

OSTEOPOROSIS: KNOWLEDGE, ATTITUDES, AND PRACTICES AMONG UNIVERSITY STUDENTS

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ABSTRACT

Prevention of osteoporosis at a young age is necessary. However, limited research has been conducted on osteoporosis among young people. This study aimed to analyze knowledge, attitudes and practices regarding osteoporosis among 384 university students using an analytic observational method with a cross-sectional design. Differences of knowledge, attitudes and practices by gender and field of study were analyzed using independent t-test and Mann Whitney test. The influence of knowledge and attitudes on the practices was conducted using Pearson product moment test. The results showed that the average knowledge (34.61 ± 4.77) of students regarding osteoporosis were classified as moderate, the attitudes (28.57 ± 6.56) and practices (4.58 ± 2.24) of students regarding osteoporosis was classified as poor. The results of the bivariate test showed that there was a difference in the mean score of total knowledge about osteoporosis between men and women ($p=0.021$), health and non-health fields ($p=0.003$). In addition, there is a relationship between attitude and practice regarding osteoporosis ($r: 0.144$; $p = 0.005$). This study shows that the implementation of education and awareness programs for students regarding risk factors of osteoporosis should be designed to improve osteoporosis awareness and prevention.

Keywords: attitude; knowledge; osteoporosis; practice; students

INTRODUCTION

Osteoporosis is still a global health problem with high rates of morbidity, mortality and healthcare costs. It is considered the second most important health problem after heart disease in developing countries (Shen *et al.*, 2022). Osteoporosis is a bone disease characterized by low bone mineral mass and deterioration of bone tissue microarchitecture (Dempster, Marcus and Bouxsein, 2021). The disease develops slowly over several years, which may not be diagnosed except after a fracture due to minor trauma (Khired *et al.*, 2022). *The International Osteoporosis Foundation (IOF)* notes that globally, one in three women and one in five men over the age of 50 has a fracture due to osteoporosis and more than 8.9 million people experience fractures every year, even every 3 seconds 1 person will experience a fracture. By 2050 in Asia it is estimated that more than 50% of people will experience fractures due to osteoporosis. The incidence of vertebral fractures in Indonesia was found to be 9.0% in women and 16% in men and when compared to other countries in Southeast Asia, the incidence of osteoporosis in Indonesia is still higher (Subashini C Thambiah, 2020).

Genetic factors play an important role in determining whether or not a person is at a higher risk of developing

osteoporosis. However, lifestyle factors such as diet and physical activity also influence bone development in adolescence and the rate of bone loss later in life (Oumer *et al.*, 2020; Bailey and Lin, 2021). Factors that contribute to osteoporosis include advancing age, female sex, postmenopausal status, hypogonadal or premature ovarian failure, low body mass index, ethnicity, rheumatoid arthritis, low bone mineral density, vitamin D deficiency, low calcium intake, high kyphosis, smoking, alcohol abuse, immobility, and long-term use of certain drugs (Rozenberg *et al.*, 2020; De Martinis *et al.*, 2021; Abdo and Idris, 2022). The diet and food choices of young adults are one of the reasons for the development of osteoporosis in the future (Davies, Rangan and Allman-Farinelli, 2020; Oumer *et al.*, 2020). This can cause osteoporosis conditions to occur even in children, adults, men and premenopausal women (Davies, Rangan and Allman-Farinelli, 2020; Rozenberg *et al.*, 2020; Sakka and Cheung, 2020). Osteoporosis can occur at any age. Therefore, it's very important to achieve maximum peak bone mass as it determines bone quality in later life. This is the basis for the need to emphasize the management and control of osteoporosis disease, which aims to control the consequences of the disease, such as fractures, and begin to think about ways to

reduce its incidence pattern (Oumer *et al.*, 2020; Sakka and Cheung, 2020).

Various studies have been conducted to evaluate knowledge, attitudes and practices. However, most of the studies that have been conducted previously focus on people who already have osteoporosis or are designed for older age groups and the main target is to reduce the consequences of osteopenic patients (Amer *et al.*, 2021; Lulla *et al.*, 2021; Huang *et al.*, 2023; Saltik *et al.*, 2023). The results showed that the level of knowledge of patients with osteoporosis was better because they had been or were on treatment and often consulted about their disease with health professionals (Amer *et al.*, 2021). Therefore, the results of such studies cannot be generalized to the entire population. The importance of adequate knowledge, attitudes and actions at a young age to prevent the incidence of osteoporosis makes research necessary because there are still very few studies conducted at a young age. Therefore, this study will focus on analyzing the knowledge, attitudes and actions to prevent osteoporosis in Prima Indonesia University students. College students often engage in behaviors that increase disease risk, such as poor sleep, diet, exercise, and alcohol use. The selection of the young age group of students at Prima Indonesia University is because this university is one of the growing

universities in Medan city with a large number of students from various regions in North Sumatra so that the results of the study can later outline the knowledge, attitudes and actions to prevent osteoporosis in the young age group in Medan City.

METHOD

This research used an analytic observational method with a cross-sectional design conducted at Universitas Prima Indonesia, Medan, Indonesia, which was conducted from April-August 2024 and has gone through the Health Research Ethics Committee (KEPK) Universitas Prima Indonesia, number 101/KEPK/UNPRI/III/2024. Sampling was done through purposive sampling method using Lemeshow's formula from 5350 population and obtained a minimum sample size of 384 respondents. Data was collected using a semi-structured questionnaire consisting of 4 sections: 1) respondent characteristics: gender, age, field of study, 2) knowledge about osteoporosis, attitudes that cause osteoporosis and practices to prevent osteoporosis. The knowledge and attitude measurement scale was measured using a five-point likert scale with the answer options "strongly disagree, disagree, undecided, agree, and strongly agree". While the practice of preventing osteoporosis was measured by giving the

answer options “Yes” and “No”. The practice section consisted of 10 questions with a maximum score of 10. The knowledge and attitude section consisted of 10 questions with a maximum score of 50. Before the questionnaire was distributed to respondents, validity and reliability tests were carried out on 30 respondents who were distributed to students outside the research subjects who had the same characteristics as the target population (students from Universitas Sumatera Utara in Medan).

The inclusion criteria in this study were students who were physically healthy, active, and willing to participate in the study, while the exclusion criteria were students who have a history of chronic illnesses like hypertension, diabetes, and bone disorders and were therefore not included in this study. This criterion was chosen to ensure that participants could

answer the questionnaire well and to provide a baseline of knowledge, attitudes and preventive practices before disease symptoms occur in the student group. The data collection was the subject of analysis by means of statistical applications. Descriptive statistics of frequency and percentage were used to describe categorical data, and mean with standard deviation (SD) was used for numerical data. An independent t-test and a correlation test were used to assess the relationship between two numerical variables, and an independent t-test was used to compare total knowledge, attitude, and behavior scores between men and women. Respondents were given questionnaires to measure knowledge, attitudes, and behaviors. The groupings of students' knowledge, attitudes and actions about osteoporosis are shown in table 1.

Table 1 . Classification of knowledge, attitudes and practices regarding osteoporosis (Ramli, Rahman and Haque, 2019)

Percentage Score (%)	Knowledge	Attitude	Action	Level
80-100	40-50	40-50	8-10	Good
60-79	30-39	30-39	6-7	Moderate
<60	<30	<30	<6	Poor

RESULTS AND DISCUSSION

Univariate Analysis

Table 2. Overview of Respondent Characteristics

Characteristics	Percentage	
	n	%
Gender		
Male	152	39.6
Female	232	60.4
Age		
≤ 20 years	311	81.0
> 20 years	73	19.0
Field		
Health science	238	62.0
Non Health science	146	38.0

The validity test showed that the calculated r value for all questions in the questionnaire was greater than the r-table value (0.239) and the Cronbach Alpha reliability value was 0.83. These results indicate that the questionnaire can be used as an instrument to measure knowledge, attitudes and practices about osteoporosis prevention in student groups. The number of respondents in this study was 384 students. Based on the sociodemographic

survey of respondents, 60.4% were female, while 39.6% were male. The majority of respondents from the age of 20 years were 81.0% where 238 respondents (62.0%) students came from the field of Health (Table 2). This study analyzed health and non-health disciplines to identify significant differences in disease prevention knowledge, attitudes, and behaviors between health and non-health students.

Table 3. Evaluation of Students' Knowledge about Osteoporosis

Statment	Answer				
	Totally disagree n (%)	disagree n (%)	agree n (%)	Strongly agree n (%)	Totally agree n (%)
Osteoporosis causes bones to become porous and break easily	14 (3.6)	51(13.3)	43 (11.2)	187 (48.7)	89 (23.2)
Only women have osteoporosis	94 (24.5)	169 (44.0)	43 (11.2)	51 (13.3)	27 (7)
No age-related changes in bone density	36 (9.4)	137 (35.7)	97 (25.3)	87 (22.7)	27 (7)
Clear symptoms of osteoporosis appear early	15 (3.9)	50 (13.0)	16 (4.2)	215 (56.0)	88 (22.9)

Consumption of more than three cups of black coffee, strong tea, and fizzy drinks a day will increase the rate of bone loss.	0 (0)	0 (0)	31 (8.1)	215 (56.0)	138 (35.9)
Vitamin D improves calcium absorption	54 (14.1)	123 (32.0)	49 (12.8)	118 (30.7)	40 (10.4)
Bone loss is accelerated in menopausal women. This is due to a decrease in female hormones	7 (1.8)	4 (1.0)	24 (6.3)	201 (52.3)	148 (38.5)
Dietary habits have not been linked to osteoporosis	4 (1)	74 (19.3)	71 (18.5)	160 (41.7)	75 (19.5)
Osteoporosis can be prevented by eating enough calcium-rich foods	4 (4)	25 (6.5)	39 (10.2)	208 (54.2)	108 (28.1)
Diet, exercise, calcium lactate, or medication cannot prevent bone loss from getting worse once you have it	26 (6.8)	140 (36.5)	119(31.0)	69 (18.0)	30 (7.8)

An overview of respondents' knowledge about prevention and risk factors for osteoporosis is shown in Table 3. Respondents agreed (56.0%) and strongly agreed (22.9%) that osteoporosis symptoms will appear at an early stage even though osteoporosis tends to show no symptoms at an early stage. Respondents also generally still do not know for sure that vitamin D can help calcium absorption where there are 14.1% of respondents who answered

strongly disagree, 32.0% of respondents answered disagree and there are 12.8% of respondents who still doubt whether vitamin D increases calcium absorption or not. In general, respondents already knew that osteoporosis causes bone loss (agree 48.7% and strongly agree 23.2%), drinking coffee and soft drinks can increase the risk of osteoporosis, and calcium consumption can prevent osteoporosis.

Table 4. Evaluation of Students' Attitudes about Osteoporosis

Statment	Answer				
	Totally disagree n (%)	disagree n (%)	agree n (%)	Strongly agree n (%)	Totally agree n (%)
I agree to have my bone mass measured regularly	99 (25.8)	188 (49.0)	23 (6.0)	52 (13.5)	22 (5.7)
I agree that we need to pay more attention to our bone density as we get older	5 (1.3)	15 (3.9)	24 (6.3)	178 (46.4)	162 (42.2)
I agree that morning sun exposure is beneficial for bone health	70 (18.2)	186 (48.8)	34 (8.9)	75 (19.5)	19 (4.9)

I agree that smoking or drinking can damage bone health	35 (9.1)	121 (31.5)	74 (19.3)	125 (32.6)	29 (7.6)
I agree that family history makes us more likely to get osteoporosis	11 (2.9)	45 (11.9)	63 (16.4)	194 (50.5)	71 (18.5)
I agree that we should eat calcium-rich foods to prevent osteoporosis problems in the future	17 (4.4)	34 (8.9)	49 (12.8)	209 (54.4)	75 (19.5)
I think people with osteoporosis will make daily activities more difficult	36 (9.4)	28 (7.3)	22 (5.7)	80 (20.8)	218 (56.8)
I agree and am motivated to eat a balanced diet to prevent osteoporosis	67 (17.4)	211 (54.9)	30 (7.8)	40 (10.4)	36 (9.4)
I agree and am motivated to exercise regularly to prevent osteoporosis	79 (20.6)	179 (46.6)	45 (11.7)	56 (14.6)	25 (6.5)
I totally agree that losing bone, dieting, exercising, calcium lactate, or taking medication won't prevent it from getting worse	87 (22.7)	153 (39.8)	75 (19.6)	60 (15.6)	9 (2.3)

Respondents' attitudes about osteoporosis prevention showed that 49.0% of respondents disagreed and 25.8% strongly disagreed to take regular bone mass measurements. This shows that lack of knowledge forms a poor attitude in preventing osteoporosis at a young age. Respondents also disagreed that sun

exposure is beneficial for bone health (48.8%). On average, respondents were not motivated to eat a balanced diet (54.9%) and exercise regularly (46.6%) in preventing osteoporosis. This is because respondents did not know that osteoporosis can occur due to poor lifestyle factors at a young age (Table 4).

Table 5. Evaluation of Student Practice on Osteoporosis

Statment	Answer	
	No (%)	Yes (%)
I eat a calcium-rich diet (such as milk, meat and protein, dried fish, green vegetables)	128 (33.3)	256 (66.7)
Not drinking more than three cups of black coffee, strong tea, or soda daily	295 (76.8)	89 (23.2)
I enjoy at least 10 minutes of sunlight every day	77 (20.1)	308 (79.9)
I get at least 30 minutes of moderate physical activity at least three days a week	257 (66.9)	127 (33.1)
I pay attention to safety in my daily life so that I do not fall down	291 (75.8)	93 (24.2)
I smoke	278 (72.4)	106 (27.6)
I consume drinks – alcoholic alcohol and softdrinks	223 (58.1)	152 (39.6)

I limit the use of salt in consuming food	317 (82.6)	67 (17.4)
I try to maintain bone health from an early age because it can reduce the risk of osteoporosis.	108 (28.1)	276 (71.9)
I consult with health workers about how to prevent diseases including osteoporosis.	107 (27.9)	277 (72.1)

Osteoporosis prevention practices by Universitas Prima Indonesia students are depicted in table 5. As many as 79.9% of respondents do not enjoy 10 minutes of sunlight every day. The physical activity of the respondents also showed a very small percentage, only 33.1% of respondents who

did physical activity while 66.9% did not do physical activity.

Based on the results of the study in table 6, students have a fairly good knowledge (34.61 ± 4.77) about osteoporosis, but not accompanied by good attitude (28.57 ± 6.56) and practice (4.58 ± 2.24).

Table 6 Total Score of Knowledge, Attitude and Practice Regarding Osteoporosis

Variable	Mean ± SD	Percentage Score (%)	Level
Knowledge	34.61 ± 4.77	69.22	Moderate
Attitude	28.57 ± 6.56	57.14	Poor
Action	4.58 ± 2.24	45.8	Poor

Bivariate Analysis

The results showed that there was a difference in the mean score of knowledge between men and women

($p=0.021$) while the results showed no difference in the mean score of attitude and practice about osteoporosis prevention between men and women

Table 7. Comparison of total knowledge, attitude and practice scores regarding osteoporosis between men and women

Variable	Mean ± SD		t-test	p-value
	Male	Female		
Knowledge	35.30 ± 4.48	34.16 ± 4.91	2.316	0.021
Attitude	28.92 ± 6.02	28.67 ± 6.80	0.373	0.710
Action	4.55 ± 2.05	4.60 ± 2.36	-0.204	0.839

The results showed that there was a difference in the average knowledge score between students from the health science field compared to students from the non-health science field ($p=0.021$). This result shows that students from the health field have better knowledge about osteoporosis compared to students from the non-health field. However, there was no difference in

attitude scores and osteoporosis prevention practices between health and non-health students. This means that although health students have higher knowledge, but in taking attitudes and actions to prevent osteoporosis at a young age is not well implemented so there is no difference in prevention practices when compared to students from non-health fields (Table 8).

Table 8. Comparison of total scores of knowledge, attitude and practice regarding osteoporosis by field of study

Variable	Mean \pm SD		t-test	p-value
	Health science	Non health science		
Knowledge	35.16 \pm 4.99	33.72 \pm 4.27	2.998	0.003
Attitude	28.93 \pm 6.79	28.50 \pm 5.99	0.633	0.527
Action	4.69 \pm 2.19	4.40 \pm 2.33	1.254	0.211

There is a significant correlation between the total score of knowledge and attitude ($p<0.0001$) with the correlation coefficient showing a fairly strong positive correlation with $r=0.505$. This shows that an increase in knowledge will improve students' attitudes about osteoporosis. Attitude and practice regarding osteoporosis also showed a significant correlation ($p=0.005$), although the correlation coefficient only showed a minimal positive correlation

between the two variables ($r=0.144$). This means that higher attitude scores will be associated with better practices regarding osteoporosis. The results of this study also showed that there was no correlation between knowledge and practice regarding osteoporosis ($p=0.116$). This means that good knowledge about osteoporosis does not necessarily change the behavior of respondents in preventing osteoporosis at a young age.

Table 9. Correlation between the total score of knowledge, attitude and practice regarding osteoporosis

Variables	r	p-value
Knowledge vs Action	0.080	0.116
Attitude vs Action	0.144	0.005

DISCUSSION

Students are one of the largest parts of society. Therefore, improving students' knowledge, attitudes, and practices towards osteoporosis can minimize the risk of high incidence of osteoporosis even though this disease is a global health problem that is generally in the elderly age group (Althobiti, 2022). The results of this study showed that most of the students had fairly good knowledge. The study participants were aware of the risk factors of osteoporosis, as most of them answered correctly about smoking and lack of physical activity can cause osteoporosis. Research on osteoporosis awareness among university students and young adults shows mixed results. A previous study in Saudi Arabia reported that 44.6% of students had good knowledge, with age, education, and employment associated with higher awareness (Alhalafi and Alhalafi, 2023). Women demonstrated an intermediate level of awareness, with higher education correlating to better knowledge (Ayyash *et al.*, 2023). However, a systematic review of Chinese studies revealed poor levels of

knowledge and perception regarding osteoporosis and its risk factors across all participants (Wang *et al.*, 2024). In this study, knowledge of osteoporosis was better among students with a health field. This suggests that reliable information provided by health educators can increase knowledge and self-efficacy and improve community health status. These studies emphasize the importance of raising awareness about osteoporosis through educational programs and campaigns to prevent osteoporosis disease (Khired *et al.*, 2022).

Attitude is one of the important aspects of self-efficacy especially in health intervention programs. In addition, motivation can lead to good attitudes about osteoporosis especially when people realize that risk issues can be reduced by minimizing negative behaviors (Schunk and DiBenedetto, 2021). In this study, the findings indicated a poor level of attitude regarding osteoporosis. The correlation test in the study illustrated a negative correlation between knowledge and attitude towards osteoporosis and indicate a gap

between knowledge and actual attitudes or practices in disease prevention (Ssekamatte *et al.*, 2021). Knowledge about how to prevent disease does not always guarantee a change in behavior. Factors such as habit, personal preference and social norms also need to be considered. Younger people can be comfortable with their current lifestyle and have a hard time changing, even though they know the risk (Gimeno-Mallench *et al.*, 2020). The mean total score for the study participants' current practices indicated poor practices in osteoporosis prevention. This may be because they feel that they are not worried about the disease at this time and therefore do not take preventive measures. This is supported by previous findings that knowledge does not always guarantee preventive behavior.

Although younger age groups have good knowledge about osteoporosis problems, unhealthy diets and lifestyles are difficult to abandon. Previous research reported that adolescents tend to consume carbonated drinks regularly which can result in Ca²⁺ shifts and cause osteoporosis (Wang *et al.*, 2024). Acebes-Sánchez *et al.* reported that 22.4% and 55.6% of college students did not achieve the WHO recommendations for physical activity. observed that 51.39% of college students did not meet the standard of doing 30 minutes of physical activity daily (Acebes-Sánchez, Diez-Vega and Rodriguez-Romo,

2019). Therefore, by avoiding a sedentary lifestyle and becoming more active through daily exercise, you can reduce your risk of developing osteoporosis (Khired *et al.*, 2022). Knowledge and attitudes without application are useless. Learning about osteoporosis alone cannot guarantee that participants will practice preventive measures against osteoporosis unless it is accompanied by strong determinants. Nonetheless, the results of this study still showed a significant correlation between participants' attitudes and practices regarding osteoporosis. These results suggest a positive attitude is essential for implementing preventive measures.

CONCLUSION

In this study, it was found that the participants had a moderate level of knowledge, while the attitudes and practices related to osteoporosis prevention were poor. Positive correlations between knowledge and attitudes, attitudes and osteoporosis prevention practices indicate that good knowledge leads to positive attitudes and good attitudes lead to better osteoporosis practices. The lack of correlation between the knowledge and the practice of students in relation to osteoporosis. These findings suggest that educational programs should be implemented that increase awareness of risk factors and preventive measures. The

results of this study can be used to guide the development of appropriate strategies and education to enhance the attitudes and practices of youth in osteoporosis prevention.

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