Nursing Intervention Based on Health Promotion Model for Improving Physical Activity among Post- Menopausal Women with Osteoporosis

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Abstract: **This study was aimed to evaluate the effect of nursing intervention based on health promotion model on improving physical activity among post - menopausal women with osteoporosis. Research design: An intervention study design was used (time series). Setting: this study conducted at women's health center in Nasser institute hospital in Egypt. Subjects: simple random sampling technique was used to recruit 50 post- menopausal women diagnosed with osteoporosis. 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 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 nursing intervention based on health promotion model 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 nursing intervention based on health promotion model for improving physical activity amonge post-menopausal women to prevent osteoporosis complication.**

Keywords: **Nursing intervention, Health promotion model, Post- menopausal women, Physical activity, Osteoporosis.**

1. INTRODUCTION

Osteoporosis is the most common disease of bone and is appeared as low bone mass, drop of bone tissue, and compromised bone strength, leading to bone fragility and fractures. Osteoporosis may be due to decrease in bone formation or increase in bone loss **(National Institutes of Health Osteoporosis and Related Bone Diseases National Resource Center, 2014).** Osteoporosis is resulted from severe bone loss, and osteoporosis in the presence of one or more fragility fractures is referred to as severe osteoporosis **(the International Osteoporosis Foundation, 2013).**

Osteoporosis is a silent disease, becoming clinically clear only when a fracture occurs or when DXA scan indicate very low bone mass **(Armenian Osteoporosis Association, 2016).** In the past, osteoporosis was considered as an unavoidable consequence of aging, particularly in women but also in men. While aging is clearly an important risk factor, it is now widely accepted that aging alone is not enough to characterize this disease **(El-Tawab et al, 2015).**

Osteoporosis affects 200 million women worldwide and causes more than 8.9 million fractures annually **(the International Osteoporosis Foundation, 2013).** In 2014, the National Osteoporosis Foundation calculated that a total of 54 million adults aged 50 and older in USA are suffered from osteoporosis and low bone mass. In Europe, in 2010 nearly 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 estimated 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 widespread form **(the International Osteoporosis Foundation, 2013)**. It is observed clearly in postmenopausal women in the form of postmenopausal osteoporosis. Secondary osteoporosis is a complicating feature of its primary cause. There are various 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 enhance the awareness of the risk factors **(Sayed et al, 2015)**.

Breaking a bone is a severe complication of osteoporosis, especially with old age. Osteoporotic bone breaks are common to occur in the hip, spine or wrist, but other bones can break too **(Hernlund et al, 2013)**. In addition to causing continual pain, osteoporosis causes some patients to lose height. When osteoporosis affects vertebrae, it often leads to a stooped or hunched posture .Breaks in the hip and spine are of specific concern because they almost always need hospitalization and major surgery, and may lead to other serious consequences, including permanent disability and even death **(Krmoyan, 2016)**.

Moreover, twenty percent of persons 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 need long-term nursing home care **(National Institute on Aging, 2015)**. Osteoporosis is responsible for two million fracture bones and $19 billion in related costs every year. By 2025, experts predict that osteoporosis will be responsible for nearly three million fractures and $25.3 billion in costs annually **(National Osteoporosis Foundation, 2014)**.

Fulfilling adequate peak bone mass is the most significant factor in the prevention of osteoporosis. Life-style related factors, contribute as much as 10-60% in the development of osteoporosis. The development of bone loss can be slowed by the change in behavior, especially in Calcium and vitamin D intake as the most important nutrients to protect bone health. Physical activity, stop smoking and reduced alcohol consumption are also essential for healthy bones **(Endicott, 2013)**.

Menopause is a period of diversion in women's lives, in which women face several medical and psychological problems. In addition of hot flushes, sweating, fatigue, headaches, sexual dysfunction and lowering of estrogen level, menopause may be the most reason for massive and rapid loss of bone mass **(Compston et al, 2013)**. With the beginning of menopause period, the prevalence of osteoporosis and related fractures increases according to the woman's age and the duration of this hormonal disturbance **(National Institute on Aging, 2015)**. The rising in life expectancy of the population and the costs produced by fractures, especially hip fractures, define the importance of studying this disease, because hip fractures present with increasing morbidity and mortality **(International Osteoporosis Foundation, 2014)**.

Physical activity plays an important role in osteoporosis where the process of bone resorption can be reduced by increasing physical activity. The regular practice of exercise in patients with osteoporosis leads to increase muscle strength, balance and mobility, improvement of the quality of life, pain relief and falls prevention **(The North American Menopause Society (NAMS), 2015)**.

Nola Pender designed the health promotion model (HPM) to be a complementary counterpart to models of health protection. It realizes health as a positive dynamic state not merely the absence of disease. Health promotion is directed at increasing individual's level of prosperity. The health promotion model describes the multi-dimensional nature of persons as they interact within their environment to maintain health **(Pender, 2012)**. Additionally, health promotion model outlines that each person has unique personal characteristics and experiences that affect the following actions. Important motivational significance takes place as a result of the set of variables for behavioral specific knowledge and affect. These variables can be modified through nursing actions. Health promoting behavior is the desired behavioral outcome and is the end point in the HPM. Health promoting behaviors should result in enhanced health status and better quality of life at all stages of life **(Pender, 2012)**.

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 6, Issue 2, pp: (1475-1487), Month: May - August 2019, Available at: **www.noveltyjournals.com**

Nurses play an essential role in the prevention and detection of osteoporosis, as well as in the management of this disease. The skills of critical thinking, good communication and interacting with the team members enable nurses to realize the needs of the patients and the goals of osteoporosis management. This role can happen through ongoing assessment of osteoporosis risk factors, teaching and counseling regarding exercise, calcium and vitamin D intake, fall prevention and suitable medication **(International Osteoporosis Foundation, 2017)**.

Justification 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 prevent osteoporosis complication through implementing nursing intervention based on health promotion model for improving physical activity amonge post-menopausal women with osteoporosis.

Aim of study: This study aimed at evaluate the effect of nursing intervention based upon Health promotion model on improving physical activity among post-menopausal women with osteoporosis

Research hypothesis: Nursing intervention based on health promotion model will improve physical activity among post-menopausal women with osteoporosis

2. SUBJECTS AND METHODS

Research design: An intervention study design (time series) 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:

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)

A simple random sample "tossing technique" was used to recruit 50 post-menopausal on the study under the following inclusion criteria; post- menopausal women diagnosed with osteoporosis, women's had natural menopause and free from any medical, gynecological, and psychological disorders except osteoporosis.

Tools of data collection:

Three tools were used for data collection

I. Structure Interviewing questionnaire sheet was designed by researchers based on literature review, and written in simple clear Arabic language named "Physical activity among post-menopausal women's with osteoporosis" It was consisted of

International Journal of Novel Research in Healthcare and Nursing
Vol. 6, Issue 2, pp: (1475-1487), Month: May - August 2019, Available at: www.noveltyjournals.com

ISSN 2394-7330

Part 1: Designed to collect data about the demographic characteristics of post-menopausal women. It included data; age, educational level, Marital Status, and occupation.

Part 2: *Anthropometric Measurements*, it was designed to assess menopausal women's anthropometric measurements " height, weight and body mass index (BMI)" that calculated for each woman then classified according to World Health Organization criteria **(2011)** (underweight (BMI< 18.5), healthy weight (BMI18.5 < 25.0), overweight (BMI25.0 < 30.0) or obese (BMI≥ 30.0).

II. The Osteoporosis Knowledge Test it was adapted from the revised version of OKT by **Gendler et al (2014)**. The scale consists of five subscales: risk factors, exercise, calcium, vitamin D, and general. It 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.

III.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.

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** a person not meeting the criteria for the "Highly active" category, but meeting any of the following criteria: Three 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.

➢ **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. Modifications were done according to the comments "rephrasing and cancelling for four questions".

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. 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 (5 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 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 the intervention. 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:

Nursing intervention 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 managing of osteoporosis that include (weight bearing exercises as walking, jogging, step aerobics, climbing stairs and lifting small weights, 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 model on improving physical activity among postmenopausal women with osteoporosis.

Statistical design

Data was tabulated and analyzed, all statistical calculations were done using computer session SPSS (Statistical Package for the Social Science; SPSS version 20). Descriptive statistics: data were presented in the form of mean ± standard deviation or frequencies and percentages. Inferential statistics: independent T test was used to determine the difference between couple. Chi-square test was used to study association between two qualitative variables. ANOVA test was used to compare qualitative variables within-group. P values less than 0.05 will considered statistically significant.

Table (1): Number and percentage distribution of post-menopausal women according to their socio-demographic data (N=50).

Socio-Demographic Data	No.	%
Age (years)		
45<50 years	14	28
50<60 years	25	50
60<70 years	11	22
≥70 years	0	0
Mean ± SD	55.90±13.98	
Level of education		
Read and write	2	4
Technical degree	19	38
University degree	29	58
Marital Status		
Married	43	86
Divorced	2	4
Widow	5	10
Occupation		
Worker	25	50
Not worker	25	50

Table (1) Shows that mean age of post-menopausal women in the study group is 55.90±13.98. Regarding level of education 58.0% of post-menopausal women in the study group have university education. Concerning marital status 86% of post-menopausal women in the study group are married. As regard occupational status 50% of post-menopausal women in the study group are worker.
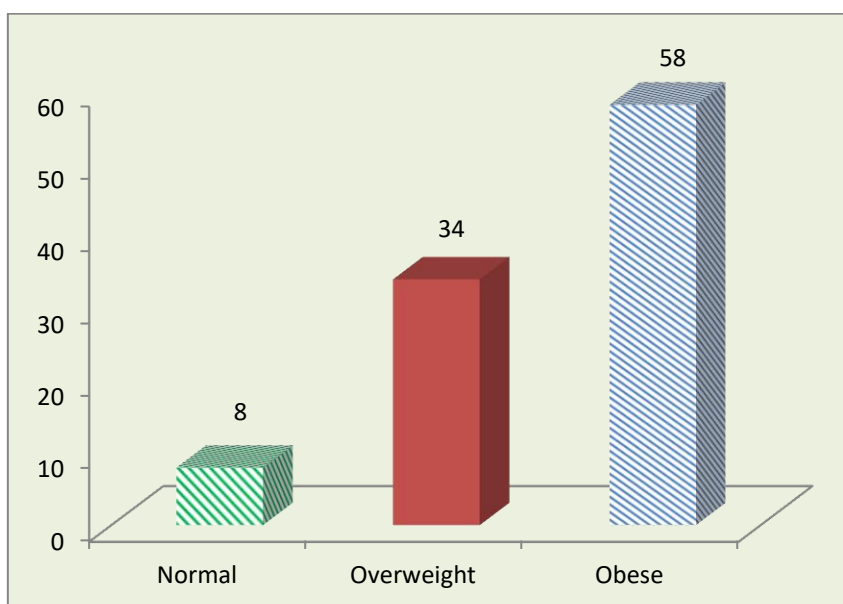

Figure (1): Percentage distribution of post-menopausal women according to their BMI.

This figure shows that more than one third of the studied women had over weight and more   than half of them had obesity
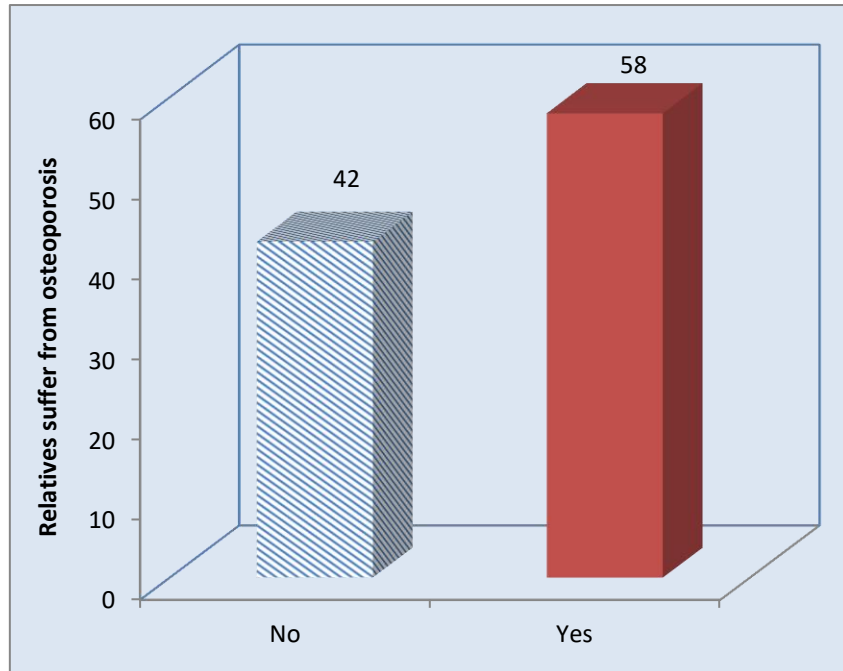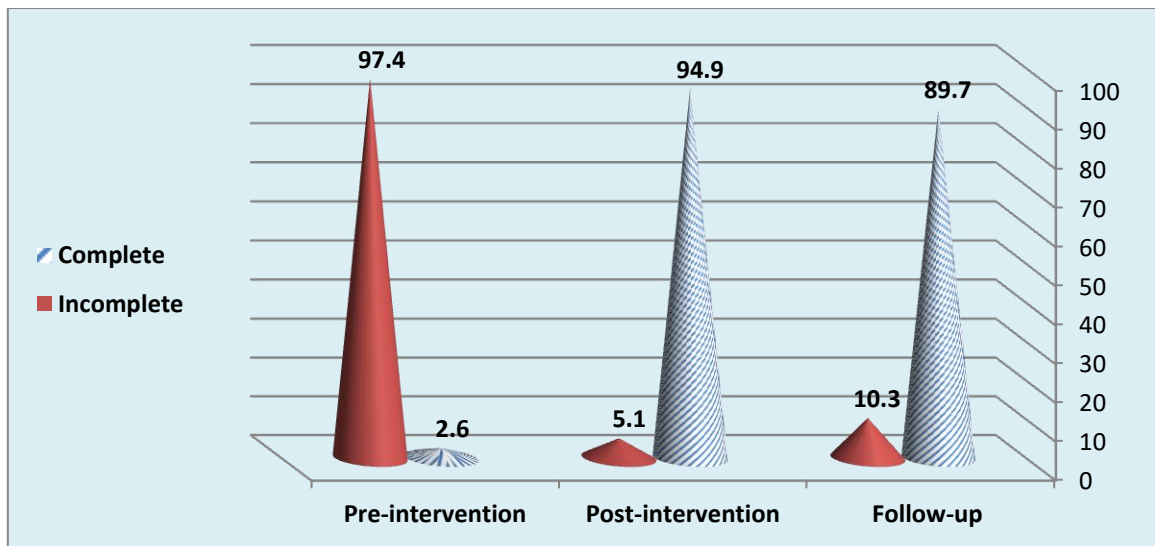

Figure (2): Percentage distribution of post-menopausal women according to their family history

This figure shows that more than half of relatives of the women were suffering from osteoporosis.

Figure (3): Percentage distribution of post-menopausal women according to their knowledge of osteoporosis pre, post-intervention and follow-up.

Post-menopausal women's Knowledge pre-intervention versus post- intervention

@ Post-menopausal women's Knowledge pre- intervention versus follow-up

Figure (3): Points out that 97.4% of post-menopausal women in the study group have incomplete knowledge regarding osteoporosis pre intervention. There is a statistical significant improvement in total knowledge level of post-menopausal women post intervention and at follow-up.

ISSN 2394-7330

Table (3): Number and percentage distribution of post-menopausal women according to physical activity pre, post, and at follow up (N=50).

Physical Activity	Pre-intervention		Post-intervention		Follow-up		Pre vs. Post	Pre vs. Follow-up
	No.	%	No.	%	No.	%	X^2 (p-value	X^2 (p-value
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*

Table (3): Indicates that there is statistical significant improvement on post-menopausal women level of physical activity after intervention and at follow-up.

3. DISCUSSION

The general characteristics of the studied post - menopausal women: concerning age, the result of the present study revealed that half of the studied women their age were between 50-60 years. Concerning educational level, more than half of women had higher education. As regards marital status, the majority of women were married. Concerning occupation, nearly half of women were worked.

Age 65, is one of the best predictors of OP, and it is also one of the most important independent indicators of fracture risk. 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. 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 group had university education. This finding was in accordance with cross-sectional study conducted by **Elsabagh, et al., (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 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 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 studied women 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 women had obesity in old age due to lack of exercise and low intake of healthy diet.

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.

Regarding heredity as one of the most important risk factors for osteoporosis, if woman's parents or grandparents have had any signs of osteoporosis, such as a fractured hip after a minor fall, woman may be at greater risk of developing the disease. Moreover, 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 women 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 order to deal with osteoporosis effectively, it is necessary to have knowledge about lifestyle, risk factors, positive attitude towards them and to practice in a corresponding suitable way **(Tanveer, 2018).** The current study indicated that knowledge score among the study participants were low pre intervention where the majority of post- menopausal women in the studied women had incomplete knowledge regarding osteoporosis (risk factors, healthy diet, and the best exercise)

These study results were in accordance with **Elsabagh et al., (2015)** who reported that the mean score for the Osteoporosis Knowledge Assessment Tool (OKAT) was 8.54 ± 2.58 that revealed poor knowledge as the total knowledge score equals 20. In addition, similar result was seen in a study conducted by **Shavaki et al., (2014)** to assess Knowledge, belief and practice among elderly about osteoporosis based on Health Belief Model in Karaj city, Iran which revealed that 65.4% of elderly had no knowledge about osteoporosis. Similarly, a quasi-experimental study conducted by **El-sol et al., (2016)** to determine the effect of educational nursing intervention about osteoporosis on knowledge of adults in Egypt, this study found that 100% of participant had inadequate knowledge about osteoporosis pre intervention.

This low level of knowledge pre intervention may be explained with insufficient in health education about osteoporosis in Egypt and this may be due to lack of time on the part of health care team, ignorance of the importance and the seriousness of osteoporosis as a disease or even low level of knowledge among healthcare professionals.

In addition, the current study revealed that there is a highly statistical improvement on total level knowledge regarding osteoporosis after one month post intervention and after three month follow up. This result was in the same line **El-sol et al., (2016)** who stated that three quarter of the subjects had adequate knowledge post intervention. In addition to **Shahbo et al., (2016)** who conducted a study to evaluate the osteoporosis knowledge levels and self- efficacy perceptions of female in Port-Said faculty of nursing Egypt and reported that the mean score of osteoporosis knowledge test (OKT) among the studied Females was (19.43±2.82) after osteoporosis educational program. Therefore, the osteoporosis knowledge score was statistical significant increase in the post education intervention (p <.05).

The findings of this study indicated that the nursing intervention was successful in increasing knowledge. This increasing in knowledge level post intervention could be explained that women look at post-menopausal period and the hormonal changes that take place carefully and had readiness to know about osteoporosis, healthy diet and recommended physical activity. Many studies have indicated that adequate knowledge consider a predictor for engaging in suitable behaviors **(Endicott, 2013).**

In relation to physical activity pre intervention, the present study indicates that the total physical activity among post - menopausal women was, more than third of them were highly active, nearly quarter of them was moderately active and more than third 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 studied women engaged in the nursing intervention and there was changing in health promoting behavior that improved 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., (2013)** 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 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.

4. CONCLUSION

The findings of the current study supported the hypothesis of this study which stated that application of nursing intervention based on health promotion model had positive effect on improving physical activity among post-menopausal women with osteoporosis. In addition, post-menopausal women's knowledge regarding osteoporosis was significantly improved after intervention and at follow-up.

5. RECOMMENDATIONS

Based on the findings of the study, the following recommendations were suggested:

▪   Application of nursing intervention based on health promotion model for improving physical activity amonge post-menopausal women to prevent osteoporosis complication.

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