

# What do female nursing students know about osteoporosis: A survey study

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**Summary.** *Aim:* The aim of the study was to examine female nursing students' knowledge of osteoporosis and its affecting factors. *Methods:* This is a descriptive survey conducted in the faculty of nursing of a state university in the west of Turkey. The sample of the study consisted of 701 female students. A nursing student information form and the Revised Osteoporosis Knowledge Test were used to collect the data. *Results:* Most of the students had heard of osteoporosis but they had inadequate knowledge. The multiple regression analysis showed that being a third or fourth year student and obtaining information on osteoporosis from the internet accounted for 13% of the nursing students' knowledge of osteoporosis. *Conclusion:* Nurses take on responsibilities for the prevention and early diagnosis of osteoporosis. For this reason, it is of the utmost importance for students, who are the nurses of the future, to fill the gaps in the knowledge which they will feel the need of in helping at-risk groups in society to gain information, awareness and preventive behaviors with regard to osteoporosis.

**Key words:** osteoporosis, knowledge, nursing, calcium intake, vitamin D

## Introduction

Osteoporosis is a devastating disease which advances silently, has high morbidity and mortality, and affects public health (1). One woman in three and one male in five are at risk of osteoporotic bone fracture (1). The prevalence of osteoporosis in Turkey has been reported as 7.5% in males and 12.9% in females (2). In women, peak bone mass is achieved at around the age of 30, after which it begins to decline (3). Thus, the majority of the population of Turkey is in this age group, making the risk of osteoporosis an important concern. At the same time, Turkey has an aging population. The increase in the aged population will increase the frequency with which the results of osteoporosis are seen, so that an assessment of the aged population with regard to osteoporosis is needed.

Although osteoporosis is an irreversible condition, it is a disease which can be avoided with healthy lifestyle behaviors. Among these preventive behav-

iors are healthy eating, exercise, and the prevention of falls (4). Nurses have significant responsibility in the development of public health, the prevention of illnesses, early deaths and disabilities, and in preserving the health of at-risk groups (5). The nursing profession occupies the most powerful position among the professions in the field of health in putting into practice strategies to improve health (1). Nurses are recognized as health professionals who are important in the prevention of osteoporosis. They are expected to provide information on the complications of osteoporosis and especially on reducing the risks of falling (4). In a systematic review examining nine education programs developed by health professionals directed at individuals with osteoporosis or those at high risk of osteoporosis, Smith (2010) found that nurses were the instructors in six programs, and that nurses took an effective role in these programs (6). At the same time, the IOF (2012), stated that nurses played a key role in providing information to individuals on the risks of

osteoporosis and protective behavior, and in securing cooperation with members of other professions on this topic (1).

It has been emphasized that education programs to increase awareness of osteoporosis and to extend conformity to preventive behaviors are of vital importance in the prevention of osteoporosis (7). Education programs carried out by nurses and encompassing osteoporosis risk factors, preventive strategies, monitoring and treatment help in the prevention of osteoporosis (8). Various studies have shown that training programs carried out by nurses on the prevention of osteoporosis have increased the knowledge of individuals concerning osteoporosis (9-12), have reduced the risks of osteoporosis (10), have increased the consumption of calcium-rich foods, which is an osteoporosis prevention behavior (9,11), and have developed the performance of load-bearing exercise (11,12). In order to perform educational roles in the prevention of osteoporosis, nurses must have adequate knowledge of the topic. Seen from this angle, some studies have emphasized that nurses have insufficient knowledge regarding osteoporosis (5,13). For example, it was found in a study that most nurses believed that osteoporosis was a problem of the postmenopausal period and for old women (5). It is seen in the literature that although there are international studies examining the level of knowledge of osteoporosis in nursing students, who would be expected to be more sensitive to osteoporosis (3,14,15), there have been few studies on this topic in Turkey (16).

It is an important priority to examine the levels of knowledge of osteoporosis of nursing students who in the future will provide treatment and education in the prevention of osteoporosis, and the affecting factors. The aim of the study was to examine female nursing students' knowledge of osteoporosis and its affecting factors.

## Method

This is a descriptive survey study conducted in the faculty of nursing of a state university in the west of Turkey between October 2016 and January 2017. The faculty offers a four-year degree program in the field of

nursing following high school. The population of the study consisted of the 1040 female nursing students. The criteria for inclusion in the research were (a) being a female student in the faculty of nursing where the study was conducted, (b) being willing to participate in the study, (c) speaking Turkish, and (d) being present in the faculty during the research period. Male students, those who are absent in classes, those who fill in the questionnaires incompletely, those who wish not to take part in the research, those who be not contacted during the period of data collection were excluded in the research sample. The sample of the study consisted of 701 female students. A Nursing Student Information Form and the Revised Osteoporosis Knowledge Test were used to collect the data.

### *Nursing Student Information Form*

This was developed by researchers based on a literature review (5,14,16,17), and consisted of two sections and a total of eight questions. The first section consisted of four questions on the students' age, year of study, marital status and place of residence. The second section of the form contained four questions to determine the students' awareness concerning osteoporosis (the perception of osteoporosis; seeing osteoporosis as a serious disease and as a preventable disease).

### *The Revised Osteoporosis Knowledge Test (R-OKT)*

The OKT was developed by Kim et al. (1991) to assess an individual's knowledge of osteoporosis. It was revised by Gendler et al. in 2011 and 2012, and the R-OKT was composed, which included 32 multiple-choice items (18). This test consists of two subscales, nutrition and exercise. The nutrition subscale consists of 26 questions (1-11 and 18-32), and the exercise subscale has 20 questions (1-11 and 30-32). The two subscales have 14 questions in common (1-11 and 30-32). The range of possible scores for the test is 0 to 32, with higher scores indicative of greater knowledge. The validity and reliability of the Turkish version of the test was tested by Atalay et al. (2015) (19). Reliability coefficients for internal consistency for R-OKT calcium and R-OKT exercise were found to be 0.71 and 0.76, and 0.76 for total R-OKT. In this study they were 0.67, 0.63 and 0.67 respectively.

The instruments were handed out to the students

in the classroom after lessons and were collected back by the researchers in a face-to-face interview after they had been answered. It took approximately 7-10 minutes to complete the questionnaires.

### *Statistical analysis*

Data was analyzed using SPSS (version 17.0, SPSS Inc., Chicago, IL, USA). Normality of the R-OKT score was examined by the Kolmogorov-Smirnov test and the R-OKT score demonstrated a normal distribution. Descriptive statistics, independent t-test and one-way analysis of variance and Mann Whitney U analysis were used to assess the data. Multiple linear regression analysis was used to identify the impacts of variables on the students' knowledge of osteoporosis. The level of significance was set at 0.05.

### *Ethical considerations*

Written permission was obtained from the University's Faculty of Nursing Ethics Committee (Approval No: 172564/09.09.2016) and from the dean of the Faculty of Nursing. After they were provided with information on the aims of the study, the participating students gave their oral approval. Permission to use the Revised Osteoporosis Knowledge Test was obtained by email from N.Ş. Atalay.

## **Results**

The students' ages ranged between 18 and 28 years (mean age=20.90±1.38); 29% were in their fourth year of study; 99% were single, and 52.3% lived in a city or large town.

Most of the students had heard of osteoporosis: 80.9% from television, 77.2% from health workers, and 72.9% from the internet, and 97.3% described it as a serious health problem and 89.4% as a preventable disease.

Most of the students knew that those who consumed few milk products in their diet (84.7%), those who had eating disorders (81.2%), and those who were in menopause (73.2%) were at risk. A few of the students knew that those who were overweight (9.4%), white and Asian women (41.1%), those whose ovaries had been surgically removed (47.6%), and those with

long-term cortisone use (50.8%) were at risk of osteoporosis. Very few of the students (13.8%) knew that in order to strengthen bones, medium strength exercise lasting for at least 30 minutes five days a week is necessary. Again, very few students knew that fast walking (24.8%) and lifting weights (10%) were the best way to reduce the risk of bone weakening. Most of the students knew that cheese (93.2%) and yoghurt (84.2%) were good sources of calcium, but only 38% knew the amount of calcium intake recommended for an adult. Only 6.3% of the students knew that an adult needed to consume three or more glasses of milk a day in order to obtain the recommended amount of calcium. Most of the students knew that vitamin D was needed for calcium absorption (83.6%) and that this was obtained from sunlight (81.6%), but only 18.5% knew the recommended amount of vitamin D for those aged 50 and over. Only 27% of the students knew that the best time for the formation of strong bones was adolescence (Table 1).

The students' R-OKT total scores ranged from 0 to 30 (mean:16.30 ± 4.09). Their mean exercise test score was 10.45±3.12 (min: 0, max:18), and their mean calcium knowledge test score was 13.67±3.69 (min:0, max:26). It was found that statistically significantly higher mean R-OKT scores were obtained by third and fourth year students ( $F=30.555, p<0.001$ ), those who had learned about osteoporosis from the faculty ( $t=3.295, p<0.01$ ), from health professionals ( $t=3.858, p<0.001$ ) and from the internet ( $t=6.532, p<0.001$ ), and those who thought osteoporosis was a serious ( $Z=2.090, p<0.05$ ) and preventable disease ( $t=2.722, p<0.01$ ) (Table 2).

The multiple regression analysis performed with variables considered significant in paired comparison revealed that variables such as attaching being a third or fourth year student and obtaining information on osteoporosis from the internet accounted for 13% of the nursing students' knowledge of osteoporosis ( $F=17.519, p<0.001, R^2=0.13$ ) (Table 3).

## **Discussion**

In this study, most of the students had heard of osteoporosis. Similarly, in a study by Amre et al. (2008), the proportion of nursing students who had

**Table 1.** Correct answers at R-OKT of nursing students (n = 701)

Items	Domain	Correct Answers	
		n	%
1. Eating a diet low in dairy products	Risk factors	594	84.7
2. Being menopausal	Risk factors	513	73.2
3. Having a parent or grandparent who had osteoporosis	Risk factors	407	58.1
4. Being a white or Asian woman	Risk factors	288	41.1
5. Elderly man	Risk factors	375	53.5
6. Having ovaries surgically removed	Risk factors	334	47.6
7. Taking cortisone for long time	Risk factors	356	50.8
8. Overweight	Risk factors	66	9.4
9. Eating disorder	Risk factors	569	81.2
10. More than two alcohols Daily	Risk factors	416	59.3
11. Smoking Daily	Risk factors	394	56.2
12. To strengthen bones, exercise at a moderately intense level for 30 minutes a day at least ? (five days in a week)	Exercise	97	13.8
13. Exercise makes bones strong, but it must be hard enough to make breathing: (much faster, but talking is possible)	Exercise	433	61.8
Which activity is best way to reduce osteoporosis ?	Exercise		
14. Walking Briskly	Exercise	174	24.8
15. Lifting weight	Exercise	70	10.0
16. Jogging or Running for exercise	Exercise	546	77.9
17. Aerobic dancing	Exercise	527	75.2
Which of these is the best source of calcium?	Nutrition		
18. Cheese	Nutrition	653	93.2
19. Canned Sardines	Nutrition	161	23.0
20. Broccoli	Nutrition	212	30.2
21. Yogurt	Nutrition	590	84.2
22. Ice Cream	Nutrition	327	46.6
23. Which of the following is the recommended amount of calcium intake for an adult (1000-1200 mg / daily)	Nutrition	265	37.8
24. How much milk must an adult drink to meet the recommended amount of calcium ? (3 or more glasses daily)	Nutrition	44	6.3
25. Which of the following is the best reason for taking a calcium supplement ? (If a person does not get enough calcium from diet)	Nutrition	453	64.6
Which vitamin needed for vitamin calcium absorption ?			
26. Vitamin D	Nutrition	586	83.6
27. Sunlight	Nutrition	572	81.6
28. Salmon	Nutrition	110	15.7
29. Amount vitamin to absorb calcium in adults over 50years (800-1000 IU / a day)	Nutrition	130	18.5
30. Which is the best time for the formation of strong bones? (Adolescent)	Knowledge	189	27.0
31. Diagnose osteoporosis (Bone density measurement - DEXA)	Knowledge	490	69.9
32. If you have osteoporosis you can get medication to heal	Knowledge	486	69.3

R-OKT: Revised Osteoporosis Knowledge Test

**Table 2.** R-OKT mean score and affected factors (n = 701)

Factors	n	%	OKT Total Mean ± SD	Exercise Mean ± SD	Calcium Mean ± SD
	701	100.0	16.30 ± 4.09	10.45 ± 3.12	13.67 ± 3.69
<b>Education level</b>					
1st	159	22.7	15.03 ± 3.41	9.30 ± 2.68	12.40 ± 2.99
2nd	144	20.5	14.65 ± 4.38	9.34 ± 3.28	12.17 ± 3.85
3rd	195	27.8	16.64 ± 3.65	10.84 ± 2.86	14.08 ± 3.31
4th	203	29.0	18.15 ± 3.99	11.76 ± 2.97	15.32 ± 3.65
	Test value <sup>‡</sup>		F = 30.555	F = 29.548	F = 32.507
	p		<b>p = 0.000***</b>	<b>p = 0.000***</b>	<b>p = 0.000***</b>
<b>Sources of knowledge on osteoporosis<sup>‡</sup></b>					
Television	134	19.1	16.36 ± 4.01	10.20 ± 3.28	13.54 ± 3.93
	Test value <sup>§</sup>		t = 0.735	t = 1.017	t = 0.424
	p		p = 0.463	p = 0.310	p = 0.672
Health professionals	160	22.8	17.39±4.23	11.28±3.17	14.64±3.86
	Test value <sup>§</sup>		t = 3.858	t = 3.885	t = 3.832
	p		<b>p = 0.000***</b>	<b>p = 0.000***</b>	<b>p = 0.000***</b>
Friends	240	34.2	16.48±4.01	10.47±3.09	13.83±3.65
	Test value <sup>§</sup>		t = 0.812	t = 0.140	t = 0.845
	p		p = 0.417	p = 0.889	p = 0.399
Internet	190	27.1	17.91±4.06	11.42±3.12	15.15±3.59
	Test value <sup>§</sup>		t = 6.532	t = 5.127	t = 6.714
	p		<b>p = 0.000***</b>	<b>p = 0.000***</b>	<b>p = 0.000***</b>
Faculty	338	48.2	16.83±4.47	10.80±3.27	14.15±4.01
	Test value <sup>§</sup>		t = 3.295	t = 2.938	t = 3.406
	p		<b>p = 0.001**</b>	<b>p = 0.003**</b>	<b>p = 0.001**</b>
<b>Is osteoporosis a serious disease?</b>					
Yes	682	97.3	16.35±4.03	10.49±3.09	13.72±3.63
No	19	2.7	14.37±5.71	9.11±3.80	11.68±5.13
	Test value <sup>§</sup>		Z = 2.090	Z = 2.116	Z = 2.343
	p		<b>p = 0.037*</b>	<b>p = 0.034*</b>	<b>p = 0.019*</b>
<b>Is osteoporosis a preventable disease?</b>					
Yes	627	89.4	16.45±4.12	10.55±3.13	13.82±3.67
No	74	10.6	15.08±3.69	9.55±2.82	12.38±3.55
	Test value <sup>§</sup>		t = 2.722	t = 2.617	t = 3.200
	p		<b>p = 0.007**</b>	<b>p = 0.009**</b>	<b>p = 0.001**</b>

<sup>‡</sup>One way analysis of variance; <sup>§</sup>independent t-test; <sup>§</sup>Mann Whitney U; \*p<0.05, \*\*p<0.01, \*\*\*p<0.001

heard about osteoporosis (84.7%) was high (20). Most of the students had obtained their information on osteoporosis from television, health workers or the internet. It was found that the level of knowledge of those who had accessed information from the internet was particularly high. The internet is an important source of knowledge for this age group, and therefore it is

felt that e-health literacy should be developed so that students will use it correctly as a source of scientific knowledge.

In this study, the students were asked two questions as to whether they thought of osteoporosis as a serious and preventable disease, in order to determine their awareness of osteoporosis. As expected, most

**Table 3.** Regression model predicting nursing students' osteoporosis knowledge (n=701)

Factors	Beta <b>16.706</b>	t-Statistics <b>16.696</b>	P-value <b>0.000</b>
Educational level (3rd and 4th class)	0.233	5.949	<b>0.000*</b>
Information source: Health professionals	0.055	1.478	0.140
Information source: Faculty	0.063	1.713	0.087
Information source: Internet	0.138	3.621	<b>0.000*</b>
Osteoporosis is serious disease	0.048	1.302	0.193
Osteoporosis is preventable disease	0.066	1.774	0.077
R <sup>2</sup> = 0.13      F (6, 701)= 17.519 *      Durbin-Watson = 1.780			
*p<0.001			

of the students saw osteoporosis as a serious health problem and knew it as a preventable disease. It was found in the study that knowledge of osteoporosis was higher in the group with awareness of osteoporosis. It is thought that increasing awareness of osteoporosis in nursing students will have a positive effect on their handling of osteoporosis when providing health services in the future.

Considering that the highest score obtainable on the osteoporosis knowledge test was 32, the scores attained by the nursing students in this study ( $X=16.30\pm4.09$ ) may be evaluated as low. Similarly, in studies with nursing students in Jordan (20), Damascus (14), Florida (21), and Thailand (15), osteoporosis knowledge scores were found to be low. It was concluded that students had inadequate knowledge, and that their knowledge and skills were insufficient for their professional lives. For example, in a study with 128 nurses and midwives, Hannon & Murphy (2007) found that most of them wanted to participate in training on osteoporosis (13). Nurses are key in providing effective health education to the public (5), and have important responsibilities in preventing disease and improving health (5,20). For this reason, there is an urgent need for nursing students to have adequate knowledge of osteoporosis, so that they can use it in their nursing practice and in their roles as educators. Also, Turkey has an aging population, and so having knowledge of osteoporosis must be a nursing priority. The focus in nursing education must be not only on the treatment of diseases but also on improving health and preventing disease (21).

Determination of the risk factors means mak-

ing an early diagnosis and a more effective, easier and more cost effective approach to preventing advanced osteoporosis. For this reason, it is of the utmost importance that nursing students should improve their knowledge of osteoporosis risk factors. The most commonly known osteoporosis risk factors, low consumption of milk products and being in the menopause, were known to most of the nursing students in the study. However, it was seen that osteoporosis risk factors which are less well known, such as in particular being overweight, being a white or Asian woman, surgical removal of the ovaries, and long term cortisone use, were inadequately known to the nursing students. It was stated in a study by Hassan et al. (2013) that students' knowledge of osteoporosis risk factors was very poor (14).

Exercise plays an important role in maintaining bone health. Very few of the students knew that in order to strengthen bones, the IOF recommends a person to carry out weight bearing and resistance exercises for 30 to 40 minutes three or four times a week.<sup>22</sup> Similar findings were encountered in the literature (15,23). As expected, the students knew best that cheese and yoghurt were a source of calcium, but most did not know that green vegetables such as broccoli and fish such as sardines were also a source of calcium. It is important to give this information in particular to people who are intolerant of milk products in order to ensure their dietary calcium intake. The IOF recommends a daily calcium intake of 1200 mg for adults between the ages of 19 and 50, and 1200 mg for post-menopausal women (51 years or more) (24). Only one student in three knew this. In education programs it is neces-



sary to provide up-to-date, alternative information in a correct way alongside classic and well-known information. Vitamin D is an important requirement for the absorption of calcium, and the IOF recommends a daily intake of 800-1000 IU of vitamin D for those aged 50 and above. Only one student in five knew this. In practices aimed at preventing osteoporosis, students must pass this information on to patients and others.

In women, peak bone mass occurs at the age of 30-35, and after that it begins to decline.<sup>3</sup> For this reason, the menopause and post-menopausal periods are late to start measures to prevent osteoporosis. This is because the greater the density of bone mass in early adulthood, the less women will be affected by post-menopausal breakdown. Thus it is important to develop osteoporosis preventive behaviors from an early age. However, only one in four of the nursing students stated that the best time to form strong bones was adolescence. In studies by Berarducci (2004) (21) and Amre et al. (2008) (20) also, most students did not know that bone loss starts in the 30 years old. Similar to this finding, Berarducci et al. (2000), in a study performed with health professionals working in primary health services including nurses, found that they mostly applied osteoporosis risk evaluation and osteoporosis education to women over that age of 50 (25). Passing on this information to nursing students will increase awareness in society of passing on the information to young women.

The education curriculum in nursing training is important in forming students' knowledge and skills (23). It was seen in this study also that as students approached their final year their knowledge of osteoporosis increased. A similar conclusion was reached in a study by Kılıç & Karabulut (2004) (16). Also, it was found in a study by Berarducci et al. (2000) that nurses following an education program on osteoporosis improved their knowledge; their interest in their own bone health increased and their functions in their roles as educators increased (25).

#### *Limitations of the study*

The study was conducted with students of one university in a single city and thus generalizability of the results to students in the country in general is weak.

#### **Conclusion**

Nurses take on responsibilities for the prevention and early diagnosis of osteoporosis in primary prevention, which is the most effective and cost-effective approach to osteoporosis. For this reason, it is of the utmost importance for students, who are the nurses of the future, to fill the gaps in the knowledge which they will feel the need of in helping at-risk groups in society to gain information, awareness and preventive behaviors with regard to osteoporosis. It is felt that improving the educational curriculum in this direction provides a chance to fill this knowledge gap. It is necessary to provide a place for information on the risk factors and preventive behaviors for osteoporosis as well as to its etiology, diagnosis and treatment. It is important to present information on osteoporosis not as a separate topic but integrated in the curriculum. When presenting this information, interactive learning methods such as problem-based learning and simulation-based learning should be chosen.

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