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A Cross-Sectional Survey of Relationship between Osteoporosis Knowledge, Perception and Calcium Intake among University Students

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ABSTRACT

Practicing healthy lifestyles and behaviours, such as physical exercise, proper dietary with calcium and vitamin D consumption have been demonstrated to be highly connected with a reduced risk of osteoporosis. Osteoporosis is characterized by poor bone density which might increase risk of fractures. Osteoporosis not only affected the elderly but also young people. This study aimed to determine the relationship between osteoporosis knowledge, perception and calcium intake among university students. A total of 202 students from Universiti Teknologi MARA Shah Alam participated in this cross-sectional survey. A self-administered online questionnaire was used as an instrument which consisted of the demographic, Osteoporosis Knowledge Tools (OKT), Osteoporosis Health Beliefs Scale (OHBS), and calcium intake questions. Results showed 91.6% of participants had a satisfactory level of osteoporosis knowledge, and 73.8% of participants had a moderate perception of osteoporosis. Only 12.9% of participants had enough daily calcium intake. The results also demonstrated that there was no relationship between the total knowledge score and perception of osteoporosis (r =.037, p =0.598), and between the total knowledge score and total calcium intake (r = .117, p = 0.099). While the perception of osteoporosis was correlated positively with calcium intake (r =.193, p =0.006). These present findings may explain that the participants may have a good knowledge and beliefs toward osteoporosis but did not translate into good dietary habits in terms of daily calcium intake as part of healthy lifestyle practices and osteoporosis preventive measures.

Keywords: *Osteoporosis, knowledge, perception, calcium intake*

INTRODUCTION

Osteoporosis is a skeletal illness characterized by poor bone density and microstructural degradation, resulting in bone fragility which increases the risk of fractures from even mild falls or traumas (Khan et al., 2019). Osteoporosis can be referred to as a "silent killer" due to the absence of symptoms associated with bone loss (Leng et al., 2017) and it is frequently found in the hip, spine, and wrist (World Health, 1994) According to Tomishige-Mukai et al. (2016), over 200 million people are thought to be affected by osteoporosis worldwide. Osteoporosis can be prevented but many people think of it as a disease that only affects older people (Chan et al., 2019). Knowledge of bone health and an osteoprotective lifestyle are important for preventing osteoporosis, but their inadequacy has been reported all over the world (Dsilva & Pinto, 2017).

Healthy lifestyles are very important for lowering the risk of bone loss. According to Muñoz-Garach et al., (2020) having enough intake of calcium, vitamin D, and protein in the diet, doing regular weight-bearing exercise, avoiding drinking alcohol, and preventing smoking help improve bone quality. Nowadays, people are learning more about the relationship between calcium, life, and sickness. Therefore, they will gradually understand the value of calcium supplementation and how calcium may help them live healthier and more satisfying lives (Sham, 2013). Changing lifestyle habits and practicing behaviors, such as physical exercise, smoking cessation, sufficient calcium intake, and vitamin D consumption have all been demonstrated to be highly connected with a reduced risk of osteoporosis (Mortada et al., 2020).

The understanding, behaviors, and practices regarding osteoporosis among the younger population in various countries have been proven in numerous studies (Chan et al., 2021). (Chan et.al., 2021) stated that most of the researchers evaluated the participants by using The Osteoporosis Knowledge Assessment Tool (OKAT) which primarily evaluates the participants' knowledge and treatment regarding osteoporosis. The number of research evaluating knowledge, attitudes, and practices about osteoporosis in various nations has steadily increased in recent years (Leng et al., 2017).

The Osteoporosis Health Belief Scale (OHBS) is a frequently used conceptual framework for forecasting health-related behavior. It is mostly used to educate and promote health. This model can serve as a guide for developing promotional programs and assist program designers in understanding health behavior and probable causes for non-compliance with suggested health behaviors (Mortada et al., 2020). Practicing good behavior is important in one's life, research shows individuals are likely to embrace a healthy behavior when they believe that their likelihood of developing a disease is high and see the advantages of adopting a healthy action as outweighing the obstacles to doing so (Edmonds et al., 2012).

Therefore, this study aims to determine the knowledge and perception of osteoporosis and its relationship to calcium intake among university students. The purpose of this present study is to provide a baseline for future improvements in calcium consumption among young adults. The findings from this study may benefit and provide good information to health-related professionals such as nutritionists, dietitians, sports scientists and others to provide ongoing health education to the community. This can help to create positive social changes not only among the university students but also for the whole community by increasing awareness of osteoporosis and reducing the risk of osteoporotic fracture later in life.

METHODOLOGY

Study design and study population

This study was a cross-sectional survey using the correlational research design. The target population was the final-year students of Sports Science and Recreation at Universiti Teknologi Mara, Shah Alam. Participants in this study were enlisted using purposive random sampling which focused on both genders' osteoporosis knowledge score, perceptions score, and calcium consumption. The total number of final-year students in the Faculty of Sports Science and Recreation, UiTM Shah Alam was 375 students. According to the Krejcie and Morgan (1970) table, the total sample size that is required to represent the population was (191) participants.

Instrument and measurement outcome

The instrument used for this study was an online-based questionnaire. The questionnaire consisted of 4 sections: *Section A* was the demographic background of the participants (5 Questions), and *Section B* was Osteoporosis Knowledge (26 Questions) adopted from Chan et al., 2021. There were 26 items of multiple-choice questions. There was only one correct answer for each question. The minimum score is 0 and the maximum score is 26. *Section C* was the perception of osteoporosis (25 Questions) from the Development and Evaluation of Osteoporosis Health Belief Scale (Boyer, 1991; Kim et al., 1991) each of the subscales consisted of a five-item score using 5 points. The scales range from the lowest probability awarded 1 point, to the highest probability awarded 5 points. As a result, each subscale can have a minimum of 6 points and a maximum of 30 points. This implied that the lowest possible score on the osteoporosis health belief scale (OHBS) will be 25 points and the highest possible score will be 125 points. *Section D* was the calcium intake (4 Questions) adopted from Knowledge and Perception of Calcium Intake among Students in University Technology Mara (Sham, et al.,2013). Each of the participants was asked to rate how often they consumed food from each group. Q1-Q3: Each item will be rated by using 1= none per week, 2 = one per week, 3 = two per week, 4 = three per week, 5 = four per week 6 = five per week, 7 = six per week, 8 = seven per week, 9 = two per day, 10 = three per day. Question 4 is rated as 1 for no, and 2 for yes answer for the question regarding the intake of calcium supplements. The total score for each participant was generated by adding responses for all categories. The questionnaire was distributed to the participants through a Google form link via email and the mobile application (i.e.: WhatsApp). The estimated time to answer the questionnaire is approximately 10-15 minutes.

Data analysis

All data were analysed using SPSS version 26. The descriptive analysis was used to determine the mean, standard deviation, frequency and percentage of the demographic data. The Pearson product-moment correlation (r) was employed for the inferential analysis to evaluate the association between osteoporosis knowledge and perception and calcium intake. The statistical significance was assigned at $p < 0.05$.

RESULT

The total number of 202 participants involved in this study. Table 1 shows the demographic data of the participants. The age of participants was between 18 – 28 years old and the mean age was 22 ± 2.18. The majority of students were aged 22 to 24 years old (55.4%), followed by students aged 19 to 21 years old, 25 to 27 years old, 16 to 18 years old, and 28 to 35 years old, accounting for 28.2%, 9.9% and 0.5% respectively. This study involves 48% of male students and 52% of female students.

Table 1. Demographic characteristics

Characteristics	Frequency	Percentage (%)
Age (years)		
16 – 18	14	6.9
19 – 21	57	28.2
22 – 24	110	54.5
25 - 27	20	9.9
28 -35	1	0.5
Gender		
Male	97	48
Female	105	52

Table 2 presents the mean scores for knowledge, perception and calcium intake. The mean score for knowledge of osteoporosis was 73.2±7.7. From the table, 91.6% of participants had a satisfactory level of knowledge regarding osteoporosis and only 8.4 had an unsatisfactory knowledge level concerning osteoporosis. For the perception of osteoporosis, the mean score was 86.3±12.0. Referring to the category of perception, most of the participants (73.8%) have a moderate perception,24.8% have a high perception and only 1.5% of participants have a low perception of osteoporosis. Meanwhile, the mean score for calcium intake was 32.3±14.3. According to the calcium intake category, only 12.9% of participants have an adequate intake of calcium, while the majority of 87.1% have inadequate calcium consumption.

Table 2. Mean ± SD scores for knowledge of osteoporosis, perception of osteoporosis and calcium intake.

Variables			
Knowledge of Osteoporosis	Mean ± SD	73.2±7.7	
	Category	(n)	%
	Satisfactory	185	91.6
	Unsatisfactory	17	8.4
Perception of Osteoporosis	Mean ± SD	86.3±12.0	
	Category	(n)	%
	Low	3	1.5

	Moderate	149	73.8
	High	50	24.8
Calcium Intake	Mean ± SD	32.3±14.3	
	Category	(n)	%
	Adequate intake	26	12.9
	Inadequate intake	176	87.1

Table 3 shows the correlation between the total score of osteoporosis knowledge, perception and calcium intake. Pearson correlation of total knowledge score and total perception score was found to be not significant (r =.037, p =0.598). Similar to total knowledge score and total calcium intake score also showed that there was no significant relationship between the two variables (r =.117, p = 0.099). Only the total perception score and total calcium intake score showed a significant correlation (r =.193, p =0.006).

Table 3. The correlation between total osteoporosis knowledge score, perception score and calcium intake

		Total Knowledge Score	Total Perception Score	Total Calcium Intake Score
Total Knowledge Score	Pearson Correlation	1	.037	.117
	Sig. (2-tailed)		.598	.099
	N	202	202	202
Total Perception Score	Pearson Correlation	.037	1	.193**
	Sig. (2-tailed)	.598		.006
	N	202	202	202
Total Calcium Intake Score	Pearson Correlation	.117	.193**	1
	Sig. (2-tailed)	.099	.006	
	N	202	202	202

**. Correlation is significant at the 0.01 level (2-tailed).

DISCUSSION

More than half of the participants in this study were female (52%) resemble to a local study in which the majority of participants were also female (70%) (Chiang, 2020). Similar to other research, the majority of university students were between 18 and 40 years of age (Chiang, 2020; Edmonds et al., 2012; Kasper et al., 2007; Sham, 2013) This is because the majority of participants were undergraduate students and only a tiny percentage were post-graduate students.

Knowledge of Osteoporosis

Findings demonstrated that knowledge and perception of osteoporosis were sufficient among university students. This finding is similar to a previous study showing that university students in Saudi Arabia had a decent knowledge of osteoporosis, where the score of knowledge was found to be greater in females and increased with increasing years of tertiary education (Khan et al., 2019). In Riyadh, Saudi Arabia, the percentage overall knowledge of their 376 participants was good at 66% (Alqahtani & Alghamdi, 2021). In this study, the participants' good comprehension of osteoporosis could be attributed to the curriculum and

their academic level. Courses such as nutrition incorporated osteoporosis and calcium-rich foods in their syllabus have assisted the students to become aware of this bone disease.

Although, these results differ from some published studies by Alshareef et al. (2018) that according to OKAT, young Saudi women attending colleges have insufficient knowledge about osteoporosis. Numerous research has also indicated that the level of osteoporosis knowledge among professionals was insufficient (Althobiti et al., 2020; Park et al., 2017; Peng et al., 2020.) The findings from this present study suggested that university students were more likely to increase their knowledge of adapting osteoprotective behaviors, which highlights the importance of increasing osteoporosis knowledge. This can be done by providing theory-based educational interventions about osteoporosis, preventive behaviors targeting peak bone mass, and incorporating focused learning on health promotion related to healthy bones into the curriculum.

The findings of this study also revealed that participants with a high level of osteoporosis knowledge were aware of the benefits of consuming enough calcium to prevent osteoporosis and changed their dietary habits accordingly. In summary, findings from the current study showed that the participants should enhance their knowledge of osteoporosis. Information of osteoporosis is easily access from the internet, getting information about osteoporosis from internet sources might be a part of health initiatives to improve osteoporosis knowledge. By doing this, it reflects the importance of developing more educational programs to increase yet to enhance the knowledge of osteoporosis as the first step to strengthening positive habits among young adults.

Perceptions of Osteoporosis

Participants in this study perceived themselves to be susceptible to osteoporosis to a moderate degree. This may be because young individuals believe that osteoporosis mostly affects women over the age of 70 years old (Chiang, 2020). According to Shawashi & Darawad, (2020), individuals with strong self-efficacy and the belief that they can achieve their goals tend to achieve high levels of success and maintain good health. Consequently, efficacy can play a crucial role in assisting individuals to adopt or sustain healthy habits. Most of the participants reported a moderate osteoporosis perception or self-efficacy with a percentage of 73.8%. Findings from this present study seem to be consistent with other research which found that participants from female university students in Jordan reported a moderate osteoporosis perception (Shawashi & Darawad, 2020). This might be due to the majority of them being exposed to information on osteoporosis and foods rich in calcium making them aware of the advantages of calcium.

However, there is 1.5% of the participants in this research had a poor perception of osteoporosis. In contrast, the majority of participants in other research had a poor perception of osteoporosis's severity and susceptibility. Althobiti et al. (2020), Bilal et al. (2017), and Nguyen et al. (2015) explained that the majority of the participants did not engage in preventative behaviors because they felt that they lacked the knowledge and awareness required to comprehend the seriousness of the disease.

The current study's outcomes indicate no correlation between knowledge and perceptions of osteoporosis, and this is in contrast with the theoretical approach of the Health Belief Model. From the Health Belief Model, an individual with a strong osteoporosis health belief can anticipate a high likelihood of good behavioral improvements. Hence, information regarding osteoporosis should be featured among the participants and the student community to enhance their health beliefs and perceptions of osteoporosis.

Calcium intake

This study investigated how often food changes and calcium pills are taken on a daily and weekly basis. Dietary calcium consumption is essential for the long-term enhancement of bone health. As this is one of the most significant components in osteoporosis prevention behavior, an evaluation of dietary calcium intake is required to develop a more effective strategy. In this present study, over half of the participants with the percentage of 87.1% did not consume sufficient calcium-rich foods, similar to other studies (Chiang, 2020; Ediriweera de Silva et al., 2014; Edmonds et al., 2012). A previous study claimed that the high price of milk and dairy products on Malaysian markets, which are largely imported from pastoralism-based nations may have contributed to the poor calcium consumption identified in this study (Yahya et al., 2018). Despite that, only 12.9% of participants had an adequate amount of calcium intake. This may be related to the fact that the participants are aware of the recommended daily calcium intake (1000 mg/day) and these lead to sufficient intake of calcium.

This present study also revealed that, despite knowing the osteoporosis condition, individuals did not incorporate calcium consumption into their everyday lives. Therefore, extra efforts are needed to educate students to practice calcium consumption in their lives which could improve and strengthen the bone mass in the student population.

The relationship between knowledge and perception of osteoporosis and calcium intake

On the relationship between knowledge and perception of osteoporosis, there was no significant relationship between the two variables. This finding was similar to those from Ziccardi et al., (2004) who discovered that there was no correlation between the participants' level of osteoporosis knowledge and perception. It may have been due to the uneven sample size distribution of the variables. However, the findings of the current study do not support the previous research, in which the knowledge and perception of osteoporosis were correlated with each other. Exposure related to bone health and levels of the participants' knowledge and beliefs about osteoporosis could contribute to these contrary findings.

Calcium intake in the present study did not show a significant correlation with osteoporosis knowledge. This is comparable to another study, which similarly discovered that there was no significant association between knowledge of osteoporosis and calcium consumption (Chan et al., 2019). But interestingly, the present study showed a positive correlation between calcium intake and osteoporosis perception. This showed the perception of osteoporosis, and the calcium intake of the participants was associated, indicating that the consumption of calcium is related to their perception of osteoporosis. This suggests that the higher the perception of osteoporosis among the participants, the higher their calcium consumption. However, this finding contradicts the Chiang et al., (2020) outcome, which found osteoporosis health beliefs were not significantly associated with the consumption of dairy products.

CONCLUSION

Participants in this study had satisfactory knowledge of osteoporosis and a moderate level of osteoporosis perception. More than half of the participants did not consume an adequate amount of calcium. The current study reported that osteoporosis knowledge and perception were not significantly correlated. Furthermore, this present study also found that there was no correlation between knowledge and calcium intake. However, there was a positive correlation between perception and calcium intake. In conclusion, this finding may indicate that university students have very good knowledge and beliefs about osteoporosis but do not practice it in their daily lives.

AUTHORS' CONTRIBUTION

Sh Syaza Nisrina Mumtaz Wan Jemudin – Conducted the data collection and the data analysis of the research.

Siti Soraya Mohd Elias - Conducted the main writing, data analysis, and article editing, and produced the final version of the article.

CONFLICTS OF INTEREST

The authors wish to confirm there is no known conflicts of interest associated with this publication.

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