.[19] In addition, employed people, nonalcoholic people, and people living in urban places are associated with good knowledge about osteoporosis. This might be due to the high chance of getting health educational programs which talk about osteoporosis as a chronic disease and the ways to prevent it.[29] This study demonstrated that osteoporosis knowledge increased with chronic use of warfarin. The positive view

Table 1. Sociodemographic characteristics of the study sample (N = 270).

CHARACTERISTICS	NONWARFARIN USERS, NO. (%)	WARFARIN USERS, NO. %	TOTAL, %
Sex			
Male	59 (42.1)	59 (42.1)	44.8
Female	81 (57.9)	81 (57.9)	55.2
Race			
Malay	52 (37.1)	52 (37.1)	39.3
Chinese	34 (27.9)	34 (27.9)	31.1
Indian	49 (35.0)	49 (35.0)	29.6
Age group, y			
≥50	77 (55)	77 (55)	33.0
<50	63 (45)	63 (45)	67.0
Education level			
Low	39 (27.9)	72 (55.4)	41.1
Medium	60 (42.8)	44 (33.8)	38.5
High	41 (29.3)	14 (10.8)	20.4
Monthly income			
Low	35 (25.0)	67 (51.5)	37.8
Medium	63 (45.0)	47 (36.2)	40.7
High	42 (30.0)	16 (12.3)	21.5
Family history			
No	125 (89.3)	125 (89.3)	83.3
Osteoporosis			
Yes	15 (10.7)	15 (10.7)	16.7
Family history of fracture			
No	121 (86.4)	121 (86.4)	78.9
Yes	19 (13.6)	19 (13.6)	21.1
Smoking			
No	47 (83.6)	47 (83.6)	87.8
Yes	23 (16.4)	23 (16.4)	12.2
Employment status			
No	61 (43.6)	61 (43.6)	94.4
Yes	79 (56.4)	79 (56.4)	5.6
Risk of osteoporosis			
Low risk	40 (28.6)	40 (28.6)	47.8
High risk	100 (71.4)	100 (71.4)	51.2
Living place			
Urban	120 (85.7)	120 (85.7)	92.2
Rural	20 (8.6)	20 (8.6)	7.8

Patients

Low risk High risk

Controls

Low risk High risk
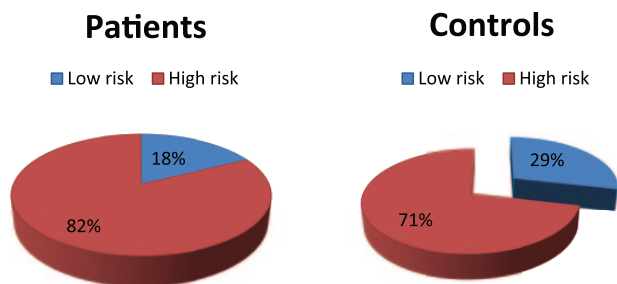
Figure 1. Incidence of osteoporosis in patient and control groups.

toward patients who used warfarin and their knowledge was high due to advices that can be taken from health care professionals, especially the pharmacists when they visited the hospital for taking warfarin and checking their international normalized ratio.[30] It is worth mentioning that the low score of knowledge does not mean a lack of intelligence in any of the patient and control groups. In addition, due to the lack of any published data in Malaysia or any data from warfarin clinical setting worldwide, no direct comparison was made between the results of this study and other studies.

Table 2. Respondents' knowledge about osteoporosis in patient and control groups (N = 270).

QUESTIONS	LIKELIHOOD OF GETTING OSTEOPOROSIS	INCORRECT	CORRECT
1. Eating a diet low in milk products	More likely,[a] Less likely, Neutral, Don't know	75 (27.8%)	195 (72.2%)
2. Being menopausal; "change of life"	More likely,[a] Less likely, Neutral, Don't know	199 (73.7%)	71 (26.3%)
3. Having big bones	More likely, Less likely,[a] Neutral, Don't know	166 (61.5%)	104 (38.5%)
4. Eating a diet high in dark green leafy vegetables	More likely, Less likely, Neutral, Don't know	95 (35.2%)	175 (64.8%)
5. Having a mother or grandmother who has osteoporosis	More likely,[a] Less likely, Neutral, Don't know	211 (78.1%)	59 (21.9%)
6. Being a women of Asian origin	More likely,[a] Less likely, Neutral, Don't know	148 (54.8%)	122 (45.2%)
7. Having ovaries surgically removed	More likely,[a] Less likely, Neutral, Don't know	241 (89.3%)	29 (10.7%)
8. Taking cortisone (steroids, eg, prednisone) for long time	More likely,[a] Less likely, Neutral, Don't know	230 (85.2%)	40 (14.8%)
9. Exercising on a regular basis	More likely, Less likely,[a] Neutral, Don't know	144 (53.3%)	126 (46.7%)
10. Which of the following exercise is the best way to reduce a person's chance of getting osteoporosis?	Swimming, Walking briskly,[a] Doing kitchen chores, Don't know	123 (40.9%)	147 (54.4%)
11. Which of the following exercise is the best way to reduce a person's chance of getting osteoporosis?	Bicycling,[a] Yoga, House cleaning, Don't know	109 (40.0%)	161 (59.6%)
12. How many days a week do you think a person should exercise to strengthen the bones?	1 day a week, 2 days a week, 3 or more days a week,[a] Don't know	168 (60.0%)	108 (40.0%)
13. What is the least amount of time a person should exercise on each occasion to strengthen the bones?	Less than 15 minutes, 20 to 30 minutes,[a] More than 45 minutes, Don't know	180 (66.7%)	90 (33.3%)
14. Exercise makes bones strong, but it must be hard enough to make breathing.	Just a little faster, So fast that talking is not possible, Much faster, but talking is possible,[a] Don't know	202 (74.8%)	68 (25.2%)
15. Which of the following exercise is the best way to reduce a person's chance of getting osteoporosis?	Jogging or running for exercise,[a] Golfing using golf cart, Gardening, Don't know	142 (52.6%)	128 (47.4%)
16. Which of the following exercise is the best way to reduce a person's chance of getting osteoporosis?	Bowling, Doing laundry, Aerobic dancing,[a] Don't know	170 (63.0%)	100 (37.0%)
17. Which of these is a good source of calcium?	Apple, Cheese,[a] Cucumber, Don't know	59 (21.9%)	211 (78.1%)
18. Which of these is a good source of calcium?	Watermelon, Corn, Canned sardines,[a] Don't know	141 (52.2%)	129 (47.8%)
19. Which of these is a good source of calcium?	Chicken, Broccoli,[a] Grapes, Don't know	98 (36.3%)	172 (63.7%)
20. Which of these is a good source of calcium?	Yogurt,[a] Strawberries, Cabbage, Don't know	120 (44.4%)	150 (55.6%)
21. Which of these is a good source of calcium?	Ice cream,[a] Grape fruit, Radishes, Don't know	151 (55.9%)	119 (44.1%)
22. Which of the following is the recommended amount of calcium intake for an adult?	100-300 mg daily, 400-600 mg daily, 800 mg or more daily,[a] Don't know	206 (76.3%)	64 (23.7%)
23. How much milk should an adult drink to meet the daily recommendation?	1/2 glass daily, 1 glass daily, 2 or more glasses daily,[a] Don't know	140 (51.9%)	130 (48.1%)
24. Which of the following is the best reason for taking a calcium supplement?	If a person skips breakfast, If a person does not get enough calcium from diet,[a] If a person is over 45 years old, Don't know	144 (53.3%)	126 (46.7%)

[a]Correct answer.

Table 3. Distribution of 2 levels of osteoporosis knowledge (N = 270).

	MEAN ± SD	NO. (%)	RANGE
Low OKT level (<14)	9.63 ± 2.294	229 (84.2)	1–13
High OKT level (≥14)	15.10 ± 1.136	41 (15.8)	14–18

Abbreviation: OKT, osteoporosis knowledge test.
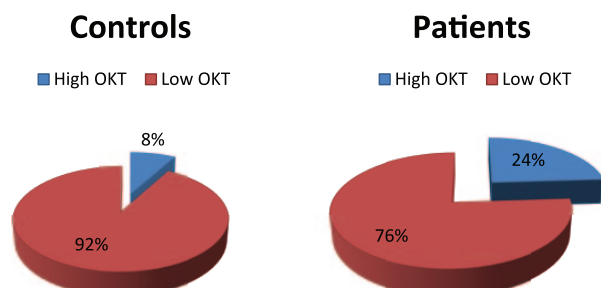
Figure 2. Level of osteoporosis knowledge in patient and control groups.

Study Limitations
This study only targeted outpatient warfarin users in HPP. It does not represent all Malaysian patients. The convenient sampling and the case-control study further limit the generalization of the finding to the entire Malaysian population. However, unequal number of ethnicity, age, and gender groups may have an impact on the results when compared with a randomized control study or a longitudinal study. The tools used to determine osteoporosis knowledge of participants might tend to report what they believe the researcher expects to see or they wish to present themselves in a socially acceptable manner. Many variables were unavailable for the study inclusion, such as the information on dietary habits or dietary calcium intake and physical activity. Assessment of these factors might provide a clearer picture about osteoporosis knowledge

Conclusions
This study showed that a low moan of correct answers of osteoporosis knowledge scores among the sample population

Table 4. Factors affecting the total score of osteoporosis knowledge among respondents.

VARIABLE	OKT SCORE MEAN ± SD	MEDIAN	*P* VALUE
Sex			
Male	10.09 ± 3.136	10.00	.07
Female	10.76 ± 2.703	11.00	
Age, y			
≥50	9.97 ± 3.245	10.00	.064
<50	10.70 ± 2.202	11.00	
Race			
Malay	10.90 ± 2.654	11.00	.001**
Chinese	10.89 ± 3.189	11.00	
Indian	9.43 ± 2.72	9.00	
Educated level			
Low	9.80 ± 2.699	10.00	.006**
Medium	10.76 ± 2.899	10.00	
High	11.29 ± 3.281	12.00	
Monthly income			
Low	10.14 ± 2.599	10.00	.007**
Medium	10.18 ± 2.915	10.00	
High	11.55 ± 3.229	12.00	
Family history of osteoporosis			
No	10.24 ± 2.815	10.00	.009*
Yes	11.56 ± 3.202	11.00	

Table 4. (Continued)

VARIABLE	OKT SCORE MEAN ± SD	MEDIAN	*P* VALUE
Family history of fracture			
No	10.14 ± 2.951	10.00	.001*
Yes	11.65 ± 2.475	11.00	
Smoking habit			
No	10.57 ± 2.785	10.00	.098
Yes	9.67 ± 3.697	10.00	
Alcohol habit			
No	10.57 ± 2.806	10.00	.037*
Yes	8.53 ± 4.067	9.00	
Employment status			
No	10.00 ± 2.516	10.00	.009*
Yes	10.87 ± 3.205	11.00	
Living place			
Urban	10.71 ± 2.771	11.00	.001*
Rural	7.43 ± 2.967	8.00	
Use of warfarin			
No	9.33 ± 2.812	9.00	.001*
Yes	11.68 ± 2.522	11.5	

Abbreviation: OKT, osteoporosis knowledge test.
*Mann-Whitney test, *P* < .05; **Kruskal-Wallis test, *P* < .05.

was 43.6%. Moreover, this study demonstrated that 75.6% of 41 participants who had high osteoporosis knowledge were patients with chronic use of warfarin—participants with high monthly income or more knowledgeable compared with others. The clinical finding of this study will provide the fundamental basis for health care professionals to understand the logic and appropriate use of health services in the management of osteoporosis in Penang. With this tool, selecting and screening participants for a densitometry test and educational program are easier by applying the suggested cutoff point. The study outcomes will lead to better patient care, enhance patient quality of life, and avoid possible adverse effects. Therefore, the OKT is considered a very useful tool for scientific researchers. Moreover, it can be used to identify an individual's need for a bone health–promoting intervention regarding lifestyle behavior. This study claims that knowledge about osteoporosis among patients taking warfarin and control group was low. This study helps to increase people's knowledge in the management of osteoporosis, thus improving their behavior in caring for bone health. This includes the improvement of knowledge on suitable physical activities and dietary requirements to prevent osteoporosis by maintaining the recommended daily intake of calcium and vitamin D.

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