

Female Adolescent Nursing Students' Guidelines about Prevention of Osteoporosis

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Abstract

Osteoporosis is a significant public health problem, The prevalence of osteoporosis among Egyptian population is 10%. It is commonly accepted that development of a higher peak bone mass during adolescent years protects against postmenopausal osteoporosis. Aim of this study was to evaluate female adolescent nursing students' guidelines about prevention of osteoporosis. Quasi-experimental research design was used in this study. Convenient sample consists of 300 of female nursing students. It was conducted in 6 nursing schools in Menofia governorate. Five tools were developed to collect the data: interviewing questionnaire sheet: osteoporosis risk factors assessment sheet, nutritional knowledge assessment sheet, anthropometric measurement sheet (weight and height), and attitude assessment sheet. The results of the study revealed that more than half of the students (57.7%) were from 14-15 years, 44.7% of them had incorrect answer about definition of osteoporosis in pretest compared to only 1% while 32.3% of students didn't know about treatment in pretest compared to 18.3% in posttest. Statistically significant difference about attitude toward osteoporosis. Conclusion, Health education about osteoporosis was successful to improve the knowledge and practice of nursing students as knowledge, attitude and practice improved after sessions of education. They changed their practice based on their knowledge improvement.

Introduction

Osteoporosis is a significant public health problem, The prevalence of osteoporosis among Egyptian population is 10% (1). Childhood is considered a prime time for maximizing one's peak bone mass through modification of lifestyle and environmental factors (2). Females are particularly at risk for the later development of osteoporosis and generally lack healthy lifestyle behaviors that promote growth of bone mass. It is commonly accepted that development of a higher peak bone mass during adolescent years protects against postmenopausal osteoporosis. Commonly osteoporosis is generally discovered in older age, but it is the result of many factors: both modifiable and non-modifiable that impact bone strength beginning in childhood(3).

Osteoporosis has been defined as a progressive systemic skeletal disorder characterized by low bone mass and micro-architectural deterioration of bone tissue, with a consequent increase in bone fragility and susceptibility to fracture (4). The adolescent years are a window of opportunity to influence lifelong bone health. About 40% of peak bone mass in girls is accumulated in this short stage of the life cycle(5). Evidence demonstrates that increasing dietary calcium intake and weight bearing physical activity increase bone mass in children and in adolescents(6).

The most serious complication of osteoporosis is hip fracture, which increases patients' morbidity and mortality rates. The incidence and costs of these fractures and their sequelae will continue to rise as the population ages; by year 2025, costs related to osteoporotic fractures are projected to reach \$25.3 billion in the United States alone (7). Osteoporotic hip fracture usually requires hospitalization and surgery and may result in lengthy or permanent disability or even death.(8)

During childhood and adolescence, much more bone is deposited than withdrawn, so the skeleton grows in both size and density. Up to 90 percent of peak bone mass is acquired by age 18 in girls and by age 20 in boys, which makes youth the best time to "invest" in one's bone health. Hence maximizing peak bone mass during the growing years is extremely important for optimal skeletal health (9).

National Institute of Health suggests that "genetic factors may account for up to 75 percent of bone mass, and environmental factors account for the remaining 25 percent." With that being said, it is important to understand what is considered a risk factor and who is potentially at a higher risk(10). The National Osteoporosis Foundation defines risk factors as "factors that increase the likelihood of developing osteoporosis and broken bones." The risk factors for developing osteoporosis can be divided into five main categories: genetics, medications, chronic conditions, lifestyle, and other(11).

Given the knowledge that high peak bone density reduces osteoporosis risk later in life, it makes sense to pay more attention to those factors that affect peak bone mass (12). Hence maximizing peak bone mass during the growing years is extremely important for optimal skeletal health (13). Although genetic factors (e.g., age, race, family history, and gender) are major determinants of peak bone mass and subsequent bone status (14).

Osteoporosis is one of diseases which are influenced by nutrition and lifestyle, it is preventable by means of adequate nutrition and sufficient physical activity as indicated by Stransky and Rysava(15). Lifestyle habits including calcium intake, general nutrition and weight-bearing exercise during adolescence and early adulthood contribute up to 20% of the observed variation in the attainment of peak bone mass, as well as to the rate of bone loss later in life(16).

Nutrition is among the modifiable factors that influence the risk of osteoporosis and fracture. Also, nutrition have a direct and indirect role: firstly, to maximize bone strength during growth through the amelioration of the peak bone mass, by improving both the protein compartment of bone and the mineralization, and by decreasing the rate of bone loss with ageing; secondly, to maintain the muscle strength by restraining sarcopenia in elderly(17).

Diets deficient in calcium, proteins or vitamin D impair skeletal integrity. The effect of other nutrients is less clear, although an excessive consumption of sodium, caffeine, or fibers exerts negative effects on calcium balance. The deleterious effects of tobacco, excessive alcohol consumption and a low BMI are well accepted(18). Although osteoporosis is an incurable disease, there are several steps that can be taken in order to control bone loss, including healthy nutritional habits (adequate calcium and vitamin D intake), regular physical exercise, and pharmacological treatment(19,20).

Significance of the study:

There is evidence suggesting that knowledge on osteoporosis is a major contributor to osteoporosis preventive behavior. Osteoporosis is a silent disease affecting both females and males, but females are more affected because during puberty bone mass increases more in boys than in girls. The difference appears to be mainly due to a more prolonged period of accelerated growth in males than in females, resulting in a larger increase in bone size. Therefore, adolescence is an important age group at which it can be intervened very well to prevent osteoporosis in the future(21). In order to meet the challenges and threats of osteoporosis, prevention efforts in Egypt need to evaluate female adolescent nursing students' knowledge, attitude, and practice related to osteoporosis.

Aim of the Study:

The aim of this study was to evaluate female adolescent nursing students' guidelines about prevention of osteoporosis.

Research Hypotheses:

1. There will be statistically significant differences among pretest female nursing students and posttest to the same group in relation to their knowledge about osteoporosis.
2. There will be statistically significant differences among pretest group subjects and posttest to the same group in relation to female student nurses' attitude about osteoporosis.
3. There will be statistically significant differences among pretest subjects and posttest to the same group in relation to their practice about osteoporosis.

Subjects and Methods:

Research design: Quasi-experimental research design was used in this study.

Setting: The study was conducted in 6 nursing schools in Menofia governorate(Berkat El-Sabea, Al-Shohada, El-Bagour, Ashmoon, Talah, Menouf).

Sample: Convenient sample (from first, second, third year nursing students). This sample consists of 300 of female nursing students. Participants recruited according the following criteria:

1. Not diagnosed with chronic disease for example: diabetes, anemia, and hypertension.
2. Not previously diagnosed with osteoporosis.
3. Agreed to participate in the study.

Data collection tools:

Five tools were developed to collect the data: interviewing questionnaire sheet: osteoporosis risk factors assessment sheet, nutritional knowledge assessment sheet, anthropometric measurement sheet (weight and height), and attitude assessment sheet. Validity was determined by colleagues from the same department at Menofia University who reviewed these instruments and judged it to measure what intended to be measured (face validity). Experts were also asked to judge the items for their adequacy (content validity). Reliability was assessed by applying the tools twice on 20 students who were excluded from the study.

1-Interviewing Questionnaire: This questionnaire was designed to collect data about student. It consisted of the following:

- a- Socio-demographic data as e.g., age, name, father education and mother education.
- b- Family history: e.g. osteoporosis, and fracture.

2- Osteoporosis Risk Factors Assessment Sheet: This was used to assess risk practice for osteoporosis that increases student's risk for osteoporosis: e.g. exercises, nutrition, and body weight.

3-Nutritional knowledge Assessment Sheet:

The students' knowledge sheet was assessed by using food frequency questionnaire and this was conducted with

special emphasis on foods that have negative or positive effect on bone growth (calcium, phosphorus, protein, and vitamin D).

4-Anthropometrics measurement:

Height and weight were obtained for each student. Height was taken by asking the student to stand in the front of the wall then a mark was taken then by using measuring tape the height was obtained in cm; on the other hand the weight was obtained by asking the student to remove her shoes then step on the weighing scale to measure her weight in kg then the Body Mass Index (BMI) was calculated by the following equation:

$$\text{BMI} = \frac{\text{Weight/ kg}}{(\text{Height/m})^2}$$

5-Students' Attitude Assessment Sheet:

The students' attitude sheet was assessed through:

- 1- Students' attitude toward risk factors for osteoporosis.
- 2- Students' attitude toward seriousness of osteoporosis.
- 3- Students' attitude toward benefits of practice for prevention from future osteoporosis.

Scoring System: The knowledge assessment tools were scored. The score ranged from 0 wrong answers to 1 to correct answers. The total scores of questionnaire were less than 50% was graded as poor, 50% to less than 75% score was graded as average, and more than 75% score was graded as good for knowledge and practice.

Pilot Study:

A pilot study was conducted on twenty students to test the applicability of the tools and to estimate the time needed. On the basis of the pilot study result the researcher determined the feasibility of data collection procedures, developed an interview schedule, and identified the most suitable time to visit subjects. The results of the pilot study helped in refining the interview questionnaire, and to set the final schedule, some modifications were done because of the length of the sheet as it took long time and effort.

Procedure of Data Collection:

Data collection took place from September 2012, till November 2013. Data was collected using five sheets. All sheets applied to each student. The aim of the study was explained to each student in the sample by a simple way. Then, the investigator started an individual interview after each student had arranged the suitable time. The interview lasted about 15-20 minutes. The investigator weighed each student and measured their height to estimate their body mass index. Then medical history was taken. All risk factors for osteoporosis were assessed to identify student. Then the investigator assessed awareness and knowledge of students. Finally the investigator assessed student practice that could be risk factor for the disease.

Administrative Approval: Permission to collect data for this study was obtained from the manager in each school.

Human right protection:

An oral consent to participate in the current study was taken after the purpose of the study clearly explained to each subject. The researcher fully informed each student that she has the full right to withdraw from the study at any time and each one was given the free opportunity to refuse to participate.

Guideline for Students:

A guideline was designed by the researchers according to the actual educational need assessment of the female students.

1. Assessment phase:

The program was designed by the researchers based on results obtained from pre assessment tools. It was revised and modified according to the related literature. Cultural and socio demographic aspect of the study sample were designed to cover female students nurses' knowledge, attitude and practice toward osteoporosis.

2. Program development:

The guideline was in a form of Arabic language to be easy understood for the students. Pretest was given to identify weakness in knowledge to include it in the guideline. The content of the guideline model has information about osteoporosis definition, causes, risk factors, signs and symptoms, food rich in calcium, treatment and prophylactic

3. Implementation Phase:

A clear and simple explanation was offered to students about aim of the study and its expected outcomes. Each student was assessed individually (10-20 minutes) using the previously mentioned tools. The total number of the sample 300 students were divided by 10 students per week. The guidelines were introduced to each student separately 2 sessions /week the total numbers of sessions was 60 sessions. Each session is ranged from 1 - 2 hours. In the first session pre-test was done and objectives of the program were explained to the students. Also, a copy from guidelines was given to each student, then the subject of the session was introduced followed by a period of discussion.

4. Evaluation phase:

The evaluation of the effectiveness the guideline was measured after one month by reassessing the students'

knowledge, attitude and practice by using the same tools.

Limitation of the study:

Large number of the students were too overloaded with their school sessions, and there were many interruptions during the time of answering of questionnaires.

Ethical consideration:

Permission to conduct the study was obtained from the dean of the Faculty and administrator of each school. Verbal consent will be obtained from each participant. The researcher will offer adequate information about the study purposes and its significance. Participation is voluntary. Participants will be assured that their responses would be confidential and information that might reveal their identity would not be recorded, and only aggregated data would be communicated.

Field work:

- Preparation of data collection tools was carried out in a period of two months and from end of September, 2012 to half of December in the same year after revised from experts' opinions, and validity test.
- Once the official permission was granted to proceed with the proposed study, plan for appointment with students to explain the nature & purpose of the study, as well as to discuss the plan of work to ensure their cooperation will be accomplished.
- Data collection was carried out two days/week (Sunday and Thursday) from 8.30 a.m. to 11.30 a.m. For assessment, 30 students / week. Each study subject was interviewed and assessed individually using study tool. The program was carried out in 2 sessions for knowledge, attitude and practice including time for discussion in order to detect any defects. This was done through pre and post administration of an interviewing questionnaire.

Statistical Design:

Data were revised, coded, tabulated and analyzed using numbers and percentage distribution and carried out in a computer SPSS program. The following statistical techniques were used: Percentage ; Qi-Square; Mean and Standard deviation . Also, Paired t-test is used for comparison.

Significance of the Results:

When $p > 0.05$ it is statistically insignificant difference.

When $p < 0.05$ it is statistically significant difference.

When $p < 0.01$ or $p < 0.001$ it is high statistically significant difference.

Results:

Table(1) Socio-Demographic Characteristics of the Studied Sample:

Variable	No	%
Age		
14 -15 years	173	57.7
16 -17 years	102	34
18 years and more	25	8.3
M + SD.	15.4333+1.2849	
Mother Education		
Illiterate	80	26.7
Read and write	105	35
Preparatory education	87	29
University	28	9.3
Father Education		
Illiterate	25	8.3
Read and Write	77	25.7
Preparatory Education	125	41.7
University	73	24.3

Table (1) shows demographics data of studied sample. More than half of the students in the sample 57.7 % have age ranging from 14 to 15 years. The mean age of the students were 15.4333+1.2849. More than one third of their mothers (35%) had read and write. Also, 41.7 % of their fathers had preparatory education.

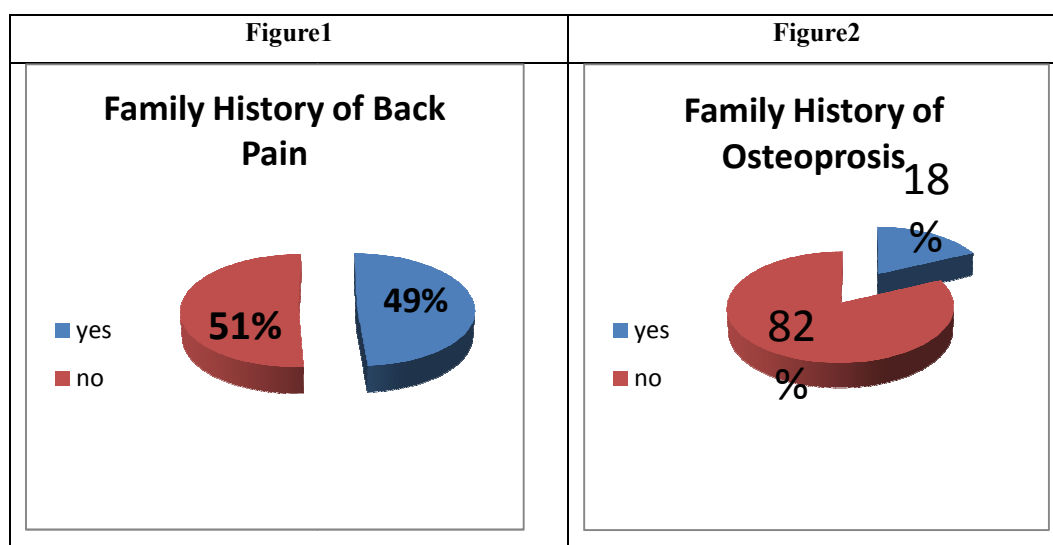


Figure (1) shows that more than half of the students (51%) has no family history of back pain.

Figure (2) shows that majority of the students (82%) had no family history of osteoporosis.

Table (2): Distribution of the Anthropometric Measurements of Studied Sample:

Variable	No	%
Height:		
Less than 150cm	53	17.7
150-160cm	187	62.3
More than 160 cm	60	20
Mean +SD	154.9567 +8.6292	
Weight		
Less than 40 kg	25	8.3
40-80 kg	270	90
More than 80 kg	5	1.7
Mean +SD	52.7633 +10.5473	
Body Mass Index (BMI)		
Under weight (Less than 18.5)	39	13
Ideal weight (18.5- 24.9)	62	20.7
Over weight (25-29.9)	141	47
Obese (30 - or more)	58	19.3
Mean +SD	17.0164+ 3.2046	

Table (2) shows anthropometrics measurement of the students in the sample. Regarding to the height relatively more than the half (62.3%) of the students in the sample their height ranged from 150-160cm. While one fifth of the student's height (20%) were more than 160 cm. The mean height was 154.9567 +8.6292cm. Also, relatively three quarters of the students (90%) their weight ranged from 40-80 kg. The mean weight were 52.7633 +10.5473. The BMI showed that less than half of the students (47%) had overweight, While (19.3%) of the students in the sample were obese with mean BMI was 17.0164+ 3.2046.

Table (3): Assessment of students Pre-& Post Knowledge in the Sample

Variable	Pre Test						Post Test						X2	p-value
	Do not know		Incorrect answer		complete correct answer		Do not know		incorrect answer		complete correct answer			
	No	%	No	%	No	%	No	%	No	%	No	%		
Definition of osteoporosis	101	33.7	134	44.7	65	21.7	49	16.3	3	1	248	82.7	16.158	0.003**
Gender Risk	186	62	94	31.3	20	6.7	21	7	5	1.7	274	91.3	16.396	0.003**
Age Risk	34	11.3	103	34.3	163	54.3	15	5	16	5.3	269	89.6	31.702	0.000***
Signs and Symptoms	144	48	35	11.7	121	40.3	48	16	1	.3	251	83.7	46.925	0.000***
Foods Rich in Calcium	119	39.7	148	49.3	33	11	86	28.7	10	3.3	204	68	14.757	0.005**
RDA of Calcium for Adolescents	41	13.7	250	83.3	9	3	42	14	30	10	228	76	49.747	0.000***
Foods Rich in vitamin D	90	30	135	45	75	25	79	26.3	12	4	209	69.7	14.124	0.007**
Treatment of Osteoporosis	97	32.3	139	46.3	64	21.3	55	18.3	26	8.7	219	73	37.675	0.000***
Prophylactic Factors	103	34.3	150	50	47	15.7	72	24	9	3	219	73	12.188	0.016*

Table (3) illustrates assessment of students pre and post knowledge in the sample. Relatively one third of students (33.7%) do not know definition of osteoporosis in pretest compared to 17.7% of them in posttest with highly statistically significant difference. However 11% of students had complete correct answer about identifying food rich in calcium in pretest compared to 68% in posttest. Furthermore, 32.3% of the students do not know treatment of osteoporosis in pretest compared to 18.3% of them in posttest with highly statistically significant difference.

Table (4): Total knowledge Scores of the Studied Sample:

Variable	Pre Test						Post Test						T-test	P
	Good		Fair		Poor		Good		Fair		Poor			
	No	%	No	%	No	%	No	%	No	%	No	%		
Total knowledge Score	12	4	233	77.7	55	18.3	293	97.7	7	2.3	0	0	51.886	.000***
Mean+ S.D	16.0300+2.7093						24.6967+ 1.17574							

Poor less than 15 Fair=15-22.5 Good=more than22.5

Table (4) shows students total knowledge score. Less than half of the students in the sample (42.3%) had poor knowledge scores in pretest compared to only 0.3% in posttest with highly statistically significant difference.

Table (5): Distribution Mean Attitude Score of Students Toward Osteoporosis:

Variable	Pre Test		Post Test		T-Test	p-value
	M	SD	M	SD		
1.The thought of having osteoporosis scares you.	2.2200	0.8330	2.7967	50.61	10.410	0.000***
2.If you had osteoporosis you would be crippled.	2.3367	0.7866	2.7100	0.5891	7.276	0.000***
3.Your feelings about yourself would change if you got osteoporosis.	2.4067	0.7232	2.7833	0.5329	7.497	0.000***
4.It would be very costly if you got osteoporosis.	2.0833	0.7907	2.8000	0.4769	13.715	0.000***
5.When you think about osteoporosis you get depressed.	2.3967	0.7755	2.8267	0.4516	8.356	0.000***
6.Regular exercises prevents problems that would happen from osteoporosis.	2.1133	0.8105	2.9600	0.2278	13.716	0.000***
7. Regular exercises build strong bones.	2.1133	0.8263	2.9233	0.3127	15.990	0.000***
8. Exercises to prevent osteoporosis also improve the way your body looks.	2.1233	0.8105	2.9600	0.2278	17.170	0.000***
9. Regular exercises cut down the chances of broken bones.	2.1133	0.8384	2.9233	0.2905	16.060	0.000***
10.I feel satisfaction when I practice regular exercises' to prevent osteoporosis.	1.8800	0.8688	2.9300	0.3247	20.547	0.000***
11.Sufficient intake of calcium prevent osteoprotic problems.	1.5733	0.8125	2.9733	0.1614	28.934	0.000***
12. Sufficient intake of calcium lowering the chance of broken bones.	1.5367	0.7942	2.9300	0.2805	29.247	0.000***
13.I think I do not worry from osteoporosis when I intake enough amount of calcium	1.5500	0.7549	2.9167	0.2887	30.039	0.000***
14.Taking enough calcium prevent painful osteoporosis.	1.5600	0.7800	2.9833	0.1282	27.901	0.000***
15.I feeling satisfaction when I intake enough amount of ca to prevent osteoporosis.	1.5300	0.7987	2.9833	0.1282	30752	0.000***

Table (5) represents mean attitude score toward osteoporosis. Students had mean score in pretest $2.1133 + 0.8105$ about regular exercises prevents problems that would happen from osteoporosis compared to $2.9600 + 0.2278$ in posttest. Also, they had mean score $1.5367+0.7942$ in pretest about Sufficient intake of calcium lowering the chance of broken bones compared to $2.9300 + 0.2805$ in posttest with highly statistically significant different.

Table (6): Distribution of Exercises' Practices and Sun Exposure of Students:

Variable	Pretest		Posttest		X2	P
	No	%	No	%		
Practiced Exercises						
Yes	168	56	221	73.7	136.487	0.000***
No	132	44	79	26.3		
Type of Exercises						
Running in place	101	33.7	110	36.7		
Riding bicycle	19	6.3	21	7	732.132	0.000***
basketball	1	0.3	8	2.7		
Walking	47	15.7	82	27.4		
Frequency of Practiced exercises/ week						
Once/week	45	15	31	10.3		
2-4times/week	112	37.3	125	41.7	211.244	0.000***
5-7 time/week	11	3.7	65	21.7		
Duration of Exercise Practice						
Less than 15 mints	80	26.7	57	19		
20-30 mints	82	27.3	135	45	228.045	0.000***
More than 60 mints	6	2	29	9.7		
Exposure to sunshine						
yes	242	80.7	300	100	112.853	0.000***
No	58	19.3	0	0		
Frequency						
little	113	37.7	70	23.3	117.402	0.000***
sometimes	90	30	117	39		
Usually	39	13	113	37.7		

Table (6) illustrates exercises' practices and sun exposure of students. More than half of the students in the sample (56%) practiced exercises in pretest compared to less than three quarters of them (73.7%) practiced it in posttest. While relatively more than one third of the students (33.7%) performing running in place as a type of exercises practiced in pretest compared to 36.7% of them in posttest. Also, more than one quarter of the students (27.3%) performed exercises from 20-30 minutes in pretest compared to less than half of them in posttest (45%) with highly statistically significant difference. Furthermore, 13% of the students usually exposed to sunshine in pretest compared to 37.7% of them in posttest with highly statistically significant difference.

Table (7) pre & post Physical activities & watching T.V\week of students in the sample:

Variable	Pre test		Post test		X2	P-value
	No	%	No	%		
How much watching T.V\week						
Less than 30 mints	56	18.7	77	25.7	344.108	0.000***
1-2 hrs	81	27	116	38.7		
2-3hrs	90	30	73	24.3		
More than 3 hrs	73	24.3	34	11.3		
How much hours of house work \week						
Less than 30 mints	133	44.3	86	28.7	259.999	0.000***
1-2 hrs	90	30	101	33.6		
2-3hrs	48	16	74	24.7		
More than 3 hrs	29	9.7	39	13		

Table (7) show distribution of physical activities & watching T.V\week of students; 18.7% of them in pretest watching T.V less than 30 minutes per week compared to more than one quarter (25.7%) of them in posttest. Also, 28.7% of the students in pretest in making house work compared to 44.3% of them in posttest with statistically significant difference.

Table (8): Distribution of Soft Drinks & Nutritional Practices of Students:

Variable	Pre Test				Post Test				X ²	P
	Yes		No		Yes		No			
	No	%	No	%	No	%	No	%		
Tea intake	115	38.3	185	61.7	102	34	198	66		
one cup/day	42	14			71	23.7				
2-3 times/day	59	19.7			28	9.3			402.141	.000***
4-7 times/day	12	4			2	0.7				
More than 7 times/day	2	0.7			1	0.3				
Mean +SD	0.6800 +.9665				0.4567 +0.7187					
Cola intake	284	94.7	16	5.3	279	93	21	7		
one cup/day	173	57.7			226	75.3				
2-3 times/day	99	33			52	17.3			252.878	.000***
4-7 times/day	10	3.3			1	0.3				
More than 7 times/day	2	0.7			0	0				
Mean +SD	1.3633 + 0.6679				1.1100 + 0.4954					
Increase Daily milk & milk products Intake	278	92.7	22	7.3	296	98.7	4	1.3	10.860	0.001***
Increase vitamin D intake	249	83	51	17	293	97.7	7	2.3	23.984	0.000***
Increase protein intake	193	64.3	107	35.7	278	89.3	22	7.3	17.911	0.000***

Table (8) shows distribution of unhealthy drinks for the students. More than one third of the students (38%) were take tea in pretest compared to 34% with highly statistically significant difference. While the majority of them (94.7%) were take cola in pretest compared to 93% of them in posttest with highly statistically significant difference. Less than two thirds (64.3%) of the students take daily protein in pretest compared to 89.3% of them in posttest with highly statistically significant difference.

Discussion

Osteoporosis has recently been recognized as a major public health problem by some governments and health care providers (22). Nurses have a major responsibility to initiate as well as impart primary and secondary osteoporosis prevention education to patients and the public. (23) Women need to know about osteoporosis prevention when they are young. Especially, adolescent girls have priority to be taught about osteoporosis. Osteoporosis is a preventable disease and many risk factors are modifiable such as calcium intake and physical activity. In addition to getting right knowledge it is also important to enhance adolescent nurse' self-efficacy. For this reason the aim of this study was to evaluate enhancement of an informational booklet for prevention of osteoporosis in terms of knowledge, attitude and practices of nursing students.

Regarding socio demographic characteristics of the participants; more than half of the students (57.7%) were from 14-15 years, Also, more than one third (35%) of mothers read and write and (41.7%) of their fathers had preparatory education. Furthermore, 49% of students had family history of back pain and 18% of them had family history of osteoporosis.

In the present study a significant increase in osteoporosis knowledge about definition, age risk and treatment were detected among them after attending health education sessions. This finding is similar to results reported by other studies of osteoporosis education on youth (24, 25). Other researchers too acknowledged that osteoporosis health education programs are instrumental in improving and enhancing public knowledge among different age groups (26). Also this study is in agreement with (27) who studied the senior nursing students' knowledge of osteoporosis to explore the terminal knowledge of senior nursing students regarding osteoporosis at the end of their baccalaureate programs, found that senior nursing students demonstrated limited knowledge related to the magnitude of osteoporosis, risk factors associated with the disease, detection, treatment and preventive measures. As regards to total knowledge score in the present study, it was significantly increased in posttest than in pretest (t = 42.77, P=.000). This finding is consistent with the study done by (28) who revealed a significant increase (t=15.79, p=0.0001) in knowledge of experimental group after administration of informational booklet. And consistent also with another study conducted by (22) in which pretest and posttest analysis revealed a significant overall increase in osteoporosis knowledge scores among the students after the health education sessions (mean score pretest (t = 9.6, P< 0.001).

In the present study, mean post –test attitude scores of studied group was significantly higher (p<0.000) than the mean pre-test attitude score of comparison group. This finding is consistent with (29) who reported that mean attitude score of case group perceived susceptibility (14.20±4.45), perceived severity (17.24±4.30) was significantly higher (p<0.001) than control group (p<0.001) after the administration of educational intervention. In the present study, the frequency of exercise practice for nursing students 2- 4 times/ week improved from

37.3% in pretest to 41.7 in post test and the duration of exercise from 20- 30 minutes improved from 27.3% to 45% in post test. This finding is agreed with (30) who found that only 18% of young adult women in USA getting three or more times per week "osteoprotective" exercise.

In the present study, expressed practices, sun exposure, and physical activity of the students in the studied sample were significantly improved in post test than pretest ($P < .000$) in experimental group after administration of guidelines. This finding is consistent with study conducted by (31) in which the total OSES (osteoporosis self-efficacy scale) score increased from pretest (mean = 1425.54, SD = 36.11) to post -test (mean = 1629.23, SD = 31.47) and the change was statistically significant ($t = 9.08$, $p < .05$). These results also demonstrate that the participants reported higher overall post-test self-efficacy levels than pre-test. Thus, the study concluded that the osteoporosis educational program positively influenced participants' belief that they could adopt lifestyle behavioral changes, specifically in calcium intake and exercise.

As regards to dairy products as a calcium rich food as increase daily milk & milk products intake (pretest was 92.7% compared to 98.7%) and increase vitamin D intake (pretest was 83% compared to 97.7%); there is highly statistically significant difference from pretest to post test. This is in agreement of study done by (32) who state that the mean estimated calcium intake in the study found to be 470+ 311.5 mg/day. It is obvious the wide range of the intake. It is very lower intake. More than 60% had <50% of their adequate intake and 86.5 % had calcium intake less than their recommendation.

Conclusion:

In conclusion for this study, Health education about osteoporosis was successful to improve the knowledge and practice of nursing students as knowledge, attitude and practice improved after sessions of education. They changed their practice based on their knowledge improvement.

Recommendations:

Based on the result of the study, the following recommendations are proposed:

1. Teach students how to use self assessment for their risk for osteoporosis. Provision of free school meal which contains essential elements to avoid bone loss such as breakfast or cup of milk as a model.
2. Encourage adolescent female students for exposing to sunshine at time of ultraviolet rays.
3. Providing an access to enjoyable physical activity opportunities for students in various socioeconomic backgrounds at their break time at least in the school.
4. Training of nursing students in the following aspects of osteoporosis prevention: a) The type and frequency of physical exercise; b) Diet that increase risk factors of osteoporosis as inadequate intake of calcium, vitamin D, phosphorus, drinking coffee or other low calcium drinks.

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