Effect of Health Promotion Program on Improving Physical Activity among Post- Menopausal Women with Osteoporosis

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Abstract

Aim: This study was aimed to investigate the efficacy of health promotion program on improving physical activity among post - menopausal women with osteoporosis. **Research design:** quasi-experimental intervention study design was used. **Setting:** this study conducted at women's health center in Nasser institute hospital in Egypt. **Subjects:** simple random sampling technique was used to recruit 100 post- menopausal women diagnosed with osteoporosis in the study. **Tools of data collection:** three tools were used for data collection; an interviewing questionnaire sheet, Osteoporosis Knowledge Test, and global physical activity questionnaire. **Results:** There is no statistical significant difference between post-menopausal women in both groups regarding their socio-demographic characteristics. There was a statistical significant improvement on total level of knowledge and physical activity regarding osteoporosis after intervention and at follow up (p= 0.001). **Conclusion:** The findings of the current study supported the hypothesis of this study which stated that application of health promotion program had positive effect on improving physical activity among post-menopausal women with osteoporosis. **Recommendation:** based on the finding of the current study the following recommendation is suggested application of physical activity program for post-menopausal women with osteoporosis to prevent osteoporosis complication.

Keywords: Osteoporosis, Post- menopausal women, Health promotion, Physical activity.

Introduction

Osteoporosis is the most common disease of bone and is characterized by low bone mass, deterioration of bone tissue, and compromised bone strength, leading to bone fragility and fractures. Osteoporosis may be due to too little bone formation or excessive bone loss **(National Institutes of Health Osteoporosis and Related Bone Diseases National Resource Center, 2014).** Osteoporosis referred to as severe bone loss, and osteoporosis in the presence of one or more fragility fractures is referred to as severe osteoporosis **(World Health Organization, 2016).**

Osteoporosis is estimated to affect 200 million women worldwide and causes more than 8.9 million fractures annually **(the International Osteoporosis Foundation, 2013)**. In 2014, the National Osteoporosis Foundation estimated that a total of 54 million adults aged 50 and older in USA are affected by osteoporosis and low bone mass. In Europe, in 2010 approximately 22 million women and 5.5 million men aged between 50 and 84 years are estimated to have osteoporosis **(Wright et al., 2014).** Middle East and Africa showed high prevalence of hypo-vitaminosis D as well as high fracture rates **(Hernlund et al., 2013).**

While, In Egypt based on different studies, it has been calculated that 53.9% of postmenopausal women have osteopenia and 28.4% have osteoporosis **(Taha, 2015).** Furthermore, **Salem et al. (2000)** reported that 16.7% of 1190 Egyptian menopausal females had lumbar osteoporosis.

Osteoporosis is either primary or secondary of which the primary type is the

commonest form **(Compston et al., 2013).** It is observed mainly in postmenopausal women in the form of postmenopausal osteoporosis. Secondary osteoporosis is a complicating feature of its primary cause. There are several factors associated with higher risk of osteoporosis. Osteoporosis is an under-diagnosed disease. Yet prevention is better than treatment and osteoporosis is a preventable disease; the first step in its prevention is to increase the awareness of the risk factors **(Sayed et al., 2015).**

Moreover, Osteoporosis may limit mobility, twenty percent of seniors who break a hip die within one year from either complications related to the broken bone itself or the surgery to repair it. Many patients require long-term nursing home care **(El-Tawab et al., 2015)**. It is responsible for two million broken bones and $19 billion in related costs every year. By 2025, experts predict that osteoporosis will be responsible for approximately three million fractures and $25.3 billion in costs annually **(National Osteoporosis Foundation, 2014).**

Once established the menopause, the prevalence of osteoporosis and related fractures increases according to the duration of this hormonal disorder and the woman's age **(National Institute on Aging, 2015).** The increase in life expectancy of the population and the costs generated by fractures, especially hip fractures, determine the importance of studying this disease, because hip fractures present with greater morbidity and mortality **(International Osteoporosis Foundation, 2014).**

Physical activity plays a key role in osteoporosis, mainly by reducing bone resorption. The increase in muscle strength, stability, balance and mobility, improvement of the quality of life, reduction of pain and prevention of falls supplement the benefits generated by the systematic practice of exercise in patients with osteoporosis **(The North American Menopause Society (NAMS), 2015).**

Nurses play a significant role in the prevention and detection of osteoporosis, as well as in the management of this condition. The skills of critical thinking, effective communication and interacting with other members of the interdisciplinary team enable nurses to understand the needs of the patients and the goals of osteoporosis management. This role can take place through ongoing assessment of osteoporosis risk factors, teaching and counseling regarding exercise, calcium and vitamin D intake, fall and fracture prevention and medication **(International Osteoporosis Foundation, 2017).**

Significance of the Study

Osteoporosis is the most common non-communicable and metabolic disease that causes disability and diminished quality of life. Women, as compared with men, are four times more likely to develop osteoporosis **(Nakatan et al., 2012).** In Egypt, the problem affects almost 30 percent of the population, and that the most recent studies point out that almost 54 percent of post-menopausal women in the country have a primary form of the disease called Osteopenia, while 28.4 percent have full blown osteoporosis. Men are no exception, with percentages of 26 and 21.9 respectively **(Bassiouni, 2014).**

So, the researcher suggested the present study to view real situation in Egypt as one of developing country has many challenges regarding Osteoporosis of the post-menopausal women and has no statistics regarding it.

Aim of study

This study aims to evaluate the efficacy of Health promotion program on improving physical activity among post-menopausal women with osteoporosis through:

- Assessing the women knowledge about osteoporosis.
- Evaluate the effect of health promotion program on physical activity among postmenopausal women with osteoporosis

Research hypothesis:

Health promotion program will improve physical activity among post-menopausal women with osteoporosis.

Subjects and Methods
Research design:

quasi-experimental intervention study design was used.

Setting:

The study was conducted at Women's health center in Nasser institute hospital. As this center includes DEXA (dual energy x-ray absorptiometry) scan that measuring bone density.

Sample Type, size and technique:

Simple random sample "tossing technique" was used to recruit one hundred women in the study, those women were divided into two equal groups randomly, 50 post- menopausal women were selected as intervention group and another 50 post-women were selected as a control group.

Sample size:

was calculated according to formula statistics

$$n= \frac{(Z_{1-\alpha/2} + Z_{1-\beta})^2[P_1 (1- P_1) + P_2 (1- P_2)]}{(P_1-P_2)^2}$$

- Z_1: statistic for a level of confidence. (For the level of confidence of 95%, which is conventional, Z value is 1.96).

- P_1: expected prevalence or proportion in intervention group. (P is considered 0.5)

- P_2: expected prevalence or proportion in control group. (P is considered 0.5)
- α: Error type 1 (is considered 0.05)
- β : Error type 2 (is considered 0.10)

    - **Sample selection criteria**: post-menopausal women diagnosed with osteoporosis

Tools of data collection:

Four tools were used for data collection:

1- **An Interview questionnaire sheet** was designed by the researcher. After reviewing the related literature to assess socio demographic data and biological characteristics of the sample such as (age, educational level, marital status, occupation, weight, height).

2- **The Osteoporosis Knowledge Test** it was adapted from the revised version of OKT by **Gendler et al. (2014).** The test consists of five parts: risk factors, exercise, calcium, vitamin D, and general. Is a 24-item of multiple choice questions regarding knowledge or facts of osteoporosis. Each item was rated using 3 point scale "3= complete correct, 2= incomplete correct, and 1= incorrect".

So, the total knowledge score ranges from 1 to 72. Total incorrect knowledge score range from 1 to 24, and the total incomplete score range from 25 to 48 and the total complete correct score ranges from 49 to 72.

3- **Global physical activity questionnaire (GPAQ)** it was adapted from WHO; 2011. It consists of 16 questions that compromise four domains: activity at work, transport activities, activity at home, and recreational activities. Participants reported duration (min) and frequency (time/week) of physical activity. Total physical activities were calculated by the sum of the total metabolic equivalents (MET) minutes of activity computed for each domain. For

the calculation of a categorical indicator, the total time spent in physical activity during a typical week, the numbers of days as well as the intensity of the physical activity are taken into account. Total physical activity scores from the GPAQ were used to divide participants into 3 groups: inactive, moderately active, and highly active. The criteria for these levels are shown below.

Highly active

▪ A person reaching any of the following criteria is classified in this category: vigorous-intensity activity on at least 3 days achieving a minimum of at least 1,500 MET-minutes per week.

▪ OR 7 or more days of any combination of walking, moderate- or vigorous-intensity activities achieving a minimum of at least 3,000 MET-minutes per week.

Moderately active

Administrative design

An official approval to conduct this study was obtained from scientific research ethical committee, faculty of nursing Ain Shams University counsel. Also a letter containing title and aim was directed to the director of Nasser institute hospital to obtain this approval for data collection.

Ethical consideration:

The ethical research considerations in this study included the following:

• The research approval was obtained from Scientific Research Ethical committee in Faculty of Nursing at Ain Shams University before starting the study.
• The researcher clarified the objective and aim of the study to post - menopausal women that included in the study.

A person not meeting the criteria for the "Highly active" category, but meeting any of the following criteria:

▪ 3 or more days of vigorous-intensity activity of at least 20 minutes per day
▪ OR 5 or more days of moderate-intensity activity or walking of at least 30 minutes per day
▪ OR 5 or more days of any combination of walking, moderate- or vigorous- intensity activities achieving a minimum of at least 600 MET-minutes per week.

Inactive

A person not meeting any of the above mention criteria falls in this category.

Validity & reliability of data collection tools: tools were reviewed by a panel of three experts in obstetric and gynecological nursing field to test the face and content validity. Each of the experts was asked to examine tools for content coverage, clarity, wording, length, format, and overall appearance. No modification was done.

• The researcher assured maintaining anonymity and confidentiality of the subject data.
• No harmful occurred to women.
• Women were informed that they were allowed to choose to participate or not in the study and that they had the right to withdraw from the study at any time.

Operational design
- Preparatory phase:

Review of the past and current local and international related literature using books, scientific magazines and net search articles, and then prepared tools of data collection.

- Pilot study

The pilot study was conducted on 10 % of total sample size (10 postmenopausal women) through the period from 1st May 2017 to 15th May 2017. It was conducted to evaluate applicability of

the study and validity of the tools then accordingly tools was modified (two questions were rephrased). Postmenopausal women included in the pilot study were excluded from the sample size.

Field work

Data was collected 3days / week form 9 am to 1 pm. Data collection started at the beginning of August 2017 to the end of February 2018. After women had been fully informed about the research and consented for participation in the research. Data collection procedure has been done through three phases; assessment, implementation and evaluation phase.

1st phase assessment:

- The researcher attended the previous mentioned sitting then the researcher interviewed each postmenopausal woman individually and participation approval was obtained orally after explaining to the woman the purpose of the study.
- The selecting postmenopausal women who suffering from osteoporosis were divided into two groups; control group (50) and study group (50).
- The researcher interviewed each woman individually to fill interviewing questionnaire sheet, osteoporosis knowledge test (OKT) to assess their knowledge related to osteoporosis, and global physical activity questionnaire (GPAQ) to assess their level of activity before implementation of program. Filling tools of data collection about 35-45 minutes.
- Each woman phone number was obtained by researcher in order to arrange meeting and follow-up.

2nd phase implementation:
a. Control group

Women in the control group received only routine care.

b. Intervention group

Program was implemented in two sessions. Each session took 45 minutes in the following technique:

- 1st session related to the knowledge provided which aimed to enhance the awareness about Healthy Bones and broad overview of osteoporosis aspects (modifiable and un-modifiable), diagnostic screening for bone density, preventive behavior & complications, exercises, sun exposure, health beliefs items. Content focusing on barriers to osteoporosis behaviors and susceptibility to osteoporosis were specifically highlighted.
- 2nd session related to the practical part (physical activity): it aimed to train post-menopausal women best exercises for management of osteoporosis that include (weight bearing exercises, resistance and flexibility exercises, strength and balance exercises) researcher demonstrate educational video about exercises. Also role play in problem solving situation were used to solve calcium intake & exercises barriers. In addition several education methods were used as group discussion, demonstration and re-demonstration. Visual aids were used as posters. At the end of the sessions educational booklet was distributed.
- Women were instructed to practice physical activity at least five times per week for 30 minutes each time. Women should do at least 150 minutes of moderate-intensity physical activity throughout the week. For additional health benefits, they should increase moderate intensity physical activity to 300 minutes per week, or equivalent.
- A hard copy of Arabic booklet was distributed at the end of this session.
- The researcher followed women with phone to help them in solving any problem that may face them in this phase.

3rd phase Evaluation and follow-up

This phase done after implementation by one month and three months to evaluate the efficacy of Health promotion program on improving physical activity among postmenopausal women with osteoporosis.

Statistical design

Recorded data were analyzed using the statistical package for social sciences (SPSS version 20.0). Quantitative data were expressed as mean ± standard deviation (SD). Qualitative data were expressed as frequency and percentage.

The following tests were done: Chi-square (x2), Independent-samples t-test, Paired t-test and ANOVA test.

Result:

Table (1): Shows that mean age of post-menopausal women in the study group is 55.90±13.98 compared to 58.52±14.63 of post- menopausal women in the control group. Regarding level of education 58.0% of post-menopausal women in the study group have university education versus 56.0 % of post-menopausal women in the control group. Concerning marital status 86% of post-menopausal women in the study group are married compared to 82.0% of post-menopausal women in the control group. As regard occupation al status 50% of post-menopausal women in the study group are worker versus 48.0% of post-menopausal women in the control group.

Table (2): Points out that 26.0% of post-menopausal women in the study group have incorrect knowledge regarding osteoporosis compared to 30.0% of post-menopausal women in the control group. In addition, there is no statistical significant difference between groups as regard their knowledge before intervention. There is a highly statistical significant difference between post-menopausal women on the study and control group as regard their total knowledge after intervention with statistical significant improvement on total knowledge level on post-menopausal women on the study group.

Table (3): Displays that there is no statistically significant difference between post-menopausal women on the study and control group regarding physical activity before intervention except for physical activity related to work.

Table (4): Reveals that there is a statistically significant difference between study and control group regarding physical activity after intervention.

Table (5): Indicates that there is statistically significant improvement on post-menopausal women level of physical activity after intervention and at follow-up.

Table (1): Number and percentage distribution of post-menopausal women according to their socio-demographic data (N=100).

Socio-Demographic Data	Study (n=50)		Control (n=50)		Chi-square test	
	No.	%	No.	%	x^2	p-value
Age (years)						
45<50 years	14	28	14	28		
50<60 years	25	50	18	36		
60<70 years	11	22	12	24	7.183	0.066
≥70 years	0	0	6	12		
Mean±SD	55.90±13.98		58.52±14.63			
Level of education						
Read and write	2	4	9	18		
Technical degree	19	38	13	26	5.597	0.061
University degree	29	58	28	56		
Marital Status						
Married	43	86	41	82		
Divorced	2	4	2	4	0.381	0.827
Widow	5	10	7	14		
Occupation						
Worker	25	50	24	48	0.04	0.841
Not worker	25	50	26	52		
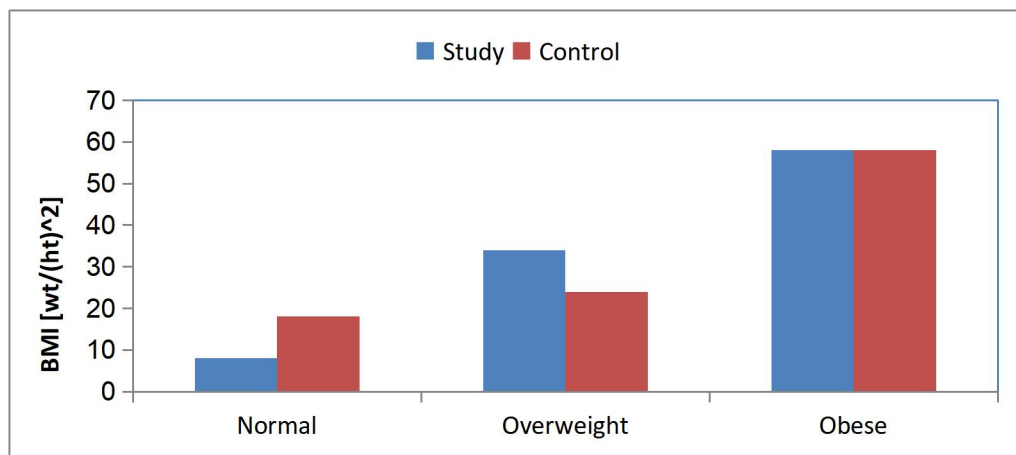
Figure (1): Percentage distribution of post-menopausal women according to their BMI.
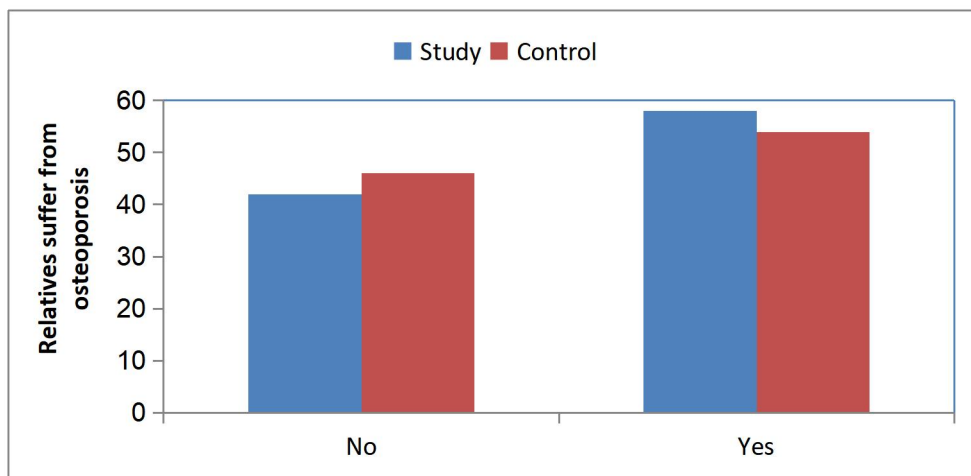
Figure (2): Percentage distribution of post-menopausal women according to their family history.

Table (2): Number and percentage distribution of post-menopausal women on the study and control according to their knowledge of osteoporosis before, after intervention (N=100).

Knowledge of osteoporosis	Study (n=50)		Control (n=50)		Chi-square test	
	No.	%	No.	%	x^2	p-value
Pre-program Incorrect <50%	13	26.0%	15	30.0%	0.050	0.824
Incomplete correct 50-75%	37	74.0%	35	70.0%		
Complete correct >75%	0	0.0%	0	0.0%		
Post-program Incorrect <50%	0	0.0%	14	28.0%	8.73	0.001**
Incomplete correct 50-75%	4	8.0%	36	72.0%		
Complete correct >75%	46	92.0%	0	0.0%		

Table (3): Number and percentage distribution of post-menopausal women on the study and control regarding physical activity before intervention (N=100).

Physical Activity	Study No.	%	Control No.	%	Chi-square test x^2	p-value
Physical activity related to work						
Highly active	8	16	22	44		
Moderately active	8	16	2	4	19.153	<0.001**
Inactive	9	18	0	0		
No work	25	50	26	52		
Physical activity related to travel						
Highly active	24	48	31	62		
Moderately active	15	30	9	18	2.439	0.295
Inactive	11	22	10	20		
Physical activity with home and family care						
Highly active	22	44	17	34		
Moderately active	12	24	16	32	1.243	0.537
Inactive	16	32	17	34		
Physical activity related to recreation						
Highly active	10	20	12	24		
Moderately active	14	28	8	16	2.104	0.349
Inactive	26	52	30	60		
Total physical activity						
Highly active	19	38	23	46		
Moderately active	13	26	8	16	1.598	0.449
Inactive	18	36	19	38		

P-value>0.05 NS; *p-value <0.05 S; **p-value <0.001 HS

Table (4): Number and percentage distribution of post-menopausal women on the study and control regarding physical activity after intervention (N=100).

Physical Activity	Study No.	%	Control No.	%	Chi-square test x^2	p-value
Physical activity related to work						
High	21	42	20	40		
Moderate	4	8	2	4	11.153	0.02*
Low	0	0	2	4		
No work	25	50	26	52		
Physical activity related to travel						
High	38	76	30	60		
Moderate	12	24	10	20	6.045	0.04*
Low	0	0	10	20		
Physical activity with home and family care						
High	43	86	16	32		
Moderate	3	6	16	32	8.152	0.03*
Low	4	8	18	36		
Physical activity related to recreation						
High	38	76	8	16		
Moderate	7	14	8	16	8.345	0.03*
Low	5	10	34	68		
Total physical activity						
High	29	58	21	42		
Moderate	21	42	9	18	7.643	0.04*
Low	0	0	20	40		

P-value>0.05 NS; *p-value <0.05 S;   **p-value <0.001 HS

Table (5): Number and percentage distribution of post-menopausal women on the study group according to physical activity pre, post, and at follow up (N=50).

Physical Activity	Pre-intervention		Post-intervention		Follow-up After 3 months		Pre vs. Post X^2 (p-value	Pre vs. Follow-up X^2 (p-value
	No.	%	No.	%	No.	%		
Physical activity related to work								
Highly active	8	16	21	42	21	42	15.152 (<0.001 **)	13.536 (0.004*)
Moderately active	8	16	4	8	3	6		
Inactive	9	18	0	0	1	2		
No work	25	50	25	50	25	50		
Physical activity related to travel								
Highly active	24	48	38	76	38	76	14.495 (0.002*)	14.495 (0.002*)
Moderately active	15	30	12	24	12	24		
Inactive	11	22	0	0	0	0		
Physical activity with home and family care								
Highly active	22	44	43	86	41	82	19.385 (<0.001 **)	15.676 (<0.001 **)
Moderately active	12	24	3	6	3	6		
Inactive	16	32	4	8	6	12		
Physical activity related to recreation								
Highly active	10	20	38	76	36	72	32.892 (<0.001 **)	28.832 (<0.001 **
Moderately active	14	28	7	14	8	16		
Inactive	26	52	5	10	6	12		
Total physical activity								
Highly active	19	38	29	58	29	58	21.966 (<0.001 **)	21.966 (<0.001 **)
Moderately active	13	26	21	42	21	42		
Inactive	18	36	0	0	0	0		

P-value>0.05 NS; *p-value <0.05 S;   **p-value <0.001 HS

Discussion

The general characteristics of the studied post - menopausal women: concerning age, the result of the present study revealed that half of women in the study group their age were between 50-60 years old compared to more than quarter of the control group were in the same age.

Concerning educational level, more than half of the study and control group had higher education. As regards marital status, the majority of both groups were married.

Concerning occupation, nearly half of the both groups were worked. Therefore, there was no statistical significant difference between the two groups as regards their general characteristic.

Older age is associated with lower BMD, even after adjusting for menopausal status **(Krmoyan, 2016).** In the current study, the mean age of post-menopausal women in the study group was 55.90±13.98 years. While, the mean age of post-menopausal women in control group was 58.52±14.63 and this result was in respect with **El-Tawab et al., (2015)** who carried out a study about Knowledge of osteoporosis among women in Alexandria (Egypt): A community based survey and found that the mean age of the studied women was 49.92 ± 7.75 years.

Concerning educational level, the results of the current study showed that more than half of the study and control

group had university education. This finding was in accordance with cross-sectional study conducted by **Elsabagh, et al., (2015)** during the period from January to March 2015 among employees working at Tanta University in Egypt to assess Osteoporosis knowledge and Health Beliefs and reported that More than one-half of the employees (60.1%) were highly educated. from my point of view, high educated women more able to deal with health problems and seek for more information about healthy behaviors than less educated women.

The result of the current study showed that the majority of the post-menopausal women in the study and control group were married. It's known that married women had loss of calcium during pregnancy & delivery that affect negatively on bone health. The previous study finding was in accordance with the study conducted by **El-Tawab et al., (2015)** who found that about three quarter (75.9%) of the studied women were married.

As regards occupational status of the studied sample, the result of the present study indicated that nearly half of the post-menopausal women in study and control group were worked. This result was in agreement with the study conducted by **El-Tawab et al., (2015)** who reported that 42.9% of the studied women were working. This may be due to deteriorate of economic situation and the burden of main needs in a lot of families in the society which lead to increase the load of work on women.

In relation to weight more than one third of the study group had over weight and more than half of them had obesity while nearly quarter of the control group had over weight and more than half of them had obesity. This may be related to bad life style among Egyptian women where great number of them had obesity in old age.

Similar study conducted by **Muir et al., (2013)** to determine the relationship between the amounts of regular daily physical activity performed and bone

mineral density among post-menopausal women aged 75 and over in Canada, The mean BMI of 26.2±6.5 of participants in this study equates to a classification of "overweight", according to the World Health Organization classification.

Women 35 years and older with a family history of osteoporosis have almost twice the risk of developing the disease, compared to women without a family history **(Hernlund, 2013).** In the current study, more than half of relatives of the both groups were suffering from osteoporosis. Similar results in a study conducted by **Endicott, (2013)** to determine if having a family history of osteoporosis impacts knowledge, health beliefs, and self-efficacy regarding osteoporosis among perimenopausal women aged from 42-52 years old in USA and reported that 48.6% of studied women had a family history of osteoporosis.

In the current study physical activity questionnaire was developed for physical activity surveillance. It collects information on physical activity participation in four domains; activity at work, travel to and from places, housework and recreational activities. The term "physical activity" should not be confused with "exercise", which is a subcategory of physical activity that is planned, structured, repetitive, and aims to improve or maintain one or more components of physical fitness. Both, moderate and vigorous intensity physical activity brings health benefits **(Beitz et al., 2017).**

In relation to physical activity pre intervention, the present study indicates that there was no statistical significant difference between study and control group regarding physical activity before intervention except for physical activity related to work. Where the total physical activity among post - menopausal women in the study group was, more than third of them were highly active, nearly quarter of them was moderately active and more than third were inactive.

Whereas, less than half of the control group was highly active, nearly quarter of them were moderately active and more than third of them were inactive.

Similar studies agreed with the current study where, **Ediriweera de Silva, (2014)** clarified that Exercise was grossly inadequate in the majority of female medical school entrants in Sri Lanka and only 13.6% engaged in the recommended exercises. Meanwhile, **Tanveer et al., (2018)** showed that Practice of regular exercise among the studied female was only 13.5% and practice of an active lifestyle was 25.0%.

Post intervention, there was a statistical significant improvement on level of physical activity after intervention and at follow-up where, more than half of the study group were highly active, more than third were moderately active and none of them were in active. Therefore, all of the post-menopausal women in the study group engaged in the intervention program and there was changing in their health promoting behavior that improved their physical activity regarding osteoporosis.

Meanwhile, as regards physical activity related to work, the majority of worked women were highly active after intervention. Concerning physical activity related to travel; more than three quarter of them was highly active and near quarter was moderately active. As regards physical activity with home and family care, the majority of them were highly active post intervention and at follow up. Concerning physical activity related to recreation and leisure time, nearly three quarter of them was highly active post intervention and at follow up.

These findings were in accordance with the findings of **Paolucci et al., (2012)** who conducted a study to determine the efficacy of a brief course of rehabilitation, comprising group-adapted physical exercises, with regard to back pain, disability, and quality of life in women with postmenopausal osteoporosis who had no

evidence of fractures and The results reported that group rehabilitation reduces back pain and improves functional status and quality of life in women with postmenopausal osteoporosis, maintaining these outcomes for 6 months. In addition with **El-sol et al., (2016)** who revealed that there was a statistical significant difference related to walking as a type of physical activity post educational nursing intervention.

In addition , a study carried out by **Cesarec et al., (2014)** to examine the impact of exercise program for osteoporosis in the duration of four weeks on health and psychological aspects of patient quality of life in Croatia, The results showed that there were statistically significant improvement in physical functioning (such as vigorous activities & moderate activities & lifting or carrying groceries & climbing several flights of stairs & walking more than a1km) where, the score for physical functioning (PF) before intervention was 40.6% compared with score 55.3% after intervention.

Moreover, a retrospective study carried out by **Plapler et al., (2014)** who conducted a basic educational program for patients clinically diagnosed with osteoporosis in Brazil and found as regards physical activity, 22.4% of the studied sample did not practice physical activity, 20.4% practiced twice a week, 24.5% practiced 3 times a week and 32.7% practiced daily. The results from the Osteoporosis Assessment Questionnaire (OPAQ) were, mobility improved in 49.0% of the patients and remained unchanged in 22.4% of the patients. The capacity to perform, and the quantity and quality of daily work improved in 40.8% of the patients, remained the same in 26.5% and worsened in 32.7% of the patients after the program. These results confirmed that the educational program increased physical activity in osteoporotic patients.

Additionally, **Stanghelle et al., (2018)** conducted a randomized controlled

trial to examine the immediate and long-term effects of a 12-weeks supervised group exercise program on habitual walking speed in older women (over 65) with osteoporosis and a history of vertebral fracture in Oslo, Norway. This study confirmed that the intervention (a resistance and balance exercise) described a positive impact on 10 m habitual walking speed.

Furthermore, **Muir et al., (2013)** reported that the vast majority (93.5%) of participants reported some level of involvement in moderate physical activity, i.e. that which could be considered activity over and above the general activity of day-to-day life, such as brisk walking, golfing, housecleaning, etc. Close to three-quarters of participants (71.7%) reported that they are moderately active for at least 4 hours per week. Over half (55.3%) of participants indicated that they were active for a minimum of one hour per day, while only 14.5% of participants were active less than an average of 15–20 minutes each day. The findings of this study indicate that regular physical activity at a moderate level can help to improve bone density in post-menopausal women.

Finally, from my point of view, the empowerment of post –menopausal women to promote the health behaviors through increase the knowledge and health beliefs regarding osteoporosis and engagement in physical activity program contribute in managing this silent disease. And all health sectors must be attributed to the better access to healthcare, better education of the public about general health and the prevention of diseases especially osteoporosis among the Egyptian women.

Conclusion

In this study post-menopausal women's knowledge and health beliefs regarding osteoporosis were significantly improved after intervention and at follow-up. In addition, application of nursing intervention based on health promotion model had positive effect on improving

physical activity among post-menopausal women with osteoporosis. The findings of the current study supported the hypothesis, and the aim was achieved.

Recommendations

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

- Implementation of awareness session for post-menopausal women to improve their knowledge and health beliefs regarding osteoporosis.
- Application of physical activity program for pre-menopausal women to prevent osteoporosis & its complication.
- Further research is needed to evaluate effect of physical activity on cardiovascular problems that face women in post -menopausal period.

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