

Impact of Health Educational Intervention to Increase Osteoporosis Knowledge among Women: A Systematic Review

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Abstract: *Osteoporosis is a growing global health concern. It is a silent and incurable disease, and many people are not aware of it till complications occur. Osteoporosis is difficult to treat and still incurable, and so prevention is critically necessary. Indeed, it is preventable by modifying unhealthy lifestyles to maximize bone mass density before its occurrence. Health educational osteoporosis program are known as an important strategy in its prevention. Theses program will increase women's knowledge levels and alter their health beliefs regarding osteoporosis and preventive behaviors. This paper reports an analysis of the results on osteoporosis educational program for women in different age group.*

Keywords: *osteoporosis, knowledge, educational program, women*

1. Introduction

Headings should be numbered and in Times New Roman. Osteoporosis is a continual debilitating metabolic bone disease which is characterized by decrease in bone mass and micro-architectural deterioration of bone tissue, leading to augment bone fragility; resulting increase in fracture risk (1). It's an asymptomatic crucial public health problem because of its medical expression in age-related fractures.

Non-modifiable osteoporosis risk factors include advance age, female gender, white race, and family history. Risk factors that can be modified consist of nutritional consumption of calcium and vitamin D, physical activity, low body mass index, excess alcohol use, and smoking (2). Peak bone mass is developed by age 30 years and therefore preventive movements of maximizing bone mass to reduce osteoporosis-related fractures in later life must start as early as possible (3).

Osteoporosis has been called "a pediatric disease with geriatric consequences" (4). Adequate calcium,

balanced diet, regular physical exercises are essential during childhood and adolescence for bone formation, and it can be an extensive issue in reducing the hazard of osteoporosis in later life. But lamentably, it has regarded that significant percent of children and adolescents, specifically females, are not consuming sufficient calcium and other nutrients during the period of peak bone mass accretion.

Health education is one of the most efficient methods to prevent disease and encourage health promotion. For chronic disease like osteoporosis, the health care system should focus on disease prevention through training and self-control aid to foster self-assurance in preference to disease itself (5). Osteoporosis is preventable. Primary prevention programs of osteoporosis, which encompass health education and promotion with the purpose of optimizing bone mass growth to prevent bone loss later in lifestyles. Maximizing bone mass in conjunction with life-style factors which include calcium consumption and regular physical exercise prevent osteoporosis (6).

According to The United State Department of Health and Human Services, osteoporosis affects more than 75 million people worldwide and will affect greater than 10 million women by 2020 if efforts to prevent are ineffective (7). As women regardless of their age are more affected than man and since women are the contributors of the community and key component of half of the world's population; it is vital to keep their health; thus the prevention of osteoporosis is very essential. In order to impact women's expertise regarding osteoporosis knowledge, risk factors and preventive measures; health-promoting activities need to be facilitate by public health educational campaign for awareness and appropriate responses to osteoporosis. The aim of this systematic overview is to scrutinize published literature regarding the effectiveness of educational interventions designed to increase female knowledge about osteoporosis.

2. Objective

This review was performed to assess the effectiveness of health education programs to improve osteoporosis knowledge among women in different age groups.

3. Methods

3.1 Data sources and literature search strategy

The literature search used multiple databases EBSCOhost medical collections (MEDLINE, CINAHL, Psychology and Behavioral Sciences series), SAGE, Wiley online Library, ScienceDirect, SpringerLink and Web of Science was conducted to identify the intervention studies published from January 1, 2000 until December 31, 2016. Titles and abstracts of all identified citations from the literature search were screened, and the reference lists of all primary articles had been examined to find other applicable publication. From the literature search, citations of articles identified as potentially appropriate for inclusion were exported to reference software, EndNote X for windows 7, for reference management. Full text articles for the citations were retrieved and evaluated the methodology, results, and discussion sections.

Studies were identified that investigated: (1) women knowledge about osteoporosis and (2) educational interventions to improve the osteoporosis knowledge of women. Key words included 'osteoporosis, mixed with 'female', 'knowledge' and 'health education program' and multiple search terms. The references and citations from the articles had been searched for other potentially eligible studies and to achieve related information (Table 1). Limits placed on the search were "English language" and "Full text article".

Table 1: Search strategy used in data base
Date from January 1, 2000 to December 31, 2016
1. Osteoporosis
2. Osteoporosis knowledge
3. Osteoporosis knowledge score
4. Female
5. Women
6. (Or/1-5)
7. Intervention study
8. Randomized trial
9. (Or/7-8)
10. Health education program
11. Intervention Education program
12. (Or/10-11)
13. (6 and 9 and 12)
14. Limits placed on the search were "English language" and "full text article".

3.2 Inclusion criteria

3.2.1 Types of study

- Intervention studies
- Education program in relation to osteoporosis
- Programs involved with or without control group

3.2.2 Types of population

- Women without osteoporosis (mean age \geq 18 year)

3.2.3 Types of intervention

- Educational programs that included teaching, coaching, discussion, demonstration and assessment
- The program carried out through medical personnel (e.g. medical doctor, nurse educator, dietician, psychologist, occupational therapist, doctor and/or podiatrist)

3.2.4 Outcome measures

- Osteoporosis knowledge score

3.2.5 Other inclusion criteria

- Articles published in nursing, healthcare, medical or health education journals

3.3 Exclusion criteria

The studies were excluded from the review in case of the following:

- Studies related to diagnostic instrument, medical and pharmacological trials and of other design (e.g. qualitative, on-experimental, systematic review, meta-evaluation and case reports);
- Articles focusing with other chronic diseases (e.g. diabetics, arthritis, renal failure and hypertension) and participants with dementia, mental illness or any cognitive problems
- Participants among healthcare provider
- Studies with only men contributors or both man and women participants are included in same study
- Articles published in other languages (because of restricted resources for translation procedure)
- Articles published earlier than January 2000

3.4 Outcome

Previously published articles concerning educational program for osteoporosis improving knowledge among the women were searched and reviewed. The desired outcome was an improvement in osteoporosis knowledge among the women participants.

4. Search outcome

The second and following pages should begin The search was conducted electronically according to the Preferred Reporting Items for Systematic and Meta-Analysis (PRISMA) guidelines, 2009 (8). Figure 1 describes the flow diagram for the study selection. Primarily, 133 articles had been recognized from six

databases (Fig. 1). The search procedure involved evaluation of the title, accompanied by the abstract. If the name and the abstract have been not associated with the study objective, the articles have been excluded from further overview. At this stage, articles such as review paper, dissertation and thesis, conference proceeding and abstract had been excluded from the study owing to several reasons. After screening of eligible articles based on the inclusion criteria, only 42 articles were examined. The assessments have been made in terms of the article content material, which include introduction, methodology, result, discussion and conclusion. Only those research articles concerning woman respondents were reviewed. A total of 30 articles had been rejected due to the following reasons: protocol development, not intervention based, and combined finding of overall result. This search found 12 studies that met the inclusion criteria.

Any programs associated with osteoporosis knowledge or combine with other behavior changes (diet, exercising, blood calcium, Vitamin D analysis and medication intake) were reviewed if the analyses in these results were conducted separately. The educational programs included teaching delivery method, one-to-one or group approaches, conducted either in health care center or patient's home, with or without a control group, follow-up session and assessment. The findings searched covered improvement in knowledge, education and osteoporosis.

Data abstraction and synthesis of the final set of articles selected in the review had been based totally on the research question based totally on the study design (intervention, technique of randomization, and type of intervention), population characteristics (sample size, and age), and Osteoporosis knowledge

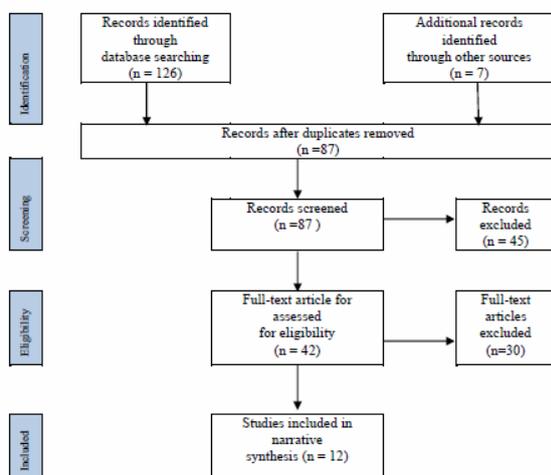


Figure 1 PRISMA 2009 flow diagram for the process of study selection score.

5. Quality assessment and data extraction process

The titles, abstract and full text of every article retrieved from the search were screened. The related articles were reviewed based on osteoporosis knowledge among woman, application of theories (if any), design, method, provider, follow-up and evaluation, outcome measures and key findings. Meta-analysis of comparable studies was not conducted due to diversity in the study design, interventions and outcome measures. The study authors were not contacted for additional information. The Consolidated Standards of Reporting Trials (CONSORT) statement for assessing non-pharmacologic treatment checklist was used as a reporting guideline to assess the articles (9) (Table 2). The criteria included inside the CONSORT components, which covered (i) title and abstract, (ii) introduction, (iii) methods, (iv) results and (v) discussion. Some studies lack information to explain sample size, randomization, allocation concealment, blinding, ancillary analysis and adverse events.

6. Result

A total of 12 articles were included in the final stage (Table: 2 Appendix). Studies involving female with osteoporosis health educational program measured by osteoporosis knowledge score were included and analyzed.

7. Finding and discussion

Even though a greater understanding of osteoporosis does not necessarily result in higher dietary calcium intake, it is still vital to determine the level of osteoporosis knowledge and common misconceptions in women as an excessive cholesterol and fat content in all milk products (22-24). Studies that have looked at osteoporosis knowledge in women have continuously found a lack of knowledge in women of every age (25-29) with mean score ranging from 35% to 63% (30-32). But this study summarized the impact of health education intervention for osteoporosis and how significantly it improves the knowledge concerning osteoporosis among women (10-21).

A lack of knowledge concerning nutritional source of calcium and the ability to identify food sources rich in dietary calcium is critical for the prevention of osteoporosis (33). Although most of the individuals understood that a diet plan rich in calcium is a defensive aspect against osteoporosis, but only 36% could identify all the calcium-rich meals, inclusive of milk, cheese and yoghurt. There also seems to be a lack of knowledge concerning the advantages of physical activity in promoting bone health (34, 35).

For example, participants showed low levels of knowledge about preventive behaviors, along with physical activity (36). However, sample selection was based totally on a convenience sample and can therefore, not be generalized to the population. Osteoporosis knowledge studies on Asian women have commonly found a lack of knowledge on osteoporosis (37).

Asian women have higher knowledge about life style risk factors than genetic risk factors regarding osteoporosis determined (37-38). For example, 85% of the participants understood that calcium build strong bones and 77% recognized that calcium can lessen the risk of osteoporosis. Moreover, 84% found that regular exercise facilitates to build strong bones and 75% identify that regular exercise can help to prevent osteoporosis. In contrast; only 16% knew that a positive family history of osteoporosis was a significant risk of osteoporosis. And all this information can disseminate by educational intervention that may appreciably improves the understanding among women and facilitates to prevent osteoporosis (10-21).

A systematic review study regarding osteoporosis stated that although the general population had a sound understanding that dietary calcium and regular physical exercise are important for bone health, knowledge on other risk factors and preventative measures are deficient (39). The study was based on 20 research articles published between 1998 and 2004. The majority of those researches had been focused on peri- and postmenopausal women and different age of male with only 3 studies based on pre-pubertal girls and 4 studies included men. The use of different tools of osteoporosis knowledge assessment makes it difficult to do direct comparisons among the studies. Furthermore, most of those studies were based on convenience sampling and therefore, can't be generalized to the whole population. Nonetheless, this systematic review found proof to suggest that even though most of the population is aware about the disease, knowledge in this area of consequences, treatment and prevention of osteoporosis is lacking (39).

Studies with osteoporosis educational intervention are very comparable, even though the arrangement and period of the teaching periods varies between studies. The content material of the intervention studies consists of specifically the identity of osteoporosis risk factors, identification of the outcomes of osteoporosis and techniques for prevention (10-21). These strategies are very frequently targeted on lifestyle changes, including increase calcium consumption and practicing weight-bearing exercise, cessation of cigarette smoking and decrease alcohol consumption; those are modifiable factors and their effects are supported by means of literature Lecturing, demonstration, and discussion was common strategies for the delivery of the

intervention, and assessment was done to evaluate the outcome of osteoporosis knowledge among women at different age.

Knowledge can increase awareness, influence attitude, and self-confidence toward health behaviors (40-41). Knowledge level selected for evaluating an osteoporosis educational intervention program to evaluate the significance of the intervention module in different study at different age group in both man and women. For example, some studies showed significant increase of osteoporosis knowledge immediately after intervention (42) & (12). A study assessed that men's knowledge of osteoporosis and revealed that men has less knowledge about the relationship between osteoporosis and men's health than between osteoporosis and women's health (43). But another randomized controlled trial showed the effects of an osteoporosis educational program for men which became conducted among 128 Hong Kong Chinese men and the intervention was statistically increased the knowledge ($P < 0.0005$) about osteoporosis in comparison with the control group (44). In a cross sectional study, women in different age group were interviewed and found that better osteoporosis knowledge did not persuade them to make decisions approximately appearing preventive behaviors to increase regular exercise and calcium intake. It's been argued that apart from knowledge and beliefs, self-efficacy is also affected by a number of different factors such as personal, social, and financial factor (28). Moreover, another study among registered nurses also stated that self-efficacy could be improved after presenting an osteoporosis educational intervention program (11).

In this systematic review clearly shows a lack of osteoporosis knowledge in women of all ages which actually improved by educational intervention. Most of the women were aware of importance of dietary calcium for strong and healthy bones, but the source of food containing calcium was poor which significantly increased after the educational intervention. Moreover, knowledge on other risk factors, which includes smoking, an excessive caffeine intake and regular physical exercise appears to be missing (10-21). One approach towards osteoporosis prevention is the use of educational interventions to increase osteoporosis knowledge and awareness. If an individual does not know that a diet with high in calcium is important for the prevention of osteoporosis, they may be probable to perceive greater barriers than advantages of dairy product intake (24). A number of educational intervention study had been formulated as the main framework to increase knowledge on risk, aetiology, prevention, analysis and prevention of osteoporosis and; results were changeable (10-21).

8. Limitation

The limitations of the articles reviewed were focused on the knowledge on osteoporosis only. Other parameters like self-efficacy, practice, attitude or belief scale regarding osteoporosis was not assessed. The study designs, strategies and methodology utilized in some studies need to be assessed carefully due to the threat of bias. Some studies were unable to describe study type, randomization procedure, sampling procedure, and sample size calculation, improvement of intervention protocol, questionnaire chosen and calibration of study instrument. Statistical methods used within this review did not report additional data including effect size, subgroup analysis and adjusted analysis. Another limitation of this overview is that the search method; original research articles published in English language between the years 2000 and 2016 was chosen. Selection bias can also have occurred throughout data extraction, as only full-text articles with certain key words had been searched and the inclusion criteria had been set at the beginning of the search. The possibility of related high quality articles not being included in this review due to the lack of a systematic searching process. Also, there may have been a chance of evaluation bias, because of inadequate data. Owing to methodological flaws in some of the studies included and with limited time and resources, it was difficult for the author to undertake meta-analysis.

9. Conclusion

All the educational programs implemented through the previous researchers showed improvement in osteoporosis knowledge scores. We endorse that osteoporosis intervention educational program should be provided for all age women as well more importantly the program should evaluate more methodological problems such as populations, settings, sample bias, small sample size, lack of control of extraneous factors for better outcome, follow-up and evaluation. And future studies also consist of more representative samples and evaluate the longer-term consequences of osteoporosis intervention educational program and their impact on behavior.

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Table 2: Systematic review of health educational intervention to increase osteoporosis knowledge among women

Reference	Sample	Methodology	Educational intervention	Outcome measure
Sedlak et al. [10]	<ul style="list-style-type: none"> N = 84 women 31 college graduates (aged under 25 years) 35 women from local university (aged between 22-83 years) community sample 18 nurses (aged between 32-59 years) 	<ul style="list-style-type: none"> Osteoporosis knowledge and health beliefs were measured at baseline and 3 weeks post-intervention 	<ul style="list-style-type: none"> 3 intervention programs : brief, intermediate and intense Brief intervention programs was given to nurses, which was a single 45 minute education session Intermediate intervention programs was administered to the community sample, which was 3 education sessions over 3 weeks Intense intervention programs was administered to the college graduates, which involved the 3 education sessions with additional assignments 	<ul style="list-style-type: none"> Osteoporosis knowledge significantly ↑ in all 3 groups
Piaseu et al. [11]	<ul style="list-style-type: none"> N = 100 women Undergraduate first year nursing female student 	<ul style="list-style-type: none"> The control group completed the pretest; two weeks later, completed the posttest measures. The treatment group completed the pretest and then participated in the educational program and then posttest was done. 	<ul style="list-style-type: none"> This program included instructional materials and a slide presentation titled "Osteoporosis throughout the Life Span" The 3-hour course was taught by the researcher. Content included: <ul style="list-style-type: none"> (a) Identification of osteoporosis risk factors (b) Identification of potential consequences of osteoporosis (c) Strategies to prevent osteoporosis including effective exercise and maintenance of the daily calcium requirement. 	<ul style="list-style-type: none"> At baseline, there was no significant difference in pretest knowledge scores between the control and intervention groups. No change in total knowledge score in control group 13.0 ± 2.7(pretest) and 13.1 ± 2.4(Posttest). Significant ↑ in total knowledge score among the intervention group; 12.7 ± 2.5 (pretest) and 21.8 ± 1.8 (Posttest).
Curry et al. [12]	<ul style="list-style-type: none"> N=188 women Elderly 	Osteoporosis knowledge was assessed before and immediately after intervention.	<ul style="list-style-type: none"> Intervention covered basics of osteoporosis, including definition, risk factors, causes, prevention, diagnosis and treatment Session was 30 minutes followed by 30 minutes for discussion Handouts were given at the end 	Mean knowledge score significantly ↑ from 6.9 out of a possible maximum of 12 to 10.0 post-intervention.
Hazavehei et al.[13]	<ul style="list-style-type: none"> N= 206 female Students from the middle schools 	The data was collected among three groups before, immediately after, and one month after the intervention.	<ul style="list-style-type: none"> Group I received two one-hour-long educational intervention sessions based on the HBM Group II, the Traditional Education Group III, the Control Group, did not have an educational intervention related to osteoporosis prevention. 	<ul style="list-style-type: none"> The mean knowledge scores of the Group I students ↑ significantly on post-test (91.82%) and follow-up test (85.52%), compared with pretest scores (49.44%). Group II students ↑ significantly in post-test (59.91%) and follow-up test (55.96%), compared with pretest scores (47.72%). For Group III, the control group, no significant changes were found; Post test (44.88%), follow-up test (47.89%), and pretest scores (45.93%).
Sanaeinasab et al [14]	<ul style="list-style-type: none"> N=48 women High school students Aged 15–16 years old 	Data collected baseline, one week and one month after the intervention	<ul style="list-style-type: none"> Three week educational program Three group sessions of 60 minutes per week. Lecture, question and answer, brainstorming, group discussion with pamphlets 	The knowledge scores about osteoporosis in both tests (pre- and post-test) were 22.91 (SD 4.3) and 37.91 (SD 5.01), and the results of the paired t-test indicated a significant difference between them before and after the education (P < 0.001).
Maria et al.[15]	<ul style="list-style-type: none"> N=163 women Student Age groups of 18-26 years. 	<ul style="list-style-type: none"> Baseline data collection Intervention given Complete a pre-validated questionnaire after two days of intervention 	The respondents were provided a self-explanatory brochure aimed to provide the basic information of osteoporosis, its risk factors, its symptoms, diagnosis, and its prevention actions and treatments.	Knowledge of osteoporosis after educational intervention regarding osteoporosis and the mean score of knowledge have been ↑ to 14.18 ± 2.7 from 0.00 with a significant value of Wilcoxon mean test of less than 0.005.
Malakheh Z.[16]	<ul style="list-style-type: none"> N=200 women Government secondary school teachers Aged 25 – 49 years old 	The participants given the questionnaire before the program (pre intervention) and repeated three months later after the intervention on the same participants (post-intervention).	<ul style="list-style-type: none"> A four-week health education Program 40 minutes each, presented via pamphlets, slides show and face to face lectures using discussion method. The content of educational sessions include definition of osteoporosis, prevalence and risk factors; symptoms, complications, diagnosis and treatment; and preventive measures including nutritional prevention and calcium-rich foods and exercise. 	<ul style="list-style-type: none"> In total, 100% of the intervention group had strong knowledge. There was no significant increase in overall osteoporosis knowledge among the teachers in the control group. 55.3% of the control group had moderate knowledge, followed by 35.0% had little knowledge, then 5.8% had strong and 3.9% had poor. The average knowledge scores about osteoporosis in both groups were M=19.08, SD= 5.00 for The control group and M= 33.22, SD= 1.08 for the intervention group
Amal M. [17]	<ul style="list-style-type: none"> N=400 women Perimenopausal women Age 40-43 year 	Pretest and posttest included an interviewing questionnaire, an osteoporosis risk factors assessment questionnaire, an osteoporosis knowledge test and an osteoporosis practice test.	<ul style="list-style-type: none"> Systematic health education was implemented Three sessions; each lasted for 15-20 minutes. The overall aim of was to address the importance of building healthy bones to prevent or delay osteoporosis. Each session consisted of a slide presentation supplemented by printed handouts. 	<ul style="list-style-type: none"> There was a statistically significance difference between pre-post knowledge score It is observed that 9.7% of women had good knowledge during pre-intervention as compared to 62.7% during post intervention phase.
Jeihooni et al.[18]	<ul style="list-style-type: none"> N=120women Aged 30 to 50 years 	Before, immediately and after six months of the intervention, both groups completed the questionnaire.	<ul style="list-style-type: none"> 60-minute educational sessions Lecture, group discussion, questions and answers, posters, pamphlets, displaying film and power point. Weekly educational text messages send to experimental groups Experimental groups attended monthly training session 	<ul style="list-style-type: none"> Before the intervention there was no significant difference between control (mean = 8.07), experimental (mean = 7.65) groups regarding knowledge; p<0.358 Immediately after intervention, control (mean = 8.67), experimental (mean = 10.82) groups; p<0.001 Six months later, control (mean = 7.17), experimental (mean = 18.33) groups; p<0.001
Sajedeh et al.[19]	<ul style="list-style-type: none"> N= 172 women Age 11 and 14 years 	Before, immediately and after two months of the intervention, both groups completed the questionnaire.	<ul style="list-style-type: none"> Intervention was applied in 90-minute sessions, weekly Using lectures, power point presentations, education manuals, CDs, and posters. The control group received no interventions Two months after the last session, a posttest was performed on both the control and experimental groups 	<ul style="list-style-type: none"> After the intervention, significant statistical differences were seen between the experimental and control groups in mean scores of knowledge. Pre-Intervention knowledge mean 13.70 (SD 2.90) in intervention group and for control group mean 19.20 (SD 2.93). Post-Intervention knowledge mean 25.39 (SD 1.47) in intervention group and for control group mean 18.16(SD 3.32)
Jamileh et al.[20]	N= 583 women High-school students	<ul style="list-style-type: none"> Pre and post intervention data was collected About two months after training, the participants were given questionnaire as post intervention evaluation 	<ul style="list-style-type: none"> Single education session (about 2 hours) Eight School were educated in eight days. The level of knowledge about osteoporosis, its risk factors and complications were assessed 	The mean total score of knowledge toward osteoporosis was significantly ↑ after educational intervention compared to prior to the educational program with the mean SD pre-educational score 0.230.19(median 0.26) and post-educational score 0.450.22 (median 0.48) (P < 0.001).
Hala et al.[21]	<ul style="list-style-type: none"> N= 302 women Secondary school students 	<ul style="list-style-type: none"> A predesigned questionnaire was used to pretest before intervention A post-test was conducted after 3 months 	The health educational program was conducted by short lectures (for about 30 min)	<ul style="list-style-type: none"> The total score of knowledge questions was ↑ 4.15 ± 1.46 (Pretest; risk factor) to 9.24 ± 1.76 (Post-test; risk factor) 22.97 ± 5.58 (Pretest; diagnosis of disease) to 35.2 ± 2.89 (Post-test; diagnosis of disease). 19.75 ± 2.01 (Pretest; Nutritional and physical activity) to 23.74 ± 1.77 (Post-test; Nutritional and physical activity)

↑ Increase; ↓Decrease