

## Bone Mineral Density Comparison with Biochemical Parameters of Bone Turnovers Among Premenopausal Women

**Golda Sahaya Rani R\***

*Department of Medical Surgical Nursing, Shri Sathya Sai College of Nursing, India*

**\*Corresponding Author:** Golda Sahaya Rani R, Professor, Department of Medical Surgical Nursing, Shri Sathya Sai College of Nursing, India.

**Received:** July 01, 2022

**Published:** July 27, 2022

© All rights are reserved by **Golda Sahaya Rani R.**

### Abstract

Osteoporosis is a multifarious and a myriad condition that may occur concurrently with various risk factors. More than 200 million people worldwide endure osteoporosis. Bone mass becomes unstable as the bone tissues are structurally depreciating eventually. Prevention services for osteoporosis are required to aid premenopausal women recognize bone health determinants and avoid bone loss.

**Aim:** The study focuses on the efficacy of biochemical parameters among premenopausal females. The goal of the undertaken study is the efficacy of the system of prevention of osteoporosis in premenopausal women on the interaction of BMD with biochemical parameters.

**Methods:** Simple random sampling methodology is used in true Experimental Design. As a first step, by testing biochemical parameters, 180 premenopausal females were evaluated for eligibility. 83 females had met the requirements for inclusion criteria. On the basis of lottery system, 40 women were shortlisted. Pretest was performed by one monitoring group (20) and one experimental group (20). The prevention program (treatment plan) for osteoporosis requires formal awareness and dietary supplementation. Structured education was provided on osteoporosis prevention, with the aid of 20 minute flash cards. Supplementation to the diet was given in three days per week. The experimental group was granted the plan of prevention of osteoporosis. After 12th week of intervention, control group received no intervention between control group.

**Conclusion:** The study concludes that the biochemical parameters of osteoporosis change substantially after intervention. In premenopausal women, there existed a positive correlation between serum calcium, phosphorus, and BMD ( $p < 0.0001$ ). Prevention Program for Osteoporosis is an important and economically viable approach for treating osteoporosis.

**Keywords:** Osteoporosis; Premenopausal Women; Biochemical Parameters

### Abbreviations

WT: Weight; HT: Height; BMI: Body Mass Index; BMD: Bone Mineral Density; WHO: World Health Organization;

ALT: Alkaline Phosphatase; UV: Ultra Violet

### Introduction

The femininity of a woman is threatened with osteoporosis after menopause due to decreased secretion production of

estrogen hormones where women are prone to lose their calcium from bones. The key agent such as reduced access to sunshine, poor nutritional status, reduced calcium and vitamin D diet intake, and low sensitivity to disease diagnosis, control and prevention that may be vulnerable to osteoporosis [1]. Osteoporosis leads to numerous fractures, and the symptoms are impairment, severe discomfort, and eventually, those afflicted by this disease are fatal. The global outcome shows that India currently has a life expectancy

of 67 years and anticipates a increase to 71 years by 2025. In the Indian case, the older people of 50 years are actually likely to be affected by osteoporosis by a high number of women. Results in 2013 indicated that about~50 million Indian populations had T-scores of -1 [2]. In younger women, osteoporosis results from both a low peak bone mass and decreased bone loss before menopause. Peak bone mass is achieved by age 30 with 90 percent of growth completed by age 18. Peak bone mass is achieved by age 30 with 90 percent of growth completed by age 18. The bone mass remains stable until menopause, with a decline in bone mineral density (BMD) [3] associated with the time-loss of estrogens in coincidence with aging. Only the peak bone loss is observable during the menstrual stages of the premenopausal period. Bone mass are accelerated during the menopause. As the age rises, women build up fracture. To prevent high risk of fracture [4], every premenopausal woman should go to the Bone mineral density test for screening test. Mineral like calcium has a vital role along with phosphorus in improving bone metabolism. Calcium dietary intake determines the peak bone mass, especially in women with low calcium intake showing reduced bone mineral density (BMD) [5]. Bone turnover is known to be the biochemical markers for bone formation. Biochemical indicators are alkaline phosphates, serum calcium, serum phosphorus. Increased bone turnover is associated with reduced bone mass levels and high fracture risks. Such biochemical parameters annotate the treatment's response [6]. Exercises are intended to improve explosive jumping strength, and generally increase speed and efficiency. It is the most respected modality of training to boost bone density. Exercises aimed to improve bone mass over 9- weeks [7] periods. Clinical treatment has not enhanced initial risk factors including functional, less muscle strength and power, both of which are interrelated and vulnerable to fracture growth. Exercise can strengthen the skeletal muscle and fall risk factors. Standard types of aerobic low-or non-impact walking has no effect to prevent age-related bone loss. Evidences reveal that walking is just a single intervention for the prevention of osteoporosis. Exercise preparation as an efficient approach to preserving bone mass is recommended. The maximum effects of exercises are highlighted if the young women are in the 30 year age group. Young women will work against exercises on weight bearing, high impact exercises are strongly recommended to store the BMD [9]. Osteoporosis needs to identify significant issues in a timely manner, and to have cause management. Educating women regarding the prevention and treatment of osteoporosis is a growing exigency, since it is a tranquil and preventable disease. Raising

consciousness among young women before an inevitable duration of declining bone mass [10] is critical. Multifaceted education in the osteoporosis community will improve patients' awareness of osteoporosis as well as their quality of life, physical activity and psychosocial functioning related to health. It can affect the ability of patients to participate in the prevention and management of osteoporosis in a positive way. Knowledge about risk factors for osteoporosis, exercise and regular calcium intake. Training health care practitioners in the use of clinical and community visits is also beneficial as an opportunity to provide information on and prevention of osteoporosis. It takes the hour to spread extensive osteoporosis-related information, particularly targeting premenopausal women, to pull up the progression of the silent illness [12]. Osteoporosis is prevented and managed at the grass root level. A nurse, who is a health-care staff shares responsibility for building a healthy society. Nurses are said to esteem and are passionate about promoting wellness. The study's intention was to introduce centered interventions such as osteoporosis prevention educational initiatives to help premenopausal women recognize the determinants of bone health and avoid bone loss.

## Materials and Methods

### Subjects

In the first step 180 women were assessed to test the premenopausal population. 83 women had met the requirements for inclusion. Of these, 40 women were chosen by method of lottery. Inclusion criteria requirements are premenopausal women between 30 and 40 years of age who live in selected urban areas during the research. As per the quantitative ultra sound, the bone mineral density measurement T-scores range from -1 to -4. Women were able to understand, speak and read Tamil and English to fill up the questionnaires and actively participated in this study. In exclusion criteria, women who were not willing to participate in the osteoporosis prevention program, were found to have cognitive disability, chronic disease and mental health problems, women under Hormonal Replacement Therapy, women who are previously diagnosed as osteoporosis. During the postmenopausal period, data were collected from premenopausal women who were able to read about the consent form, study purpose, possible results and purposes of the tests, blood sample requirement before and after the intervention period. The present thesis has been endorsed by the Saveetha University Human Ethical Committee, Chennai, Tamil Nadu, India.

### Study design

The approach to research had been quantitative. True Experimental Design was adopted for the undertaken study. Women who meet the criteria for inclusion and the basic random method were divided into two groups. Women who meet the criteria for inclusion and the simple random method were divided into two groups. Pretest was done by one control group (20) and one experimental group (20). The experimental group was given the program of prevention of osteoporosis (OPP) after assessment. The return compliance was obtained from premenopausal women. The participants were clearly explained that the disposable syringe was used to extract blood samples by the professional phlebotomist (technicians qualified to draw blood from premenopausal women for clinical research purposes) from an accredited laboratory. The level of bone mineral density was estimated using ultrasound bone densitometer for premenopausal females. All 40 premenopausal women with demographic variables were given a standardized questionnaire. While then a small group on the prevention of osteoporosis was given formal health education after the pretest. Each wing was been formulated into 2 groups in all. One group was chosen each day to conduct organized health education. Each group is composed of 10 personnel. Prevention of osteoporosis includes structured education, exercises, and dietary supplementation. Each group was taken to a common hall every day and made themselves comfortable, and then formal health education was provided on osteoporosis prevention, with the aid of flash cards for 20 minutes and their doubts were explained. Then, demonstrations of exercises were undertaken followed by the diet supplementation (Ragi Laddu) was distributed for three days in a week. Subjects were instructed to walk regularly for 20 mins in the morning, and pursue the dietary recall method promptly. The pamphlets were distributed to the premenopausal women with required brief details about the bone health issue, tests and their benefits. Every weekend, the research had been improving substantially. The experimental group was granted Osteoporosis prevention program (OPP). Control group received no intervention.

### Study measurements

The demographic characteristics of 40 premenopausal women with respect to age, marital status education, religion, no children, type of family, socioeconomic status, family history of osteoporosis, age of menarche attainment, menstrual cycle, dietary habits, source of osteoporosis information. The weight and height were also inputted from the women to calculate the body mass index (BMI) by dividing weight (in kilograms) by the square of the height (in meters). The obtained BMI values were classified based

on the standards of WHO (2004). The 24-hour nutritional recall preparation for the diet was performed. The calcium rich diet plan was offered to the participants according to a dietician's directions. It maintained the routine diary to track prescribed diet intake. Blood testing was performed using standard techniques. Serum Calcium was calculated using (colorimetric method) The Serum Phosphorus, Alkaline phosphatase (ALP) was calculated using Molyb date UV Method and ALP is measured using Liquid Kinetic Method.

### Statistical analysis

In a master data sheet, data was entered, categorical variables were summarized using the frequency and percentage. The quantitative variables are summarized using mean, standard deviation, median, to appraise the osteoporosis prevention program (OPP) on information and biochemical parameters using repeat measures. Biochemical variables with selected socio-demographic variables test and kruskal Wallis test are performed and values less than 0.05 are considered statistically significant. Complete analysis of data was carried out using SPSS software version 20.

### Results

Total 40 premenopausal women were compared with the control group and the experimental group. In table 1, it reveals that the experimental group statistical data was expressed in the mg/dl, mean  $\pm$  SD values. Serum calcium, serum phosphorus, BMD of the premenopausal women was determined among the control group and experimental community. In experimental community, that was found to be highly important ( $p < 0.0001$ ).

Graph 1 shows the study and control group BMD pretest level and post test level. The graph shows the major difference when the two groups are compared. In the experimental group, after the osteoporosis prevention program among premenopausal women, the values of BMD are improved.

**Graph 1:** Percentage of bone mineral density distribution among premenopausal women in experimental and control group.

Variables	Group	Mean ± S.E	Median	Mann Whitney rank sum test	
				Exp and Con Pretest	Exp and Con Posttest
Serum Calcium	Exp-Pretest	7.83 ± 0.05	7.90 (7.20 - 8.10)	T = 153.0 P = 0.198 Z = -1.289	T = 22.0 P < 0.0001 Z = 4.836
	Con-Pretest	7.78 ± 0.04	7.80 (7.50 - 8.10)		
	Exp-Posttest	8.34 ± 0.06	8.30 (7.70 - 8.80)		
	Con-Posttest	7.78 ± 0.04	7.80 (7.50 - 8.10)		
Serum Phosphorous	Exp-Pretest	2.18 ± 0.03	2.20 (1.90 - 2.40)	T = 145.50 P = .0134 Z = 1.499	T = 4.0 P < 0.0001 Z = 5.328
	Con-Pretest	2.09 ± 0.04	2.10 (1.70 - 2.40)		
	Exp-Posttest	2.59 ± 0.03	2.60 (2.30 - 2.90)		
	Con-Posttest	2.09 ± 0.04	2.10 (1.70 - 2.40)		
Alkaline Phosphorous	Exp-Pretest	34.70 ± 0.26	35.0 (32.0 - 37.0)	T = 140.50 P = 0.101 Z = -1.638	T = 9.0 P = 0.000 Z = 5.196
	Con-Pretest	33.65 ± 0.48	38.50 (30.0 - 38.0)		
	Exp-Posttest	38.75 ± 0.35	33.50 (36.0 - 42.0)		
	Con-Posttest	33.65 ± 0.48	33.50 (30.0 - 38.0)		
Bone Mineral Density	Exp-Pretest	-1.75 ± 0.05	-1.75 (-2.40 - -1.40)	T = 189.50 P = .0775 Z = -0.285	T = 14.50 P < 0.0001 Z = 5.022
	Con-Pretest	-1.73 ± 0.05	-1.72 (-2.50 - -1.40)		
	Exp-Posttest	0.59 ± 0.24	0.90 (-1.85 - 1.85)		
	Con-Posttest	-1.73 ± 0.05	-1.72 (-2.50 - -1.40)		

**Table 1:** Comparison of BMD on osteoporosis, biochemical parameters between experimental and control group of premenopausal women n = 40 (20+20).

The table describes the comparison of BMD and Biochemical performance parameters. It was observed that there is a significant difference of biochemical parameters ( $p < 0.0001$ ) of premenopausal women between the experimental group as compared to the control group.

**Graph 2:** Bone Mineral Density Comparison among premenopausal women in experimental group.

**Graph 3:** Comparison of knowledge on biochemical parameters of osteoporosis in experimental group among premenopausal women.

## Discussion

Results explanation is a cornerstone of a research project. The present study was conducted on the effectiveness of the prevention program for osteoporosis (OPP) in biochemical parameters among premenopausal women. It shows that a highly significant ( $p < 0.001$ ) difference among premenopausal women was observed between the pretest and post-test.

Kathleen G., *et al.* [13] Osteoporosis is common, and its prevention and treatment involves physical activity. On examination of physical activity (PA), we found that during development and into adulthood, weight-bearing and very hard physical activity had the greatest association with areal bone mineral density (BMD). Past PA>7 METS was positively correlated with BMD and this operation would presumably constitute a fairly high proportion of all weekly PA to positively impact BMD.

Mariola Janiszewska., *et al.* [15] The research was to assess the level of awareness among women about osteoporosis prevention. The screen test is done by bone densitometry. The response to the question whether 292 women aged 51-83 participated in the level of knowledge was studied. The examined women were bone densitometry patients at Lublin healthcare centres. Well trained women, urban residents as well as women with very good or decent social and health conditions showed a substantially higher level of awareness on prevention of osteoporosis.

Najam R., *et al.* [16]. The present cross-sectional research was conducted to determine osteoporosis by assessing bone mineral density in postmenopausal females. The participants were subjected to BMD assessment by bone densitometer Achilles Ultrasound. The BMD results were analyzed using T-Scores and depicted in the form of a graph. Quantitative ultrasound (QUS) is a simple and inexpensive method of bone density measurement. 90 per cent of postmenopausal women in our sample had subnormal T levels. In this vulnerable group we recommend regular measurements of BMD in subjects for early diagnosis and treatment of osteoporosis.

A Prentice [17] study research on diet and nutrition relating to osteoporosis to provide guidelines for the prevention of osteoporosis, address the challenges of using bone mineral density to assess the risk of osteoporosis in a global context, to propose that fragility fracture should be regarded as an endpoint for the

disease. There is little information relating bone mineral status, growth levels or bone turnover in adolescents to aspects of the diet, growing evidence indicates that current healthy-eating advice to decrease sodium intake, raise potassium intake, and consume more fresh fruits and vegetables is unlikely to be harmful to bone health and may be beneficial.

Karen L. Troy [18] Physical activity is a contributor to bone health which is widely accessible, low cost and highly modifiable. Exercise is particularly effective during adolescence, a period in which almost 50 per cent of peak adult bone mass is gained. Here we are looking at the evidence relating exercise and physical activity to women's bone health. In particular in the sense of clinical diagnosis of osteoporosis, bone structure and consistency will be discussed. In the context of physical activity and exercise, we review the mechanisms which regulate bone metabolism.

Shivani Sahni, *et al.* [19] Adequate nutrition is important to achieve and maintain optimal bone mass and also to prevent this devitalizing disease. Adequate intake of calcium and vitamin D is widely accepted as necessary for good bone health; however, nutritional benefits to bone go beyond these two nutrients. The article will include new information on all the known nutrients and foods to alter bone health.

Dionyssiotis, *et al.* [20] This study had the purpose of investigating the association of physical activity and calcium intake with bone parameters. Quantitative ultrasound (QUS), Assessed physical activity and dietary calcium intake by questionnaire. Physical exercise and adequate consumption of calcium in the diet are suggested as a way for women to optimize the benefits of bone status.

## Conclusion

The study was conducted among premenopausal women with low bone mass density. The overall results show that among premenopausal women the 12 weeks of OPP increased substantially ( $p < 0.0001$ ) in biochemical parameters. In premenopausal women, the importance of prevention and control measures of bone loss was raised and actively motivated them to increase quality of life. Using Mann Whitney Rank Sum Test and Wilcoxon Signed Rank Test the current study, statistical analysis, was conducted. The study found no bias. During the research premenopausal was strongly cooperative.

## Acknowledgment

With interest for the study we thank the participants for their continued support. The authors are grateful to the Kanchi sangamam private association authorities for granting permission to perform the study.

## Conflict of Interest

None of the authors have any conflicts of interest in personal or financial matters.

## Bibliography

1. Kling JM, *et al.* "Osteoporosis prevention, screening, and treatment: a review". *Journal of Women's Health* 23.7 (2014): 563-572.
2. Khadilkar AV and Mandlik RM. "Epidemiology and treatment of osteoporosis in women: an Indian perspective". *International Journal of Women's Health* 7 (2015): 841.
3. McLendon AN and Woodis CB. "A review of osteoporosis management in younger premenopausal women". *Women's Health* 10.1 (2014): 59-77.
4. Garg N, *et al.* "An epidemiological study to assess bone mineral density and its association with contributing factors among premenopausal and postmenopausal women in selected villages of District Shimla, Himachal Pradesh, India". *International Journal of Reproduction, Contraception, Obstetrics and Gynecology* 7.2 (2018): 487-494.
5. Samiya Begum I, *et al.* "Association of Bone Mineral Density with Biochemical parameters in Perimenopausal Women". *International Journal of Scientific Research* 6.11 (2017): 200,201.
6. Jada MR, *et al.* "Evaluation of biochemical and bone density parameters in premenopausal and postmenopausal women". *International Journal of Biological and Medical Research* 4.3 (2013): 3441-3443.
7. Kumari A, *et al.* "Study of Serum Calcium Level in Pre- and Postmenopausal Women of Jamshedpur, Jharkhand". *International Journal of Scientific Study* 6.6 (2018): 18-20.
8. Daly RM, *et al.* "Exercise for the prevention of osteoporosis in postmenopausal women: an evidence-based guide to the optimal prescription". *Brazilian Journal of Physical Therapy* 23.2 (2019): 170-180.

9. Soomro RR, *et al.* "Comparing the effects of Osteoporosis Prevention Exercise Protocol (OPEP) versus walking in the prevention of osteoporosis in younger females". *Pakistan Journal of Medical Sciences* 31.2 (2015): 336.
10. Takoo S. "A Study to Assess the Effectiveness of Structured Teaching Program on Knowledge of Menopausal Women regarding Prevention and Management of Osteoporosis, Attending Gynaecological OPD of Batra Hospital and Medical Research Centre, New Delhi". 5.1 (2018): 6.
11. Jensen AL, *et al.* "Effectiveness and characteristics of multifaceted osteoporosis group education—a systematic review". *Osteoporosis International* 25.4 (2014): 1209-1224.
12. Gayathripriya N, *et al.* "Knowledge on osteoporosis prevention among Bahraini women: A cross sectional study" (2017).
13. Greenway KG, *et al.* "Relationships between self-reported lifetime physical activity, estimates of current physical fitness, and aBMD in adult premenopausal women". *Archives of Osteoporosis* 10.1 (2015): 34.
14. Jeihooni AK, *et al.* "Effects of an osteoporosis prevention program based on health belief model among females". *Nursing and Midwifery Studies* 4.3 (2015).
15. Janiszewska M, *et al.* "Knowledge about osteoporosis prevention among women screened by bone densitometry". *Przegląd Menopauzalny= Menopause Review* 15.2 (2016): 96.
16. Najam R and Huda N. "Assessment of osteoporosis in post menopausal women: a clinical study". *Nepal Journal of Obstetrics and Gynaecology* 6.2 (2011): 11-13.
17. Prentice A. "Diet, nutrition and the prevention of osteoporosis". *Public Health Nutrition* 7.1a (2004): 227-243.
18. Troy KL, *et al.* "Exercise early and often: effects of physical activity and exercise on women's bone health". *International Journal of Environmental Research and Public Health* 15.5 (2018): 878.
19. Sahni S, *et al.* "Dietary approaches for bone health: lessons from the Framingham Osteoporosis Study". *Current Osteoporosis Reports* 13.4 (2015): 245-255.
20. Dionyssiotis Y, *et al.* "Association of physical exercise and calcium intake with bone mass measured by quantitative ultrasound". *BMC Women's Health* 10.1 (2010): 12.