

Evaluation of Health Education Program on Knowledge, Attitude and Practice of Female adolescents regarding Osteoporosis Prevention

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Abstract: Background: Osteoporosis is a growing chronic health problem that could result in mortalities and poor living quality. The most effective prevention of this disease is founded during childhood and adolescence when the prevention is actually the easiest. **Aim & design:** This study aimed to evaluate the effect of health education program on knowledge, attitude and practice of female adolescents regarding osteoporosis prevention. The design of the study was Quasi-experimental. **Subjects & setting:** A purposive Sample of one hundreds (100) female adolescents in the 1st year of technical institute of nursing were included in this study. **Tools:** Data were collected through two tools; 1) Self-administered questionnaire to assess female adolescents' general characteristics, their knowledge and practices regarding osteoporosis prevention, 2) Likert attitude scale, in addition to supportive material of Arabic instructional booklet, and educational video. **Results:** The study revealed that there were statistically significant differences between the pre intervention program compared to post intervention in female adolescent knowledge, attitude and practices regarding osteoporosis prevention. **Conclusion & recommendation:** The study concluded that health education program has a positive effect on enhancing female adolescent students' knowledge, attitude and practices regarding osteoporosis prevention. The researchers recommended that, Educational programs regarding osteoporosis should be included as components of adolescence education curriculum as active steps to increase awareness of osteoporosis prevention through schools, community, and cultural groups. **Further** studies are needed to evaluate the effect of health promotion program regarding osteoporosis prevention on other female age groups. **Keywords:** Health education program, Osteoporosis prevention, Adolescent.

Date of Submission: 27-02-2019

Date of acceptance:13-03-2019

I. Introduction

Osteoporosis, a common bone disease and a major public health concern around the world, is characterized by low bone mass and degenerative changes to skeletal bone tissue microstructures [1]. The perception that osteoporosis is an older person's disease is an erroneous one. Osteoporosis does not discriminate by age; in fact, it is a geriatric disease with an adolescent onset. 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 [2].

Adolescence is a period of significant growth and change. It is a critical time for bone development, mineralization and the attainment of a peak bone mass. At this age there are several controllable and uncontrollable risk factors which increase the predisposition to osteoporosis. The uncontrollable factors include gender, family history, ethnicity and race, advancing age, postmenopausal status and small boned body build. Controllable risk factors include sedentary lifestyles, poor nutrition including eating disorders, low calcium intake, caffeine consumption and replacing milk with non dairy drinks such as fizzy drinks. Excessive consumption of carbonated and caffeinated drinks is believed to impair calcium absorption and increase its loss through the kidneys, cigarette smoking, and alcohol abuse [3].

Osteoporosis leads to a wide range of complications. The most common complication is fractures. Other possible complications include loss of height, kyphosis, negative body image, back pain, chronic pain syndrome, , reduced quality of life and increased morbidity and mortality [4]. Nevertheless, osteoporosis is a preventable disease, and primary prevention should begin as soon as possible because a rapid increase in bone density occurs at a young age [5, 6].

Osteoporosis prevention is of paramount importance worldwide. Although osteoporosis begins in childhood, it does not manifest until later in life. Early intervention to encourage health life style through correct

or balance diet and regular physical exercise in adolescence has an important role in reducing or eliminates risk of osteoporosis [7]. Diet should contain micronutrients as calcium, magnesium, phosphorus, sodium, potassium, various trace elements, vitamins and macronutrients as protein and fatty acids are important elements to prevent the risks of bone fractures, these nutrients and food ingredients have a positive impact on bone health [8]. Physical activity is the greatest important role that improving strength of bone, flexibility of joint, minimize incidence of fracture in people at high risk, weight bearing exercise as walking is the best example, three or four time per week for 30 minute has a positive effect in reducing osteoporosis[9].

Adolescents usually do not believe that they are at risk for the osteoporosis. Based on recent research, considerable numbers of adult females are unaware about osteoporosis, which indicated that there is deficiency in knowledge and poor application of the preventive actions; therefore, health education is needed to improve awareness and motivating healthy behaviors [7]. Early assessment and prevention programs should start at an early age to avoid the behavioral risk factors, so great responsibility rests with the nurses to contribute in prevention of osteoporosis [10].

Significance of the study

Bone is a dynamic tissue that is renewable throughout life, especially in the first two decades of life. The renewing rate estimated at 20% in children and about 3% to 5% in adults [11]. In order to protect the body bone strength and mobility have to be increased; bones can act as repository of calcium, phosphorus and other ions necessary for the homeostatic functioning [12]. However, osteoporosis threatens bone strength throughout life.

The world health organization declared osteoporosis as one of the four main enemy of mankind along with cancer, heart attack and stroke [13]. This disease is the most common metabolic bone disease characterized by decreased bone mass and deterioration of bone tissue, and thus the bones are thin and prone to fragility [14]. The risk of mortality from osteoporosis is equal to the risk of mortality from breast cancer and about four times greater than the risk for uterine cancer [13].

The origins of the disease can begin early and are often related to lifestyle choices made during adolescence and young adulthood. Studies reveal that adolescent diets are frequently lacking in calcium intake and levels of physical activity are lower than is recommended, these are two lifestyle factors that can help to improve bone density especially during this crucial age. Education on these factors can contribute significantly to reducing the risk of developing osteoporosis [14].

Numerous studies demonstrate a general lack of knowledge regarding osteoporosis risk factors and preventive behaviors among adolescent. Public awareness of osteoporosis is crucial but remains low, especially in less-developed countries, in which educational interventions have been implemented, knowledge levels have altered positively; there was always a corresponding change in beliefs, attitudes or undertaking of preventive behaviors [15]. So the current study will be done to evaluate the effect of health educational program on knowledge, attitude, and practice of female adolescent regarding osteoporosis prevention.

Aim of the Study

This study was aimed to evaluate the effect of health education program on knowledge, attitude, and practice of female adolescents regarding osteoporosis prevention. This aim was achieved through:

- Assess female adolescents' knowledge, attitude, and practice regarding osteoporosis prevention.
- Developing and implementing health education program regarding osteoporosis prevention for female adolescents.
- Evaluate the effect of intervention on knowledge, attitude, and practice of female adolescent regarding osteoporosis prevention.

Research hypothesis: health education program will enhance knowledge, attitude, and practice of female adolescent regarding osteoporosis prevention.

Subjects and methods:

Quasi-experimental study design regulated by a pre-test and a post-test was used .The study was conducted at technical institute of nursing, faculty of nursing Ain Shams University, A purposive sample one hundreds (100) female adolescent in the 1st year of technical institute of nursing were included in this study during first semester in the academic year 2017-2018. Participants recruited according the following:

Inclusion criteria;

- Age ranging from 17 to 19 years.
- Agreed to participate in the study.

Exclusion criteria:

- Having a known diagnosis of osteoporosis.
- Having a chronic disease, such as renal failure, heart disease or diabetes mellitus.
- Being Pregnant.

Tools of data collection: Two tools were used for data collection related to this study in addition to Arabic educational booklet and educational video regarding osteoporosis prevention.

1) Self-administered questionnaire: it was developed by the researcher based on literature review and adapted from (16, 17); it consisted of 32 questions; covering three parts as the following: ;

Part (I): Included assessment general characteristics of the study sample as age, marital status, qualification, place of residence , previous training courses regarding osteoporosis) (6 questions).

Part (II): It was designed to assess female adolescents' knowledge regarding osteoporosis as (definition, type, risk factors, symptoms, complications, and prevention). (10 questions)

Scoring system:

Each question was scored as one for correct answer and zero for incorrect answer. The score was ranged from zero to ten; students' total score was classified as follows;

- Poor: (< 50%) Score (0-4)
- Average: (50-74 %%) Score (5- 7)
- Good: (≥75%) Score (8-10)

Part (III): It was designed to assess female adolescents' practices towards osteoporosis prevention as (healthy diet, practice exercise, exposure to sunshine) (16 questions)

Scoring system:

The scores of items ranged as: the complete correct answer takes 2 degrees, the incomplete correct answer takes 1 degree, and the incorrect answer or don't know takes scored zero. The total score ranged between (0-32).

The female adolescent total practices scores were classified as the following:

- Unsatisfactory: (<60%) Score (0-18).
- Satisfactory: (≥60%). Score (19-32).

2) **Likert attitude scale adopted (18):** It was used to assess female adolescents' attitude regarding osteoporosis prevention. It contains 19 statements and is rated by the three-point Likert scale; “agree”, “disagree”, “uncertain” total score ranged between (0- 57) .The total attitude score was classified as the following;

- Positive: (≥70%) corresponding (40-57).
- Negative: (<70%) corresponding (0-39) .

Supportive material: it included;

A) Arabic educational booklet: it was developed by the researcher based on recent literature review. It was designed by the researchers using simple Arabic language and different illustrative pictures in order to facilitate for female adolescent to understand its contents. It consists of two parts; **the first part;** concerned with providing the female adolescent an essential information regarding osteoporosis which included concepts and definition, risk factors, causes, clinical manifestations, diagnosis, complications and management . **The second part;** focused on knowledge about preventive measures for osteoporosis as proper diet, follow regular exercise, exposure to sunshine and avoidance of unhealthy behavior as alcohol consumption, and tobacco use. **The third part** including myths related to osteoporosis.

B) Educational Video regarding healthy behaviors that prevent osteoporosis among female adolescent.

Validity and reliability:

Tools were evaluated for face and content validity by 5 experts from the staff of Faculty of Nursing& medicine, in maternity-gynecological nursing, medical surgical, orthopedic & public Health departments. Their comments were considered. **Reliability** was measured using Cronbach's' Alpha coefficient test; the results were 0.780 for the first tool and **0.820** for the second tool.

Ethical considerations:

Ethical approval from the Scientific Research Ethical committee in Faculty of Nursing at Ain Shams University was granted before starting the study, Informed consent obtained from participants after explaining the purposes

of the study, no harmful methodology used with participants, each participant had right to withdrawn from the study at any time, Human rights were used, data would be confidential and using coding system for data.

Administrative design:

An official approval were issued form dean of Faculty of Nursing, Ain Shams University to the director of technical clinical institute, Ain Shams University explaining the aim of the study to get the permission for data collection.

Preparatory phase: It included reviewing of local and international related literature about the various aspects of the research problem. This helped researcher to be acquainted with the magnitude of the problem, and guided her to prepare the required data collection tools, then the researcher tested the validity of the tool through jury of expertise to test the content, knowledge, accuracy and relevance of question for tool. Also preparing and designing of educational aids used by researchers during intervention as Arabic booklet, educational video and lecture about osteoporosis and its prevention was done during this phase.

Pilot study: A pilot study was carried out on 10% of the study sample. It was done to evaluate the efficiency and content validity of tools to find the possible obstacles that might face during data collection. The necessary modifications were done based on the pilot study findings such as (omission of some questions from tool). The pilot sample was excluded from the current study subjects, to avoid sample contamination.

Implementation phase:

Field work description:

- The researchers visited the study settings for 4 days per week until the completion of the pervious predetermined sample size. The data were collected through a period of 4 months, October 2017 to January 2018.
- The researchers classified students into 4 groups; each group included 25 students.
- Educational program was implemented for 4 sessions for each group each session ranged from 60- 90 minutes with one week interval at class room in the technical institute of nursing Ain Shams University at the end of the day after finishing their academic sessions from 1 pm until 2.30 pm afternoon, and session schedule was 4 days/week.

Program Sessions:

First session (assessment session)

At the beginning, the researchers introduced themselves to the participants and they explained the aim and tools of data collection of the study for them and reassure them that information collected would be treated confidentiality and that would be used only for the purpose of the study. Then verbal & written consent of participant was obtained.

- The researchers distributed a self-administered questionnaire to assess participants' personal characteristics, their knowledge regarding osteoporosis, and their practices towards osteoporosis prevention using **self-administered questionnaire (tool one)**. It took about 30-40 minutes to be filled by each participant.
- Then the researchers distributed the **Likert attitude scale (tool two)** to assess participants' attitude regarding osteoporosis prevention. It took about 10-15 minutes to fill by each participant.

Second session:

- The aim of this session was to increase awareness of the participants regarding osteoporosis disease including concept; prevalence; risk factors; symptoms, complications, diagnosis, treatment. This was achieved through lecture presented by the researcher through power point presentations, group discussion, and brain storming.

Third session:

- The researchers presented and explained strategies for osteoporosis prevention among adolescent including healthy diet "diet rich in Calcium and vitamin D, important of regular exercises, exposure to sun shine and avoidance of unhealthy habits and behavior as smoking, alcohol, cola and caffeine intake. The researcher used lecture, group discussion, questions and answers, role play, brain storming, and PowerPoint prepared by researchers.

Fourth session:

- The researcher displayed the educational video regarding healthy behavior about osteoporosis prevention for the participants. It lasted for 30 minutes.
- Then researchers implement 5 different scenarios through role play about osteoporosis prevention and ask each student to discuss her ability for dealing effectively in role play situations.
- At the end of this session the researcher summarized all important points regarding osteoporosis prevention and they distributed the educational booklet for all the participants and informed them about the follow up date after two months.

Evaluation phase:

- Adolescent female students were assessed after two months (follow up) for their knowledge, attitude and practices regarding osteoporosis prevention by researchers using the same tools of data collection used in pre intervention stage.
- The effect of health education program was evaluated by comparing female adolescents' knowledge, attitude, and practice towards osteoporosis prevention before and after two months of intervention by using the same tools.

Limitation of the study:

- One of the limitations was the lack of suitable audiovisual facilities to conduct optimum education in at technical institute of nursing.

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, r test is used for correlation

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): Shows that (80%) of studied sample were more than 18 years with the mean age 19.07 ± 0.7 , (60%) of them were from rural area, (98%) of studied sample were single, (96%) of studied sample had secondary education and (30%) of studied sample were attended training courses regarding osteoporosis.

Table (2): Clarifies that; (41%) of studied sample had correct knowledge about types of osteoporosis in pre intervention compared to (84%) of them in post intervention with highly statistically significant difference, However (55%) of studied sample had correct knowledge about risk factor of osteoporosis at pre intervention reached to (82%) at post intervention. Meanwhile, (54%) of studied sample had correct knowledge about symptoms of osteoporosis's at pre intervention reached to (88%) at post intervention. Furthermore (44%) of them had correct knowledge about preventive measures of osteoporosis at pre intervention increased to (88%) at post intervention with highly statistically significant differences ($P < 0.000$).

Table (3): Shows highly statistically significant improvement in total knowledge score of female adolescent regarding osteoporosis at post intervention program compared to pre intervention. As, (28% & 20%) of female adolescent had good and poor total knowledge scores, respectively at pre intervention compared to (87% & 3%) at post intervention ($P < 0.000$).

Table (4): Illustrates female adolescents' practices towards osteoporosis prevention, it revealed that (68%, 66%) of the studied sample had diet rich in calcium and vitamin D, respectively during pre intervention program reached to (92% & 88%) post intervention with highly statistically significant difference $P < 0.000$. (83%) of studied sample were take Cola pre intervention as compared to (58%) post intervention with highly statistically significant difference $P < 0.000$. Regarding to practices' exercises and sun exposure of the studied sample, (56%) of the studied sample practices exercises before intervention program reached (72%) at post intervention. Furthermore, 22 % of the studied sample usually exposed to sunshine at pre intervention program compared reached to 80 % at post intervention with highly statistically significant differences $P < 0.000$

Table (5) & figure (1): Reveals that highly statistically significant improvement in total practice score of female adolescents towards osteoporosis prevention at post intervention program compared to pre intervention. As 55% of the studied sample had satisfactory total practice score pre intervention program reached to (88%) at post intervention, while (45%) of them had unsatisfactory total practice score at pre intervention as compared to (12%) at post intervention (P <0.000).

Table (6) & Figure (2): Presents that, there was highly statistically significant improvement in total attitude score of female adolescent regarding osteoporosis prevention at post intervention program compared to pre intervention. As (78%) of studied sample had positive attitude regarding osteoporosis at post intervention as compared to (52%) at pre intervention (P <0.000).

Table (7): Presents a statistically significant positive correlation between total studied sample knowledge score and total studied sample practices score and attitude regarding osteoporosis prevention p < 0.05.

II. Results

Table (1): Frequency distribution of the studied sample according to their general characteristics: (n=100)

General characteristics	%
≤ 18	20
>18	80
Mean ±SD	19.07 ± 0.7
Residence	
Rural	50
Urban	50
Marital status	
Single	98
Married	2
Qualification	
Diploma	4
Secondary	96
Previous training courses regarding osteoporosis	
Yes	30
No	70
If yes, place of training	
Private	53.4
Government	46.6

Table (2): Frequency distribution of the studied sample according to their knowledge regarding osteoporosis before and after intervention program: (n=100)

Adolescents' knowledge regarding osteoporosis	Pre intervention		Post intervention		X ²	P value
	Correct		Correct			
	No	%	No	%		
Meaning	60	60	80	80	9.52	0.002*
Types	41	41	84	84	39.44	0.000**
Causes	55	55	82	82	16.89	0.000**
Symptoms	54	54	88	88	28.07	0.000**
Complications	66	66	80	80	4.97	0.026*
prevention	44	44	88	88	43.14	0.000**

Table (3): Total Knowledge score of the studied sample regarding osteoporosis before and after intervention program: (n=100)

Adolescents' Total knowledge	Pre intervention		Post intervention		X ²	P value
	No	%	No	%		
Poor	20	20	3	3	59.87	0.000**
Average	52	52	10	10		
Good	28	28	87	87		

**highly statistically significant

Table (4): Frequency distribution of the studied sample according to their practices towards osteoporosis prevention before and after intervention program: (n=100)

Adolescents' practice regarding osteoporosis prevention	Pre intervention		Post intervention		X ²	P value
	No	%	No	%		
Take diet rich in calcium						
Yes	68	68	92	92	18.0	0.000**
No	32	32	8	8		
Take milk products						
Regularly	43	43	66	66	10.92	0.004*
Irregularly	54	54	26	26		
Never	3	3	8	8		
Take diet rich in vitamin D						
Yes	66	66	88	88	14.12	0.000**
No	34	34	12	12		
Cola intake						
Yes	83	83	58	58	15.03	0.000**
No	17	17	42	42		
Tea and coffee intake						
Yes	74	74	54	54	8.68	0.003*
No	26	26	46	46		
Practiced Exercises						
Yes	56	56	72	72	4.85	0.028*
No	44	44	28	28		
If yes :						
-Regular	20	20	42	42	6.45	0.011*
-Irregular	36	36	30	30		
Exposure to sunshine						
Yes	80	80	94	94	8.66	0.003*
No	20	20	6	6		
Duration of sun exposure						
Usually	22	22	80	80	67.34	0.000**
Sometimes	28	28	12	12		
Little	30	30	2	2		

Table (5): Total Practices score of the studied sample regarding osteoporosis Prevention:

	Pre intervention n=100		Post intervention n=100		X ²	P value
	No	%	No	%		
Unsatisfactory	45	45	12	12	26.72	0.000**
Satisfactory	55	55	88	88		

**highly statistically significant

Figure (1): Total Practices score of the studied sample regarding osteoporosis prevention before and after intervention program: (n=100)

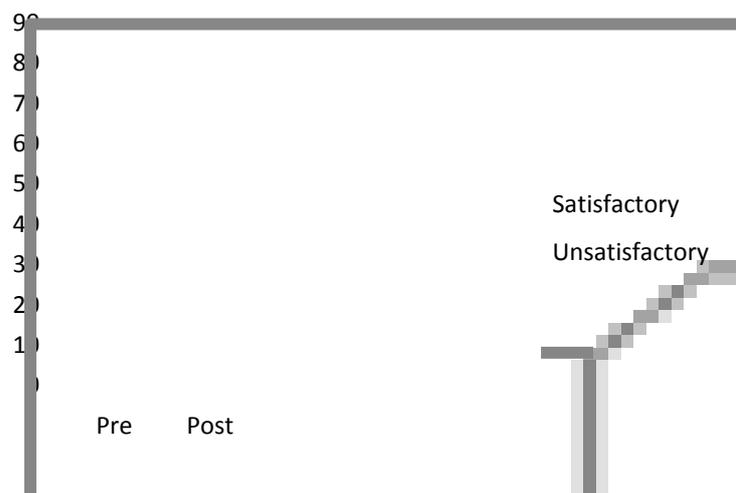


Table (6): Total attitude score of the studied sample regarding osteoporosis prevention before and after intervention program:

Total attitude Levels	Pre intervention		Post intervention		Chi Square χ^2	P-value
	No	%	No	%		
Negative	48	48	22	22	14.86	0.000**
Positive	52	52	78	78		

Figure (2): Total attitude score of the studied sample regarding osteoporosis prevention before and after intervention program:

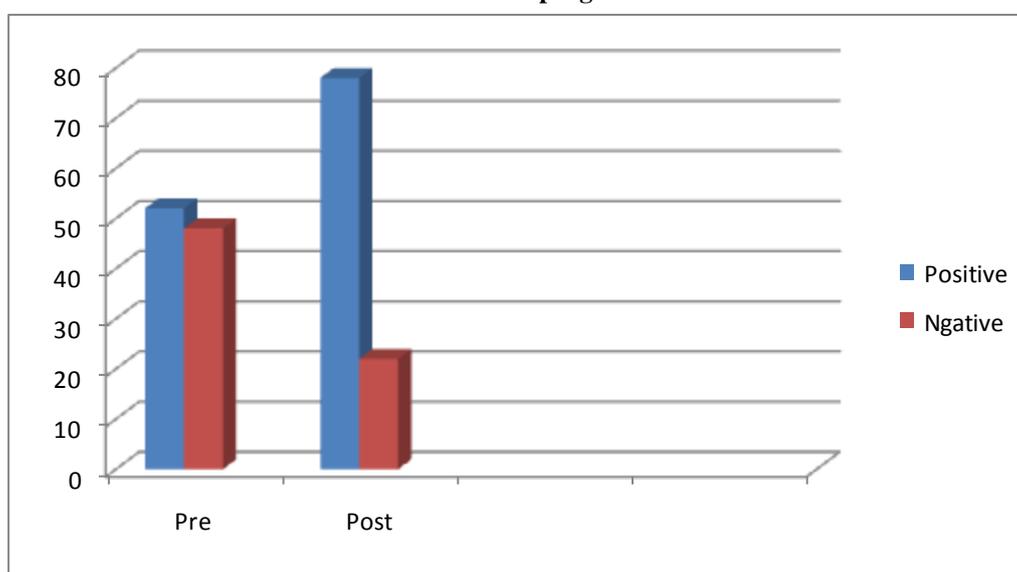


Table (7): Correlation between adolescents' total knowledge and their total practice and total attitude score regarding osteoporosis prevention at Pre and Post intervention program:

Adolescents' Knowledge	Adolescents' Practice				Adolescents' attitude			
	Pre		Post		Pre		Post	
	r	p	r	p	r	p	r	p
Pre	0.175	0.483	-	-	0.098	0.499	-	-
Post	-	-	0.861	0.035*	-	-	0.762	0.040*

*Statistically significant difference

III. Discussion

Osteoporosis is a serious public health. Since the majority of bone mass occurs during adolescence, primary prevention is important. Probably participation in health education interventions leads to promote health behaviors in adolescents [7]. The current study was handled to evaluate the effect of health education program on knowledge, attitude, and practice of female adolescents regarding osteoporosis prevention.

Concerning Adolescents' knowledge regarding osteoporosis, the present study showed significant improvement in the knowledge of female students as regards osteoporosis risk factor, types, symptoms, and prevention before and after the intervention program. This result was in agreement with a study conducted in Saudi Arabia [16] which reported that there is a significant difference between knowledge on risk factor, exercise, calcium-containing food and total knowledge on osteoporosis before and after the intervention program; this was in agreement with a study conducted by [19], who found a significant increase in overall osteoporosis knowledge in the studied group after attending health education sessions this agreement support the evidence that developing and implementing health education programs have been shown to be effective in improving knowledge and awareness among the public and in retaining the knowledge over time.

Contrary to our findings and according to (20), who investigated Osteoporosis knowledge among female school students in Jordan showed that no health education program is perfect in all aspects. Some areas of osteoporosis knowledge such as fracture risk factors, osteoporosis diagnosis, and treatment of osteoporosis

and fracture pain did not show significant differences between the pretest and posttest scores, indicating a need to focus on these areas on future osteoporosis education program as well as adopting need-focused education program. They explained their findings as methodological problems related to pretest–posttest designs.

In order to meet the challenges and threats of osteoporosis, prevention efforts need to be geared to young girls and women. In this regard, and **not similar** to our study findings, defective knowledge about preventive measures for osteoporosis was observed in a study done by (21) as regards to eating diet rich in calcium and vitamin D and also regarding limitation of the intake of tea and coffee. This was in an agreement with (22) from Canada who reported significant knowledge deficit in the areas of osteoporosis consequences and prevention.

In a study by (23), on knowledge, attitude, and preventive behavior among the females around age of peak bone mass in Bangkok, it was observed that the majority of women showed good knowledge on osteoporosis after educational program, this was in **the same** line with our study finding clarified the positive effect of educational program on improving adolescent females knowledge regarding osteoporosis.

The current result was constantly with study done by (24) who revealed that adolescent had limited knowledge of osteoporosis, and it improved after introduction of educational program using video assisted teaching material. Thus, along with other modalities of sensitization such as educational booklet and counseling, video assisted teaching method is an effective mode of increasing the awareness on osteoporosis. Making the vulnerable aware of the disease using various modalities such as video assisted teaching to bring about a reduction in the risk factors of osteoporosis and enhance the quality of life.

Regarding female adolescents' practices towards osteoporosis prevention, the present study illustrated that more than two thirds of the studied sample had diet rich in calcium and vitamin D, pre intervention program and this practice was improved to nearly the majority of them after intervention with highly statistically significant differences. Cessation of unhealthy diet is an averting factor in osteoporosis prevention especially for adolescent age, the current study showed a modification in adolescent females diet in form of significant reduce in cola intake after educational program, that improvement support the positive enhancement of program used by researcher regarding adolescent practices modification.

Enhancement of healthy practice behavior as physical activity and exercise is important factor in improving adolescence health, as regular physical activity would eventually lead to maximizing the bone mass and preventing osteoporosis[9], **concerning** practices' exercises and sun exposure among studied sample, there was as significant improvement after implementing educational program. with highly statistically significant difference & reveals that highly statistically significant improvement in total practice score of female adolescents towards osteoporosis prevention at post intervention program compared to pre intervention. As the majority of adolescent females had satisfactory total practice score toward prevention of osteoporosis at post intervention.

The current result was constantly with study done by (24) who found that the majority of the studied sample knew that exposure to the sun is good for bone and this agreed with (21) who found that usually 10-15 minutes exposure of the hands, arms and face two or three times a week is enough to satisfy the body's vitamin D requirement. Also and similar to our study finding a study done by (25) on Early Osteoporosis Prevention in the adolescent: used an educational module to teach adolescents of middle-school age how to build strong bones through diet modification and increased physical activity. Programs have already shown some success in changing adolescent dietary and physical activity behavior.

Consistent with results of present study, a study done by (26), Showed better education program had a positive impact on preventive strategies regarding self care practices. Almost half of the students participating in the program reported continued dietary changes one month after the study was completed, this was **Contrary** to present study findings and agreed with (21), whom conducted a study on knowledge practices and prevention among female adolescent in El-Minia, Egypt, the study reveals lack of awareness about osteoporosis among female adolescents after intervention, this difference may be due to differences in subject criteria between two studies and different socio cultural factor between two settings, hence the findings highlight the need for educational interventions to promote female adolescents' knowledge about osteoporosis.

In a study done by (22) the practice of female students in secondary schools showed significant improvement in healthy and nutritional practice and regular exercises before and after the intervention program. This result was similar to our study findings and in agreement with that of [23], who mentioned that, an individual's dietary behavior can be altered by increasing their knowledge and changing internal beliefs. Moreover, they mentioned that interventions that focus on osteoporosis awareness, calcium self efficiency, health motivation, as well as overcoming personal barrier to calcium intake, may be the most effective methods for osteoporosis prevention. They also reported that adolescent osteoporosis preventive behaviors (e.g. daily calcium intake, daily physical activity time, and sun exposure time) were improved significantly after the intervention.

The present study showed a significant improvement in adolescent females attitude toward osteoporosis prevention as more than three quadrants of studied sample had positive attitude regarding osteoporosis prevention at post intervention as compared to half of them at pre intervention, with highly statistically significant differences between them, this improvement support the evidence that adolescence age is a period of changing attitude, especially that was based on interesting and accepted education programs as used by researcher. This was in similarity with a study done by (22) that showed significant improvement in the attitude of female students as regards importance of Ca-containing food and barriers to have Ca, healthy intentions, attitude toward the disease, and regular exercises and barriers to exercise before and after the intervention program. This result was in agreement with the study conducted by [24], who found that a health belief model based intervention increases girls' perception about osteoporosis susceptibility and seriousness after the intervention showed that more than two-third of the adolescents had a positive view of health after intervention. This finding was in agreement with that of. [25], who mentioned that a health belief model based education increases the average score of perceived susceptibility and increases perception about seriousness of osteoporosis and motivates positive view of health.

An important key finding reported in the present study was that there was positive correlation between knowledge and adolescent practices, attitude towards osteoporosis prevention, this finding was not in the same line with a study done by (26) found no significant correlation between osteoporosis knowledge and beliefs, and calcium intake and physical activity. Knowing about a problem does not necessarily promote behavior change to avoid the problem.

The previous findings were not in the same line with (21) that showed no relationship between student knowledge related to osteoporosis and practices to prevent it, according to researchers, exercise and walking program can help build stronger bones and muscles and can be used to increase strength, flexibility and balance., students knew that regular exercise can protect against osteoporosis, but this knowledge does not translate to practices; nearly one-half of the students were exercising at a minimal level and not on regular basis.

According to the current study findings health education program had a positive effect on female adolescents regarding osteoporosis prevention in form of knowledge, attitude and practices, this was similar to an Interventional Study for Osteoporosis Prevention among Female Employees of Faculty of Medicine, Ain Shams University done by (27) concluded that the health education intervention was effective in increasing knowledge, attitude and practice as regards osteoporosis prevention. These findings were **contrary with study done by (28)** the findings from this study indicate that knowledge, attitudes and related health behavior concerning osteoporosis among nursing students before internship practice in China may be inadequate and that there are considerable gaps in their existing knowledge, especially in the aspects of preventive and treatment. The discrepancy among different study results could be explained by the difference in the sampled populations, and also the differences in the data collection tool.

On conclusion the present study emphasized that implementing educational programs based on needs and interest could improve adolescent females knowledge, attitude and practices regarding osteoporosis prevention that results approved the research hypothesis, Osteoporosis being a major public health entity; still, there is no health program launched to create awareness among the target population for its prevention, which should draw attention of public health researcher and policymakers about a rethink. There is a great need for more research with various samples and different age groups when exploring osteoporosis among female adolescents. The challenge remains in turning knowledge gained from health education into lifelong practices and adopting new health behaviors.

IV. Conclusions

The study concluded that health education program is effective on enhancing female adolescent' knowledge, attitude, and practices regarding osteoporosis prevention, these research findings proved the research hypothesis.

V. Recommendations

In the light of the results of present study, the following recommendations are suggested:

- Educational programs regarding osteoporosis should be included as components adolescence education curriculum as active steps to increase awareness of osteoporosis prevention through schools, community, and cultural groups.
- There is a need to implement public health measures to improve recognition and knowledge of osteoporosis and its repercussions.
- Health promotion program regarding osteoporosis prevention should be published through mass media
- **Further** studies are needed to evaluate the effect of health promotion program regarding osteoporosis prevention on other female age groups.

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Amal Fathy Mohammed. " Evaluation of Health Education Program on Knowledge, Attitude and Practice of Female adolescents regarding Osteoporosis Prevention" .IOSR Journal of Nursing and Health Science (IOSR-JNHS), vol. 8, no.02 , 2019, pp. 35-45.