# Statistical Predictors: Exploring Knowledge, Attitude, and Self-efficacy of Osteoporosis Among Perimenopausal Women

**Afnan A. Albokhary**

Faculty of Nursing, Umm Al-Qura University, Makkah, Saudi Arabia.
Corresponding Author: **Afnan A. Albokhary**
Assistant Professor, Faculty of Nursing, Umm Al-Qura University, Makkah, Saudi Arabia.

## ABSTRACT

**Aims:** This research aims to fill a gap in knowledge by establishing awareness (knowledge) about osteoporosis and exploring the association with attitude and self-efficacy among women over the age of 40 in India after an education program. The results have also revealed the correlation of knowledge, attitude, and self-efficacy with participants' demographics. **Materials and Methods:** A quasi-experimental one-group pretest, post-test design was adopted to collect data. It involved 120 perimenopausal women between 40 to 50 years who work in automation Power Systems, Coimbatore, a developing country. A survey questionnaire was developed to assess their knowledge, attitude, and practices about Osteoporosis before education and sixty days after an education program. Investigators discussed knowledge aspects of Osteoporosis in terms of definition, types, causes, signs and symptoms, risk factors, diagnosis, and pharmacological intervention. It also discusses the prevention and promotion perspectives to consistently practice exercises and healthy balanced nutrition. **Results:** In Pre-test, 84 (70%) of them had inadequate knowledge, 36 (30%) had moderate knowledge with a mean score of a low value13.16 ± 3, whereas, in the post-test, only 32 (27%) had inadequate knowledge, 88(73%) had adequate knowledge with a mean value of 23± 2.87. Findings indicated that a structured teaching program enhanced their knowledge with a significant value of level p<.05. A highly significant association was found between the level of attitude about Osteoporosis and a healthy attitude (benefits of calcium) at p=.000 during the post-test. Pre and post-test scores of self-efficacy differed significantly only with the factor on benefits of exercises at p=.007. **Conclusion:** This research explored a profound deficit in awareness about Osteoporosis among women in a developing country. Hence a dire need is required to teach awareness regarding the prevention and promotion of health among women prone to prevent them from Osteoporosis.

**Keywords:** Perimenopause, health attitude, self-efficacy, education program, osteoporosis

## Introduction

Osteoporosis is a significant global health issue. It is a systemic skeletal illness characterized by decreased bone mass and associated degradation of bone structure [1]. As life expectancy rises, bone-related disorders, particularly osteoporotic diseases, are becoming a serious public health concern [2]. Nutrition has a substantial role in preventing and treating bone-related risk factors. Vitamin D supplements consumption has been shown to enhance bone health in older people [3]. It is also critical to consume calcium-rich foods regularly. Calcium hydroxyapatite crystals accumulate in bones' type I collagen matrix, enhancing bone strength. Osteoporosis and fractures can occur as a result of a calcium shortage. Several factors influence the capacity for maximum bone mass acquisition [4]. The building up of bones and the health of bones have been documented in association with an optimum level of calcium intake [5]. After forty years, bone breakdown outpaces bone buildups due to aging; bone mineral density reduces with age and is generally unavoidable [6].

Osteoporosis was assumed as a normal part of aging in the olden days. But it is now understood that it could be prevented and treated [7]. Many interventions could minimize fracture risk in the general population and can be used for primary and secondary prevention. Calcium intake is one of the strategies [8]. The most prevalent inorganic salt component accounting for 99% of it in the human body's bones and teeth, is calcium [9]. According to The Indian Council of Medical Associations, the Indian population does not meet their daily calcium requirement from food [10]. Exercise can also ward

off some of the threats of Osteoporosis [11]. Ultimate focus on early diagnosis of identifying the prevalence to implement optimum strategies plays a pivotal role in health promotion [12,13]. Significant gaps in the early screening and prevention of Osteoporosis remain; thus, it is mandatory to highlight the necessity for more research in this area [14].

Institute for Social and Economic Change finding is shocking that four percent of Indian women experience menopausal signs even from 29 years. It can sometimes be 8% if the discussion comes to women at 35 years [15]. Osteoporosis is many times underdiagnosed and undertreated in Asia. Also, knowledge deficiency about diet, exercise, and risk factors for Osteoporosis is more prevalent among the populations in developing countries [16]. It occurs mainly in rural areas among illiterate women and those who do not know the susceptibility. In countries India and China, people from rural regions risk getting fractures due to osteoporosis 17. Lack of awareness regarding diet and identifying early signs and symptoms of deficiency would lead the vulnerable population to risk factors [10].

The prevalence of osteoporosis in post-menopausal women ranged from 12% to 60%, and it has been shown to rise with age [18]. Due to steep increase in the aging population in developing countries, the proportion of perimenopausal women is also enhancing. Estradiol production is less in the transition period from pre-menopause to post-menopause, and susceptibility is associated with women with osteoporosis [19]. A survey about awareness of postmenopausal Indian women revealed a significant deficiency in the awareness level, attitude, and perception about osteoporosis. Predominantly women were innocent of its considerable impact due to calcium deficiency and focused on prevention. The study insisted that professionals in the healthcare team have a focus to cover in decreasing the new cases of osteoporosis and its adverse health consequences [20]. A systematic meta-analysis review documented that intermittent or daily standard consumption of vitamin D alone will reduce fracture risk; however, supplementation of vitamin D and calcium will not be a more promising strategy [21].

Osteoporosis risk factors can be both nonmodifiable and modifiable. Age, height, weight, body mass index, and menopause are nonmodifiable risk variables that cannot be changed. Preventable risk factors include calcium intake, sunlight exposure, smoking, alcohol consumption, exercise, underlying illness conditions such as rheumatoid arthritis, systemic lupus erythematosus, other autoimmune disorders, steroid use, and hormone replacement therapy [22]. Modifiable risk factors are preventable and can be identified early [14]. The occurrence of Osteoporosis in the Perimenopausal group is more likely to get exposed to many of the threat factors like family history of Osteoporosis, low calcium diet, vitamin D deficiency, and history of anorexia. The pathophysiology of menopausal osteoporosis is complicated by the interaction of numerous variables related to diet, environment, and hereditary factors [23]. Surprisingly, Indian women have earlier osteoporosis than their Western counterparts [14]. Several studies reported that perimenopausal women lack knowledge or do not perceive their potential to fall into risk [24, 25]. However, less research has been performed to explore knowledge, attitude, and practices to implement the relevant educational program.

Hence, the investigators found this target group of women to investigate their baseline knowledge, attitude, and practices. Besides, the researchers focused on providing them the education to promote health domains of Osteoporosis. The current study explored the impact of education programs in revamping knowledge, attitude, and practices among perimenopausal women and determining any association with their demographics.

**Materials and Materials:**

Women working in the power system at Coimbatore from 2020 January 1 to 2020 March 15 were selected as a population. Study participants were 120 as a sample size, computed using previous studys' power analysis of 95% confidence level, 5% error, and 80% power. Initially, 150 women were included in the study with a response rate of 80%. A non-probability random technique was used to access the population.

The adopted research design method was a quasi-experimental one-group pre and post-test design to investigate 120 women aged 40-50 years working in an automation company. Women between 40 and 50 are willing to participate, read and speak either Tamil (regional language) or English, and cooperate and obey commands were included in this research. Women who did not have their menstruation for more than a year and surgical removal of ovaries were excluded.

The objectives were a. during a pretest, a. explore participants' baseline knowledge, attitude, and self-efficacy, b. during a post-test, a. does the STP alter this population's level of knowledge, attitude, and self-efficacy?

The data collection tool is comprised of three sections. The first section of the survey tool included demographic details age, marital status, religion, occupation, socio-economic status, type of family, type of residence, and family history of

osteoporosis. The second part had researchers semi-structured thirty multiple-choice questions to measure the participants' knowledge about osteoporosis-related content. Questions were on anatomy and physiology (Question No 1-6), perimenopause (Question No 7-9), Osteoporosis (Question No 10-19), management and prevention of osteoporosis (Question No 20-30). The correct response was given one score. Each item was assigned with one score to get a total score of 30. The knowledge score was categorized into adequate (above 75%), moderate (50-75%), and inadequate (below 50%). The attitude questionnaire was with 30 subscale items. Participants responded to the statements agreeing (score 1) and disagreeing (score 0). Each carries .25 scores to obtain thirty scores for all participants if they all have answered correctly. The participants responded to yes or no questions for attitude, and it consisted of items about exercise and calcium-rich resources of food consumption.

Four experts validated a survey questionnaire in obstetrics and two from Orthopedics specialty nursing professionals. The pilot study helped determine the time required to administer the questionnaire on a demographic variable, administer the intervention, and record the study's domains. The tool and the interventions were administered to 12 women (10% of the sample size) who fulfilled the sample selection criteria. The piloted results revealed the pretest knowledge among the women was 13.16 and after the intervention was 23.03, and the mean difference was 10. The obtained 't' value of 14.46 was significant at a $p < 0.05$ level. The pilot study results showed that the setting, sample, and tool were feasible to conduct the main study.

The lesson plan included the definition, types, causes, risk factors, signs and symptoms, diagnosis, pharmacological management, physical therapy, dietary therapy, and osteoporosis prevention strategies. Besides, a dietary awareness and exercise demonstration was taught, followed by return demonstrations. The women also filled Semi-quantitative survey to transcribe their nutritional habits. Their knowledge was also monitored to compute the scores regarding dietary habits. Eight weeks' time periods were given to adopting practices consistently. After eight weeks, a post-test was done to identify the effect of the education.

Data were interpreted using SPSS 23 version. Descriptive statistics were adopted to calculate frequency, percentage, mean, and standard deviation categories. The statistical differences were calculated using a t-test (pre and post-test) and Chi-square (demographic and level of scores from each domain).

The institutional review board approved the research title and objectives. Formal permission was obtained from the proprietor of the intelle power system, Coimbatore. Confidentiality was ensured to all participants. Informed consent was obtained from the individual perimenopausal women. The participants in the study were subject to their willingness and informed consent. They were allowed to withdraw from the project at any time.

**Results**

**Table 1 Socio-demographic Variables (N=120)**

| No | Demographic variables | No | Percentage(%) |
|---|---|---|---|
| 1 | **Age** a) 40-42years b) 43-45years c) Above 45 years | 44 48 28 | 37 40 23 |
| 2 | **Marital status** a) Married b) Unmarried c) Widow | 96 16 8 | 80 13 7 |
| | **Religion** | | |

| | | | |
|---|---|---|---|
| 3 | a) Hindu | 76 | 63 |
| | b) Christian | 20 | 17 |
| | c) Muslim | 24 | 20 |
| 4 | **Educational status** | | |
| | a) Illiterate | 16 | 13 |
| | b) Schooling | 32 | 27 |
| | c) Undergraduate | 52 | 43 |
| | c) Postgraduate | 20 | 17 |
| 5 | **Occupation** | | |
| | a) Manager b) Supervisor c) Accountant/Office worker d) Labours | 20 | 17 |
| | | 32 | 26 |
| | | 24 | 20 |
| | | 44 | 37 |
| 6 | Types of family | | |
| | a. Nuclear family | 76 | 63 |
| | b. Joint family | | |
| | | 44 | 37 |
| 7 | Residence | | |
| | a. Urban | 72 | 60 |
| | b. Rural | | |
| | | 48 | 40 |
| 8 | a. Low | | |
| | b. Middle | 24 | 20 |
| | c. High | 60 | 50 |
| | | 36 | 30 |
| 9 | Family history | | |
| | a. Yes | 64 | 53 |
| | b. No | | |
| | | 56 | 47 |
| 10 | Medication taken | | |
| | a. Hypertension | 32 | 27 |
| | b. Diabetes | | |
| | c. None | 32 | 27 |
| | | 56 | 46 |

**Table 2: Participants' Level of Knowledge before and after intervention**

| S.No | Level of Knowledge | Pretest | | Post-test | |
|---|---|---|---|---|---|
| | | No | % | No | % |
| 1 | Inadequate | 84 | 70 | 0 | 0 |
| 2 | Moderate | 36 | 30 | 32 | 27 |
| 3 | Adequate | 0 | 0 | 88 | 73 |

The above table depicted that 84(70%) participants had inadequate knowledge, and 36(30%) had moderate pretest expertise. Women were inadequate in their knowledge about Osteoporosis before intervention. In the post-test, none of them had inadequate knowledge. 32(27%) of them had average knowledge, and the majority [88(73%)] of them had adequate knowledge regarding Osteoporosis.

**Table 3: Association of pre and post-test levels of knowledge(N=120)**

| S.No | Test | Mean | SD | 't' | Table value |
|---|---|---|---|---|---|
| 1 | Pretest | 13.16 | 3.18 | | |
| 2 | Post-test | 23.03 | 2.87 | 14.46** | 1.96 |

**Legend **P<0.01 Significant**

Significant differences before and after an STP about Osteoporosis were computed using a paired t-test. The findings stated a considerable difference in the participant's knowledge after receiving education.

Table 3 depicts the Mean and standard deviation during pre and post-test levels of perimenopausal women. The pretest mean was 13.16, the standard deviation was 3.18; the post-test mean value was 23.03, and the standard deviation was 2.87. It is imperative that there were highly significant differences between pre and post-test scores, so it has revealed the effectiveness of structured teaching programs on Knowledge regarding Osteoporosis.

**Table 4. Comparison of Post-test knowledge with demographic variables**

| variables | N | Level of Knowledge | | | Chi square value | P-Value |
|---|---|---|---|---|---|---|
| | | In-adequate | Moderate | Adequate | | |
| **Age in years** a)40-42years b)43-45years c) Above 45 years | 44 48 28 | 0 0 0 | 12 8 12 | 32 40 16 | 6.24 NS | 0.711 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Marital status** a)Married b)Unmarried c)Widow | 92 16 8 | 0 0 0 | 20 12 0 | 76 4 8 | 5.66 NS | 0.711 |
| **Religion** a)Hindu b)Christian c)Muslim | 76 20 24 | 0 0 0 | 16 8 8 | 60 12 16 | 12.33 S | 0.042 |
| **Educational status** a)Illiterate b)Schooling c)Undergraduate d)Postgraduate | 32 16 52 20 | 0 0 0 0 | 4 8 16 4 | 12 24 36 16 | 4.63 NS | 1.635 |
| **Occupation** Manager Supervisor Accountant/Officeworker Labors | 20 32 24 44 | 0 0 0 0 | 12 8 12 0 | 8 24 12 44 | 8.13 NS | 0.711 |
| **Types of family** a) Nuclear family b) Joint family | 76 44 | 0 0 | 24 8 | 52 36 | 6.38 NS | 0.103 |
| **Residence** a)Urbanb)Rural | 72 48 | 0 0 | 12 20 | 60 28 | 3.46 NS | 0.103 |
| **Socio economic status** a)Low b)Middlec)High | 24 60 36 | 0 0 0 | 8 4 20 | 16 60 16 | 5.46 NS | 0.711 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Family history of Osteoporosis** a) Yes b) No | 62 16 | 0 0 | 2 6 | 14 8 | 3.43 NS | 0.103 |
| **Any other medication is taken for** a) Hypertension b)Diabetes mellitus c)Others D)None | 32 32 0 56 | 0 0 0 0 | 8 12 0 12 | 24 20 0 44 | 8.11 NS | 1.635 |

S=Significant; NS=Non Significant

Table 4 shows that association was not found between the level of knowledge with the demographic variables except religion.

**Table 5 Comparing Pre and Post Test Scores Attitudes and Self-efficacy**

| Beliefs about Osteoporosis | Mean | SD | P-value |
|---|---|---|---|
| Perceptions about Osteoporosis Pre Post | 20.67 21.55 | 3.62 4.5 | .524 Not Significant |
| Seriousness about Osteoporosis Pre Post | 15.67 17.22 | 3.009 5.124 | .149 Not Significant |
| Benefits of Exercise Pre Post | 25.34 26.89 | 2.52 2.41 | .007 Significant $(p<.05)$ |
| Benefits of Calcium Pre Post | 23.58 27.00 | 3.86 3.54 | .000 Significant $(p<.001)$ |
| Self-Efficacy Exercise Pre Post | 58.55 58.82 | 25.13 22.11 | .751 Not Significant |
| Self-Efficacy Calcium Pre Post | 75.58 77.50 | 13.14 13.42 | .502 Not Significant |
| Motivation Pre Post | 24.55 25.72 | 3.52 3.48 | .106 Not Significant |

S=Significant; NS=Non-Significant

(p<.001)= Highly significant; (p<.05=significant)

The above table describes the participant's attitudes and self-efficacy before and after an educational intervention. A paired t-test was used to compare self-efficacy levels before and after the osteoporosis-specific education intervention. It was observed that mean self-efficacy scores increased after the intervention among perimenopausal women. However, a statistical difference was seen only with the variable of benefits of calcium (p<.05) and exercises (p<.001).

**Discussion**

This study was performed to explore the impact of structured teaching programs on enhancing knowledge, attitude, and practice among perimenopausal women of 40-50 years. The main objectives were a. Is there a difference in the level of knowledge before and after an intervention program? b. Is there a difference in the level of attitude and self-efficacy before and after intervention for this population?

The analysis revealed a positive statistical association between pre and post-test knowledge scores. However, perimenopausal women had no association of their osteoporosis knowledge compared with their demographic characteristics except religion. The significant impact of this study was that the osteoporosis education program had a substantial impact on enhancing knowledge, attitude, and practice, despite the statistical differences were not found in the rest of the variables. Earlier research asserted a deficiency in awareness among postmenopausal women of the North-East region of India about Osteoporosis. If not addressed in time, these women were unaware of the specific information that can lead to weak bone fracture [26]. Dietary calcium intake (DCI) was lower than the RDA, and most postmenopausal women were physically inactive, emphasizing the need for better DCI education and calcium supplements and physical activity, both of which can help to prevent the effects of osteoporosis [27]. These study results are consistent with Kadam's. et al. in the year 2019 [28]. According to previous research, bone loss begins between 30 and 40. This accelerated rate of bone loss stabilizes around ten years following menopause and subsequently merges into a continual age-related loss.

It is an empirical finding that women with a family history of Osteoporosis had more realization of susceptibility to developing Osteoporosis than those who do not have a family history of Osteoporosis, as women with a family history are more likely to develop Osteoporosis [29]. In our study, women did not realize their susceptibility to developing Osteoporosis, though they belong to the history of family members. After the education program, perceived susceptibility did rise, although this finding was not statistically significant. Previous work with a group of perimenopausal women had a consistent result [30].

Before education, there were exciting findings on women's perception of exercise and calcium intake. The group had several barriers to practicing exercises and consuming a calcium-rich diet. After the education session, women felt the importance of performing regular workouts and the necessity of considering the optimal intake of calcium-rich food. This result supports further exploration of the health beliefs of perimenopausal women regarding Osteoporosis. A similar study stated that study participants had plenty of misconceptions and lack of knowledge about osteoporosis [31]. Healthy lifestyle behaviors (practices) criteria have been classified into a. ability to increase activity, b. maintain, c. persistence in regular activities though facing barriers. Our research is essential to specify that the pretest scores were below average before education. The mean score increased after the structured teaching program with the more significant benefits for the women who were not aware of the particular activity being in a non-osteoporotic history family. However, the results were not statistically significant (p>.05). It is interesting to note that the self-efficacy scores were above the moderate level of knowledge, and their scores enhanced after the education program. Clinically the significance was found as the scores were above the expected level; still, there was no statistical significance. Regarding healthy behaviors, a few studies are similar to our research exploring satisfactory results about motivation, exercise, susceptibility, and calcium intake [32,33,34].

A recent study by Bailey.,2021 [35] concluded that limited knowledge perimenopausal group participants were highly motivated to keep their lives healthy by performing exercises. Although osteoporosis is associated with the aging process, appropriate care can slow disease progression and often result in a better life for the patient [36]. These findings are similar to our study of being appropriately aware of activities, even though it was not statistically significant. An exciting truth about the current research is a negative association between motivation among perimenopausal women regarding family history and without a family history. These indifferences are not a surprise. Also, these interpretations need further

investigation regarding perimenopausal osteoporosis. Though this context is not the primary aim of this study, it insists on the necessity of a global community education program. Regarding the recommendations of a study to explore the quality of life of perimenopausal women, it was stated that establishing a training program is mandatory for every woman, particularly in their menopausal period [37].

The study is limited to a part of a community, and it has adopted a quasi-experimental one-group pre and post-test. However, the significant result of this study was that a structured education program has a higher importance in providing awareness and revamping the participant's knowledge.

**Conclusion**

Globally, in the current era, the age group from 40 years is more likely to develop Osteoporosis due to hormonal imbalances. Besides, vulnerability to Osteoporosis increases with hormonal imbalance and lack of knowledge about the value of balanced nutrition. Hence, early diagnosis, health maintenance, and promotion, identifying the risk factors, and healthy practices in perimenopausal osteoporosis, require an educational protocol nationally and globally to decrease morbidity in a woman's life later.

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