# Effect of Systematic Health Education on Perimenopausal Rural Women's Knowledge and Practices Regarding Osteoporosis

Amal M. Gamal, DNSc.[1]. Amera B. Rashed. DNSc.[2]

[1, 2,] *(Maternal and Newborn Health Nursing Department, Faculty of Nursing - Menoufia University. Egypt)*

***Abstract:*** *This study was conducted with the aims of assessing the knowledge level regarding osteoporosis care among rural perimenopausal women and designing an effective systematic health education program on perimenopausal women's knowledge and practices regarding osteoporosis based on needs assessment. The **Design** of this study was quasi-experimental (pre-post). The **sample** of the study was one group, comprised of 400 perimenopausal women (40-43 years). Participants were recruited according the following criteria: free from chronic diseases (diabetes, anemia and hypertension) and free from osteoporosis. **Tools** included an interviewing questionnaire, an osteoporosis risk factors assessment questionnaire, an osteoporosis knowledge test and an osteoporosis practice test. The main **finding** was that there was a statistically significant difference between pre, post and follow-up tests scores.*

***Conclusion:*** *research hypothesis are accepted as it was found that systematic health education improved perimenopausal rural women's knowledge and practices regarding osteoporosis and there was a relation between demographic variables and level of knowledge and practice regarding osteoporosis care.*

***Recommendations***: *systematic health education is suggested to encourage primary health care providers to consult with women more effectively about osteoporosis preventions.*

*Keywords – osteoporosis, perimenopausal women, systematic health education*

## I.    Introduction

### 1. 1. Operational Definitions
**Systematic health education:** is any combination of learning experiences designed to help individuals and communities improve their health, by increasing their knowledge or influencing their attitudes.

**Perimenopause:** the perimenopausal period is approximately 2 years during which menstrual cycles become erratic and estrogen levels fall, ending with the cessation of menstruation for about 2 years from last appearance of menstrual blood [1]

**Osteoporosis:** WHO has defined osteoporosis as a systemic skeletal disease characterized by low bone mass and microarchitectural deterioration of bone tissue with a consequent increase in bone fragility and susceptibility to fracture, which usually involves the wrist, spine, hip, ribs, pelvis or humerus [2]
        Perimenopause is a span of 4 to 6 years preceding menopause when menstrual cycles and blood flow may be irregular. As estrogen levels decline, osteoporosis begins, and women are at increased risk for cardiovascular disease [3]. Climacteric indicates the period of time when a woman passes from the reproductive stage of life through the perimenopausal transition and the menopause to the postmenopausal years. Climacteric is derived from the Greek word for [4] [5]. Osteoporosis is a substantial cause of morbidity and mortality and is an extremely important problem in primary care where most post-menopausal women are seen for physician visits [6]. The same reference also added that that many studies linked with osteoporosis have spotlighted knowledge of and the health beliefs of individuals. Osteoporosis is a "silent killer" that millions of people around the world suffer from, and it is important due to its morbidity, mortality, adverse effects on the quality of life and the extra costs imposed to the patient and the society [7]. One of the ways to prevent osteoporosis in the society is to use population-based interventional approaches in order to decrease the risk factors of osteoporosis. Do these approaches, it is necessary to have information about the knowledge, attitude, and practice of the society [8]. Osteoporosis is a very old disease, as it was already present in ancient Egyptians [9]. Based on different studies, in modern Egypt, it has been calculated that 53.9% of postmenopausal women have osteopenia and 28.4% have osteoporosis [10].  According to [11]; nurses have the responsibility to reinforce professional role as it advocates for a new generation to take charge of their bone health. Indeed, it is argued that health promotion and disease prevention should be an integral part of nursing practice. Nurse initiated osteoporosis prevention programmers for young adults have the potential to reduce osteoporosis risk and thus, prevent or delay the development of the disease. Nurses are in a powerful position to change attitudes throughout the community on bone health, osteoporosis and fracture risk, by taking a long term view of bone health from

conception to older life and using a public health approach in a variety of settings, possible to provide unified care across a community**.**

### 1. 2. Significance of the Study

According to [12]; osteoporosis is second only to cardiovascular disease as a global health care problem and medical studies show a 50year old woman having a similar lifetime risk of dying from hip fracture as from breast cancer [13]. [10] Pointed out that, in the Middle East, the burden of osteoporosis in the general population is expected to increase and is becoming a heavy financial burden. The annual incidence rate of osteoporosis fractures in women is greater than the combined incidence rates of heart attack, stroke and breast cancer. In modern Egypt, based on different studies, it has been calculated that 53.9% of postmenopausal women have osteopenia and 28.4% have osteoporosis.

[14] Showed that perimenopausal women have significantly less knowledge about osteoporosis than menopausal women. This may be because primary care providers generally do not offer osteoporosis related information until the onset of menopause. The majority of studies are interested in premenopausal and postmenopausal women, and few studies have targeted perimenopausal women [15].

According to the previously mentioned data which stressed the magnitude of the problem of osteoporosis, the researchers were motivated to undergo this research study.

### 1.3. Aims of the Study:

This study was conducted with the aims of assessing the knowledge level regarding osteoporosis care among rural perimenopausal women and designing an effective systematic health education program on perimenopausal women's knowledge and practices regarding osteoporosis based on needs assessment.

### 1.4. Research hypothesis:

Systematic health education will improve perimenopausal rural women's knowledge and practices regarding osteoporosis. There is a relation between demographic variables and level of knowledge and practice regarding osteoporosis care

## II. Subjects And Methods

### 2. 1. Research design:
A quasi-experimental design (pre, post) was used in carrying out the present study

### 2. 2. Setting:
The study was conducted in a rural area in El-Shohada, Menoufiya governorate. This area was selected because it has the largest number of population among the governorate.

### 2. 3. Subjects:
The study sample was one group, comprised of 400 perimenopausal women (40-43 years). Participants were recruited according the following criteria:
1. Free from chronic diseases, for example: diabetes, anemia and hypertension.
2. Free from osteoporosis.
   The sample size was determined through the following equation.

$$x = Z(^c/_{100})^2 r\,(100-r)$$
$$n = {^{N\,x}}/_{((N-1)E^2 + x)}$$
$$E = Sqrt[^{(N-n)x}/_{n(N-1)}]$$

(N) Is the population size.
( r ) is the fraction of responses that you are interested in,
Z(c/100) is the critical value for the confidence level c.

It was calculated as confidence interval (5), the total population of (334915) and perimenopausal women are 12000, the sample size was calculated as 372 with a confidence level of 95%**.** This sample size was comparable to what other researchers have used in professional literature. The sample size was about 372 women and to allow for drop out; the sample size was increased by 20% to be 400 women.

### 2.4. Maneuver of Intervention
### 2.4.1. Preparatory Phase:

An extensive reviewing of electronic data related to osteoporosis was done. A review of literature to collect relevant knowledge pertinent to study participants was also used in developing data collection instruments. Telephone number of each participant was taken for communication and for follow up. All

recruited participants were interviewed three times: pre, post and three months after giving the systematic health education. Field work was done six days per week to collect data. Ten cases were recruited per day, on average.

### 2.4.2. Operational Phase:
**Systematic health education**

   Systematic health education was implemented through 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. Arrangement of materials was based on the human body mass (HBM) and emphasized the importance of dairy product consumption, calcium intake, physical activity and health lifestyle; each session consisted of a slide presentation supplemented by printed handouts.

The intended learning outcomes of systematic health education were as follows:

Knowledge and understanding
- List the risk factors for osteoporosis
- Recall the diagnosis of osteoporosis
  Intellectual skills
- Differentiate outline types of osteoporosis
- Summarize the role of calcium, vitamin D and other dietary factors affecting bone health
  General and transferable skills
- Value the importance of early osteoporosis prevention to perimenopausal woman.
  Attitude
- Communicate effectively with perimenopause women to prevent and early detect any sign or symptoms of osteoporosis

**Session 1:**
**Osteoporosis facts**
- What is osteoporosis?
- Why does bone become brittle?
- Serious consequences of osteoporosis.
- Who will get osteoporosis?
- Symptoms of osteoporosis.

**Session 2:**
- Diagnosis of osteoporosis.
- Treatment of osteoporosis.

**Session 3:**
Prevention of osteoporosis:
- Prevention strategies.
- Eating a balanced diet.
- Role of calcium, vitamin D and other dietary factors affecting bone health.
- Exercise.

**Teaching materials:**
- Information Booklet: prepared by the researchers and validated by experts. It contains information regarding the various aspects of prevention of osteoporosis. It was offered after pre test to be a permanent source for emphasizing the acquired knowledge.
- **2-** PowerPoint presentation outlining the session's contents.

### 2. 5. Data Collection Instruments
   Data was collected using three instruments, developed by the researcher including an interviewing questionnaire; an osteoporosis risk factors assessment questionnaire and an osteoporosis knowledge test.

### 2.5.1. An Interviewing Questionnaire
   This questionnaire was designed to collect data about perimenopausal women. It included two parts:
Sociodemographic data: Such as age, sex, social class, religion, marital status, education, occupation, family size, and income

Biomedical data: Such as medical history, surgical history, obstetric history, smoking status and menstrual history.

**Anthropometric measurements:** Participants' weight was measured on electronic scales. Height was measured using a calibrated wall mounted.

### 2.5.2. An Osteoporosis Risk Factors Assessment Questionnaire
This was used to assess risk factors for osteoporosis: e.g. exercise, nutrition and body weight. This was conducted twice before nutritional counseling and three weeks after intervention.

### 2.5.3. An Osteoporosis Knowledge Test
It was used to measure knowledge about osteoporosis:
* General knowledge about osteoporosis (items 32-43).
* Knowledge about exercise (items 44-47)
* Sources of vitamin D (items55-59, 80).
* Food sources of calcium (items 56-64).
* Recommended intakes of calcium (items 40,65-81**)**

 **Scoring:** The score ranged from 0 to 100. The total score was categorized into:
1. Poor Knowledge (less than50).
2. Fair Knowledge **(**50-75).
3. Good Knowledge (>75).

### 2.5.4. An Osteoporosis Practice Test
It was used to examine practices about osteoporosis. When the practice instrument wsa scored, the score ranged from 0- to 40. The total score was categorized into:
1. Poor practice (less than20).
2. Fair practice **(**20-29).
3. Good practice (>30).

**2.6. Validity:** The validity of the instruments was ascertained by a group of subject areas experts, medical and nursing staff who reviewed the instruments for content validity. Also, they were asked to judge the items for completeness and clarity. Suggestions were incorporated into the instruments.

**2.7. Reliability :** Test-retest reliability was applied by the researcher for testing the internal consistency of the instruments. It is the administration of the same instruments to the same participants under similar conditions on two or more occasions. Scores from repeated testing were compared.

**2.8. Piloting the Instruments:**
A Piloting was conducted on forty women to test the applicability of the instruments and to estimate the time needed for data collection. On the basis of the piloting results the researcher determined the feasibility of data collection procedures, developed an interview schedule, and identified the most suitable time to visit participants. The results of the piloting help in refining the interview questionnaire and to set the final schedule, some modifications were done because of the length of the interview questionnaire as it took a long time and effort.

**2.9. Statistical Data Analysis:**
The data collected were tabulated & analyzed by SPSS (statistical package for the social science) software, statistical package version 20 on IBM compatible computer. Quantitative data were expressed as mean & standard deviation (X±SD) and analyzed by applying student t test for the comparison of two groups of normally distributed variables and two groups of not normally distributed variables by applying student t test for the comparison of two groups of normally distributed variables.
Qualitative data were expressed as number and percentage (No & %) and analyzed by applying chi-square test**,** and whenever testing proportions Z test was applied.

P-value at 0.05 was used to determine significance regarding:
* P-value > 0.05 to be statistically insignificant (NS).
* P-value ≤ 0.05 to be statistically significant(S).
* P-value ≤ 0.001 to be high statistically significant (HS).

## III.     Results
**Table (1): Distribution of the Participants Regarding their Socio-Demographic Characteristics:**

| Socio-Demographic Characteristics | Value (n=400) | |
|---|---|---|
| **Age (years)**<br>-Range<br>-Mean±SD | 40.00-43.00<br>415.± 1.5 | |
| | NO. | % |
| **Education:**<br>Illiterate<br>Read /write<br>Primary<br>Preparatory<br>Secondary<br>University | 62<br>57<br>78<br>72<br>90<br>41 | 15.5<br>14.3<br>19.5<br>18.0<br>22.5<br>10.2 |
| **Occupation :**<br>Employee<br>House wife | 189<br>211 | 47.3<br>52.7 |
| **Marital status:**<br>Married<br>Unmarried(Single) | 374<br>26 | 93.5<br>6.5 |

Table (1) describes the socio-demographic characteristics of the participants recruited in the study sample. Their ages ranged between 40 and 43 years, with a mean of 41.5 ± 1.5 years. As regards their education, 15.5 % of them were illiterate, while 10.2 % had university education and the highest percentage of them 22.5 % had secondary education. Concerning occupation, more than half of them (52.7 %) do not work. As for the marital status, the majority of women (93.5 %) are married. On the other hand, (6.5%) of them are unmarried.

**Table (2): Distribution of the Participants Regarding their Reproductive Health History:**

| Obstetric History | NO. | % |
|---|---|---|
| **First menstrual period (age of onset in years):** (n=400)<br>-Range<br>-Mean±SD | 9.00-18.00<br>13.54± 1.64 | |
| **Number of births:**(n=374)<br>-Range<br>-Mean±SD | 0.00-15.00<br>4.31±2.19 | |
| **Number of pregnancies:**(n=374)<br>-Range<br>-Mean±SD | 0.00-15.00<br>4.89 ± 2.50 | |
| **Breast feeding for most of children:** (n=361)<br>Yes<br>No | 312<br>49 | 86.4<br>13.6 |
| **Period of lactation in months:** (n=312)<br>-Range<br>-Mean±SD | 11.00-24.00<br>18.67 ± 3.87 | |
| **Method of contraception :** (n=374)<br>Yes<br>No | 316<br>58 | 84.5<br>15.5 |
| **If yes what method used : (n=316)** | | |
| **1-Tablets:** (n= 113)<br><1year<br>1 year<br>>1year | 10<br>28<br>75 | 8.8<br>24.8<br>66.4 |
| **2-Injection :** (n=43)<br><1year<br>1 year<br>>1year | 0<br>16<br>27 | 0.0<br>37.2<br>62.8 |
| **3-subcutaneous capsules :** (n= 41)<br><1year<br>1 year<br>>1year | 0<br>5<br>36 | 0.0<br>12.2<br>87.8 |
| **4- IUD:** (n=119)<br><1year<br>1 year<br>>1year | 9<br>9<br>101 | 7.6<br>7.6<br>84.8 |

Table (2) describes the reproductive health history of the participants. Their first menstrual period ranges between 9-18 years, with a mean of 13.54± 1.64 years. Number of births of the women had ranges between 0.00-15.00 with a mean of 4.31±2.19. The number of pregnancies also ranges between 0.00-15.00, with a mean of 4.89 ± 2.50, while the majority of them (86.4%) are breast feeding. Their period of lactation ranges between 11-24months with a mean of 18.67 ± 3.87. The majority of the participants (84.5%) use the method of contraception. Used methods were (84.5%), Injection>, subcutaneous capsules and IUD.

**Table (3) Distribution of the Participants Regarding their Menstrual Cycle Disturbances:**

| Menstrual Cycle | NO. | value | | | |
|---|---|---|---|---|---|
| | | NO. | | % | |
| **Menstrual cycle irregularity :** | 400 | | | | |
| Yes | | 134 | | 33.5 | |
| No | | 266 | | 66.5 | |
| **If the answer is No , Is there any change occurred** | 266 | | | | |
| Yes | | 219 | | 82.3 | |
| No | | 47 | | 17.7 | |
| **types of change:** | 219 | | | | |
| 1-    Hypomenorrhea | | 79 | | 36.1 | |
| 2-    Intermenster | | 71 | | 32.4 | |
| 3-    3-sudden absence then returns | | 60 | | 27.4 | |
| 4-    4-more than one(2and3) | | 9 | | 4.1 | |
| **Since menstrual cycle interrupted or changed you ever suffer from:** | 353 | **Yes** | | **No** | |
| | | NO. | % | NO. | % |
| nfection in Genitourinary system | | 213 | 60.3 | 140 | 39.7 |
| **Lack of sexual desire** | | 168 | 47.6 | 185 | 52.4 |
| **Pain during intercourse** | | 122 | 34.6 | 231 | 65.4 |
| **Weakness in sight** | | 92 | 26.1 | 261 | 73.9 |
| **Hearing impairment** | | 56 | 15.9 | 297 | 84.1 |
| **Lack of taste** | | 22 | 6.2 | 331 | 93.8 |
| **Lack of smell** | | 4 | 1.1 | 349 | 98.9 |
| **Lack of touch** | | 52 | 14.7 | 301 | 85.3 |
| **Dermatological change** | | 61 | 17.3 | 292 | 82.7 |
| **Lack of memory** | | 105 | 29.7 | 248 | 70.3 |
| **Weight gain** | | 89 | 25.2 | 264 | 74.8 |
| **Others mention diseases** | | 2 | 0.6 | 351 | 99.4 |

Table (3) describes the menstrual cycle disturbances among the participants. The menstrual cycle of the majority of women (66.5%) is regular and 82.3% had no changes in their menstrual cycle. As for the type of change, the majority of women (36.1%) had hypomenorrhia while 60.3% of them suffered from genitourinary infection
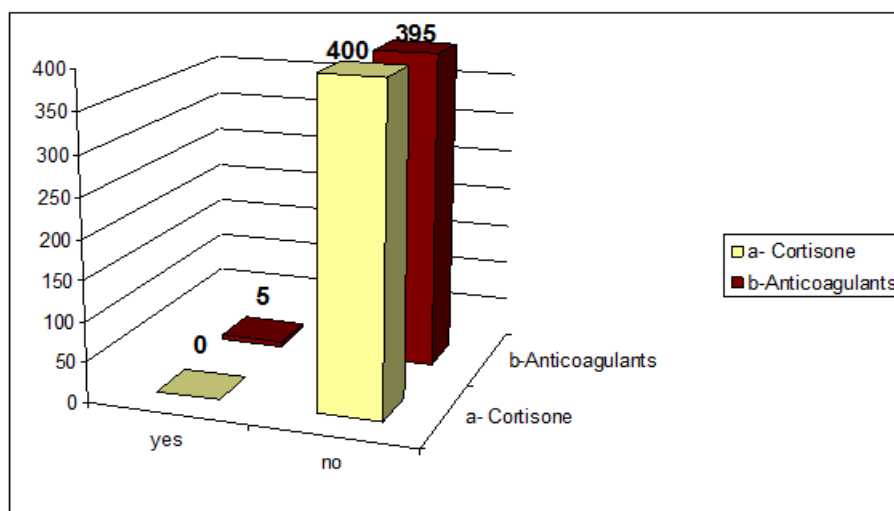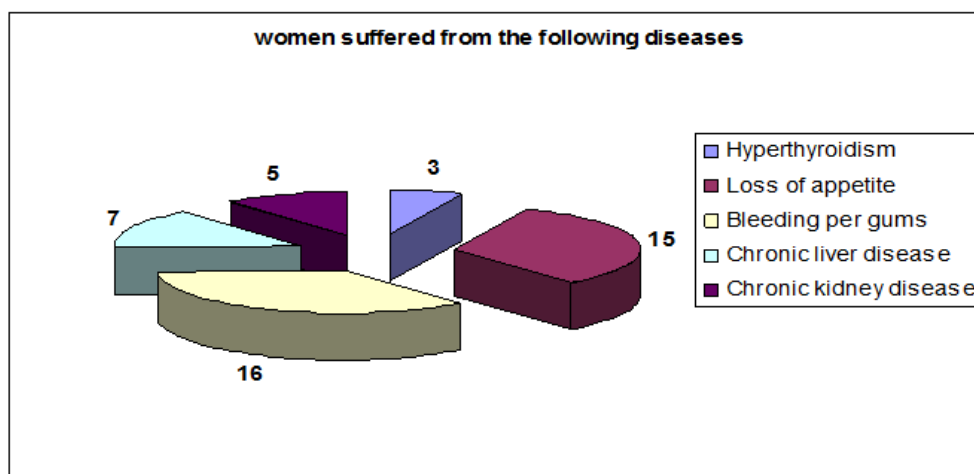
Figures (1 and 2) describe the medical history of the participants. Four percent (4%) of the woman in the sample had bleeding per gums. Three point eight percent (3.8%) of the women in the sample had Loss of appetite. Two point five percent (2.5%) of the woman in the sample had diabetes. Only one point seven (1.7%) percent of them had chronic liver disease. Also, one point three percent (1.3%) of the woman in the sample had anticoagulants. On the other hand, one point two (1.2%) percent of them had chronic kidney disease. Only point eight percent (0.8%) of the woman in the sample had hyperthyroidism.

**Table (4) Distributions of Women Regarding Knowledge Level about Osteoporosis on pre-post Intervention:**

| Knowledge | Pre Intervention knowledge assessment N=400 | | | | | | Post Intervention knowledge assessment N=400 | | | | | | chi square test | P value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Good | | fair | | poor | | Good | | fair | | poor | | | |
| | No | % | No | % | No | % | No | % | No | % | No | % | | |
| Def. of osteoporosis | 38 | 9.5 | 100 | 25 | 262 | 65.5 | 260 | 65 | 100 | 25 | 40 | 10 | 51.36 | < 0.001 |
| Cause | 114 | 28.5 | 86 | 21.5 | 200 | 50 | 206 | 51.5 | 114 | 28.5 | 80 | 20 | 21.12 | < 0.001 |
| Gender risk | 100 | 25 | 100 | 25 | 200 | 50 | 200 | 50 | 70 | 17.5 | 130 | 32.5 | 51.71 | < 0.001 |
| Age risk | 160 | 40 | 200 | 50 | 40 | 10 | 250 | 62.5 | 75 | 18.75 | 75 | 18.75 | 91.22 | < 0.001 |
| Symptoms | 30 | 7.5 | 180 | 45 | 190 | 47.5 | 170 | 42.5 | 150 | 37.5 | 80 | 20 | 30.33 | < 0.001 |
| Food rich in calcium | 80 | 20 | 141 | 35.25 | 179 | 44.75 | 140 | 35 | 170 | 42.5 | 90 | 22.5 | 70.23 | < 0.001 |
| RDA for adult | 74 | 18,5 | 146 | 36.5 | 180 | 45 | 120 | 30 | 133 | 33.25 | 147 | 36.75 | 50.56 | < 0.001 |
| treatment of osteoporosis | 19 | 4.75 | 180 | 45.25 | 200 | 50 | 105 | 26.25 | 99 | 24.75 | 196 | 49 | 28.88 | < 0.001 |
| Factors assist prevention | 50 | 12.5 | 164 | 41 | 186 | 46.5 | 244 | 61 | 67 | 16.75 | 89 | 22.25 | 60.22 | < 0.001 |

Table (4) demonstrates the comparison of women's score regarding the knowledge of osteoporosis pre-post intervention. There was a statistically significance difference between pre-post knowledge score regarding the definition of osteoporosis, causes, gender risk, age risk, symptoms, food rich in calcium, RDA for adult, treatment and factors that assist prevention.

**Table (5) Distribution of Participants Regarding Mean and Standard Deviation of Their Perimenopausal Knowledge at the Pre, Post and Follow-Up Tests:**

| Variable | Pre test (X ± SD) N= 400 | Post test (X ± SD) N= 400 | Follow-up (X ± SD) N= 400 | Repeated Measures ANOVA | P value |
|---|---|---|---|---|---|
| Def. of osteoporosis | 2.91± 1.75 | 6.78 ± 0.22 | 5.07 ± 1.17 | 342.32 | <0.001* |
| Cause | 4.38 ± 2.42 | 17.84 ± 0.44 | 15.56 ± 1.46 | 332.64 | <0.001* |
| Gender risk | 0.97± 0.89 | 4±1.0 | 3.11 ± 1.05 | 373.25 | <0.001* |
| Age risk | 1.30 ± 0.22 | 2.95 ± 0.5 | 2.0 ± 0.63 | 339.15 | <0.001* |
| Symptoms | 0.90 ± 0.63 | 3.98 ± 0.2 | 2.89 ± 0.29 | 396.23 | <0.001* |
| Food rich in calcium | 1.2 ± 0.3 | 3.97 ± 0.13 | 2.99 ± 1.05 | 326.29 | <0.001* |
| RDA for adult | 1.48 ± 0.23 | 3.84 ± 0.26 | 2.89 ± 0.21 | 359.08 | <0.001* |
| treatment of osteoporosis | 3.0 ± 0.4 | 8.47 ± 0.63 | 7.28 ± 1.71 | 338.73 | <0.001* |
| Factors assist prevention | 2.0 ± 1.03 | 5.0 ± 1.0 | 5.0 ± 0.21 | 374.68 | <0.001* |

(*) Statistically significant at p<0.001

From table (5) it could be concluded that there was a highly statistically significant difference (p<0.001) between the mean knowledge score of each variable at the three measurements times.

**Table (6): Distribution of Women's Regarding Knowledge Level and Practice for Osteoporosis Care pre-post Intervention:**

| Knowledge-Practice | Pre intervention (n=400) NO.    % | | Post intervention (n=400) NO.    % | | chi square test | P value |
|---|---|---|---|---|---|---|
| **Knowledge(score =40):** | | | | | | |
| -Poor knowledge (less than20) | 289 | 72.3 | 81 | 20.3 | | |
| -Fair knowledge (20-29) | 72 | 18.0 | 68 | 17.0 | 272.02 | < 0.001 |
| -Good knowledge(≥30) | 39 | 9.7 | 251 | 62.7 | | HS |
| **Practice(score =40):** | | | | | | |
| -Poor practice (less than20) | 98 | 24.5 | 24 | 6.0 | | |
| -Fair practice (20-29) | 264 | 66.0 | 89 | 22.3 | 322.41 | < 0.001 |
| -Good practice(≥30) | 38 | 9.5 | 287 | 71.7 | | HS |

Table (6) compares between women in respect of their knowledge level and practice regarding care for osteoporosis pre-post intervention. It is observed that 9.7% of women had good knowledge during pre intervention as compared to 62.7% during post intervention phase.

**Table (7): Distribution of the Participants regarding their Nutritional Practices on pre-post Intervention, as they Stated:**

| Nutritional practice | Pre Intervention (n=400) | | | | | | Post Intervention (n=400) | | | | | | Chi square test | P value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rarely | | Sometimes | | often | | Rarely | | sometimes | | often | | | |
| | No | % | No | % | No | % | No | % | No | % | No | % | | |
| **Dairy products intake** | 70 | 17.5 | 230 | 57.5 | 100 | 25 | 30 | 7.5 | 150 | 37.5 | 220 | 55 | 44.31 | < 0.001 |
| **Protein intake** | 81 | 20.25 | 150 | 37.5 | 169 | 42.25 | 23 | 5.75 | 357 | 89.25 | 20 | 5 | 88.53 | < 0.001 |
| **Fish intake** | 282 | 70.5 | 118 | 29.5 | 0 | 0.0 | 195 | 48.75 | 200 | 50 | 5 | 1.25 | 105.4 | < 0.001 |
| **Legumes intake** | 90 | 22.5 | 201 | 50.25 | 109 | 27.25 | 33 | 8.25 | 300 | 75 | 67 | 16.75 | 69.66 | < 0.001 |
| **Vegetables intake** | 57 | 14.25 | 278 | 69.5 | 65 | 16.25 | 30 | 7.5 | 299 | 74.75 | 71 | 17.75 | 71.7 | 0.009 S |
| **Fruits intake** | 151 | 37.75 | 240 | 60 | 9 | 2.25 | 85 | 21.25 | 203 | 50.75 | 112 | 28 | 20.2 | < 0.001 |
| **Carbohydrate intake** | 0 | 0.0 | 3 | 0.75 | 397 | 99.25 | 0 | 0.0 | 3 | 0.75 | 397 | 99.25 | 0.35 | 0.68 NS |

Table (7) shows the distribution of women in the sample regarding nutritional practices' pre-post intervention. It is clearly noticed that there was a statistically significance difference regarding dairy products intake, protein intake, fish intake, legumes intake, vegetables intake, fruits intake and carbohydrate intake during the pre and post phases. From tables 5, 6 and 7; hypothesis 1 is accepted. This means that systematic health education improved perimenopausal women's knowledge and practices regarding osteoporosis

**Table (8): Distribution of Women Regarding Knowledge and Practice of Osteoporosis Care before and after Intervention:**

| Knowledge-Practice | Illiterate (n=62) NO.   % | | Read and write (n=57) NO.   % | | Formally educated (n=281) NO.   % | | Total (n=400) NO.   % | | Chi square test | P value |
|---|---|---|---|---|---|---|---|---|---|---|
| **Before Intervention** | | | | | | | | | | |
| **Knowledge:** | | | | | | | | | | |
| -Poor knowledge (< 20) | 61 | 98.4 | 50 | 87.7 | 178 | 63.3 | 289 | 72.3 | | |
| -Fair knowledge (20-29) | 1 | 1.6 | 7 | 12.3 | 64 | 22.8 | 72 | 18.0 | 41.19 | <0.001 |
| -Good knowledge(≥30) | 0 | 0.0 | 0 | 0.0 | 39 | 13.9 | 39 | 9.7 | | HS |
| **Practice(score =40):** | | | | | | | | | | |
| -Poor practice (< 20) | 21 | 33.9 | 26 | 45.6 | 51 | 18.1 | 98 | 24.5 | | |
| -Fair practice (20-29) | 38 | 61.3 | 28 | 49.1 | 198 | 70.5 | 264 | 66.0 | 24.28 | <0.001 |
| -Good practice(≥30) | 3 | 4.8 | 3 | 5.3 | 32 | 11.4 | 38 | 9.5 | | HS |
| **After Intervention** | | | | | | | | | | |
| **Knowledge:** | | | | | | | | | | |
| Poor knowledge (<20) | 43 | 69.4 | 8 | 14.1 | 30 | 10.7 | 81 | 20.3 | | |
| Fair knowledge (20-29) | 1 | 1.6 | 10 | 17.5 | 57 | 20.3 | 68 | 17.0 | 111.36 | <0.001 |
| Good knowledge(≥30) | 18 | 29.0 | 39 | 68.4 | 194 | 69.0 | 251 | 62.7 | | HS |
| **Practice(score =40):** | | | | | | | | | | |
| -Poor practice (< 20) | 11 | 17.7 | 8 | 14.0 | 5 | 1.8 | 24 | 6.0 | | |
| -Fair practice (20-29) | 21 | 33.9 | 20 | 35.1 | 48 | 17.1 | 89 | 22.3 | 51.71 | <0.001 |
| -Good practice(≥30) | 30 | 48.4 | 29 | 50.9 | 228 | 81.1 | 287 | 71.7 | | HS |

Table (8) demonstrates the distribution of the women regarding the knowledge and practice of osteoporosis care before and after intervention. There was a high statistically significant difference between knowledge and practice of osteoporosis care pre and post health education (p<0,001).

**Table (9): Comparison between Employee and House Wife Women Regarding Knowledge and Practice of Osteoporosis Care before and after Intervention:**

| Knowledge-practice | Employee Women (n=189)NO. | % | House Wife Women (n=211) NO. | % | Chi square test | P value |
|---|---|---|---|---|---|---|
| **Before Intervention** | | | | | | |
| **Knowledge**: | | | | | | |
| -Poor knowledge (<20) | 107 | 56.6 | 182 | 86.2 | | |
| -Fair knowledge (20-29) | 55 | 29.1 | 17 | 8.1 | 44.21 | < 0.001 |
| -Good knowledge(≥30) | 27 | 14.3 | 12 | 5.7 | | HS |
| **Practice(score =40):** | | | | | | |
| -Poor practice (< 20) | 44 | 23.3 | 54 | 25.5 | | |
| -Fair practice (20-29) | 128 | 67.7 | 136 | 64.5 | 0.47 | 0.78 |
| -Good practice(≥30) | 17 | 9.0 | 21 | 10.0 | | NS |
| **After Intervention** | | | | | | |
| **Knowledge**: | | | | | | |
| -Poor knowledge (<20) | 51 | 27.0 | 87 | 41.3 | 18.23 | |
| -Fair knowledge (20-29) | 62 | 32.8 | 79 | 37.4 | | < 0.001 |
| -Good knowledge(≥30) | 76 | 40.2 | 45 | 21.3 | | HS |
| **Practice(score =40):** | | | | | | |
| -Poor practice (< 20) | 11 | 5.8 | 61 | 28.9 | 48.88 | |
| -Fair practice (20-29) | 69 | 36.5 | 88 | 41.7 | | < 0.001 |
| -Good practice(≥30) | 109 | 57.7 | 62 | 29.4 | | HS |

Table (9) shows the comparison between employee and house wife women regarding their knowledge level and practice for osteoporosis before and after intervention. There was a statistically significant difference between them concerning their knowledge level and practice before and after intervention.

From tables 8 and 9; hypothesis 2 is accepted as it was found that there was a relation between demographic variables and level of knowledge and practice regarding osteoporosis care

## IV.    Discussion

In the present study the age of the women in the sample ranged between forty to forty three years. This result was similar to the study conducted in Beirut and Rabat among women with the same age [16] and another study conducted in Turkey [17].

In this study, the lower knowledge scores were found regarding the definition, causes, gender risk, symptom/sign, recommended amount of calcium for adults, diagnosis/treatment and risk factor dimensions. The lowest score was for symptoms/signs, while the majority of the women in the sample had fair knowledge about age risk of disease on pre intervention. This could be explained by the fact that the majority of the women in the sample were educated. The same result was reported by [18]; whose study concluded that Vietnamese women may have heard of osteoporosis, yet they would benefit from education targeting the prevention and treatment of the disease**.** Defective knowledge about prevention of osteoporosis was observed in the present study. This was in agreement with [19] from Canada who reported significant knowledge deficits in the areas of osteoporosis consequences, prevention and treatment.

This coincided with the study of [20] in Canada who investigated whether patients could be effectively aware of osteoporosis and lifestyle modification during their outpatient visits to an orthopedic surgeon' office. They reported that in response to educational intervention, significant improvements were seen in terms of the patients' ability to define osteoporosis, the ability to identify being female as a major risk factor, and the understanding that females should begin adequate calcium intake at a young age. However, their post menopausal group demonstrated a less response to educational intervention. However, [21], study conducted to assess Greek female population knowledge about osteoporosis risk factors, found that 96% of the participants knew osteoporosis definition.

After systematic health education, in present study, there was a significant improvement in knowledge level observed in the post and follow-up tests. The majority of the women in the sample were able to correctly identify definition, causes, gender risk, signs; the recommended amount of calcium for adults, factors assisting the prevention and treatment of osteoporosis. They were also able to identify alternate sources of calcium. The same result was reported by [22]; in their health beliefs regarding osteoporosis risk factors of women in NewZealand.

Regarding the comparison between knowledge of osteoporosis pre-post implementing the systematic health education; there was a statistically significant difference between knowledge score in the pre-post test.

Such findings showed that this positive effect can last for at least 3 weeks. This can be compared with [23] study in Kansas City that revealed improvement in knowledge three weeks after the program.

This coincided with [20] study in Canada revealed that, in response to educational intervention, significant improvements were seen in terms of the patients' ability to define osteoporosis, the ability to identify being female as a major risk factor, and the understanding that females should begin adequate calcium intake at a young age. However, their post menopausal group demonstrated a less response to educational intervention. However [21] study that was conducted to assess Greek female population knowledge about osteoporosis risk factors, found that 96% of the participants knew osteoporosis definition.

The findings of the current study were in agreement with the study that was conducted by National Research Centre on a representative sample of the female employees and revealed that there was a significant improvement in the mean score of total correct knowledge during post-test after systematic health education compared with the pre-test's mean score. This result reflected the importance of health systematic health education in raising the level of knowledge among target groups. This was in agreement with similar studies performed in different ages namely; middle school girl students [24], young adults [25], and old adults [26], [27] in different countries. They showed statistically significant improvement in osteoporosis knowledge test scores after intervention with systematic health education ($p<0.001$).

Regarding the comparison between practices regarding osteoporosis in pre-post implementing the systematic health education, there was a statistically significant difference between practices' score regarding osteoporosis in pre-post implementing the systematic health education. The findings of the current study were in agreement with five studies [28], [29], [30], [24] stating that prevention behavior revealed improvement in the pre-post test. However, two studies [23] and [31] described the participants' preventive behavior; which did not improve during intervention.

Regarding the comparison between pre-post interventions of women's food habits, participants in this study increase consumption of calcium, protein, fish, legumes, vegetables and fruits after counseling, but there was no change in carbohydrate. This result may be due to the availability and reasonable prices of the carbohydrate. The findings of the current study were in agreement with [32] at the University of Massachusetts. The major finding of the participants was reported as changing their behavior to reduce their risk of osteoporosis and fall by practicing balance exercises at home, and changing their diet.

Concerning the effect of education level, the present study considered it as a predictive variable affecting the level of knowledge of female employees. This was consistent with the findings of [33] in Turkey who revealed the same results. Similarly, another study found that better educated Chinese women in Singapore knew more about osteoporosis compared to the less educated ones [34].

Regarding the comparison between the educational level of females, practice and knowledge of osteoporosis before and after the systematic health education, there was a statistically significant difference between pre-post implementing health education levels of the women in the sample. The findings of the current study were in agreement in that there was difference between knowledge (awareness) of osteoporosis and the higher levels of education [33] in Philadelphia. The findings of the current study were in agreement with [35] in Vietnamese women.

Regarding the comparison between employee and house wife women concerning knowledge level and practice of osteoporosis before and after implementing the systematic health education, a statistically significant difference between them was revealed. The knowledge level did not change in post intervention and practice changed post intervention. This was in consistent with the finding of [33] in Turkey that revealed the same results.

## V. Conclusion

In the light of the current study findings, it can be concluded that research hypotheses 1 & 2 are accepted **Research hypothesis 1** is accepted as systematic health education improved perimenopausal rural women's knowledge and practices regarding osteoporosis. **Research hypothesis 2** is accepted as it was found that there was a relation between demographic variables and level of knowledge and practice regarding osteoporosis care.

## Recommendations

- Educational programs are suggested to encourage primary health care providers to consult with women more effectively about osteoporosis preventions.
- Perimenopausal women should increase the physical activity and maintain a healthy body weight.
- Perimenopausal women should reduce sodium intake and avoid passive smoking.
- Perimenopausal women should increase consumption of fruit and vegetables.
- Further studies need to be conducted:

o More evidence is required in young people to link intermediate outcome measures such as BMC and density, bone turnover and skeletal dimensions to long-term fracture risk.
o The evidence base needs to include males and people in countries at low risk of osteoporosis fracture in countries at high risk of fracture.
o Research is needed to define the mechanisms, by which adaptation to a low calcium intake occurs, and to examine the interaction of genetic make-up, diet composition and other environmental exposures with calcium regulation and bone health.

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