

Comparative Study of Serum Calcium and PTH (Parathyroid Hormones) In Pre-Menopausal and Post- Menopausal Women of Maharashtra

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Received: 28-10-2025 / Revised: 27-11-2025 / Accepted: 20-12-2025

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Conflict of interest: Nil

Abstract

Background: In menopausal women, there are many factors that cause osteoporosis. As the systems include metabolism and anabolic metabolism function very slowly hence there will not be regrowth or redeposition of osteogenic cells; hence, osteoporosis is a common phenomenon in menopause.

Method: 40 premenopausal and 40 postmenopausal women were studied. Apart from their anthropological parameters, their biochemical profile was studied. 5 ml of venous blood from each patient was collected. Serum calcium was measured by the colorimetric method (Erba kit). Calcitonin and PTH were estimated by ELISA, and results were compared.

Results: In anthropological parameters, the age group of premenstrual and postmenstrual women had a significant p-value ($p < 0.001$). In the comparative study of serum calcium and serum calcitonin, PTH had a significant p-value ($p < 0.001$).

Conclusion: It is proved that postmenopausal women have low calcium along with higher PTH, which results in osteoporosis. More research is required to increase calcium levels in postmenopausal women to lead healthy, socioeconomically independent lives.

Keywords: Erba-kit, ELISA, anthropometric, mineralization, osteoporosis, calorimetry.

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Introduction

The quality, quantity, density, and ratio of bone mineralisation depends upon several hormones, parathyroid hormone (PTH), induce the resorption of calcium from bone and maintain the serum calcium level. Bone strength is measured by bone mineral density and its architecture [1]. Due to a reduction in the secretion of PTH, leads to osteoporosis. Osteoporosis is a disorder characterized by compromised bone strength, which increases the risk of fragility fractures [2].

Osteoporotic fractures impair mobility, independence, and quality of life. Any jerk or mere fall leads to osteoporotic fracture. Fracture of the hip increases mortality by up to 20% as the patient becomes bedridden.

The diagnostic criteria for osteoporosis are defined in terms of bone mass, but true clinical consequences, are the fractures. The classical osteoporotic fractures are wrist, spine, ribs, pelvis, and hip.

The prevalence of osteoporosis increases with age, especially in females [3]. In the decade following perimenopause and postmenopause. Most women

experience rapid bone loss due to estrogen deficiency. The most common etiology of osteoporosis is estrogen deficiency.

However, there are numerous causes of secondary bone loss, including adverse effects of drug therapy, endocrine disorders, eating disorders, immobilization, marrow-related disorders, and disorders of G.I.T or biliary tract, renal disorder or malignancy [4]. Hence, attempt is made to rule out the serum calcium and PTH level in pre- and postmenopausal women.

Material and Method

80 adult women visited Datta Meghe Medical College, Wanadongari, Hingna. Nagpur, Maharashtra-441110, referred by the orthopedics, obstetrics, and gynecology department, was studied.

Inclusive Criteria: Pre- and postmenopausal women who gave their consent in writing for the study were selected.

Exclusion Criteria: The patients who underwent thyroid surgery and were already on treatment and

nutritional supplements were excluded from the study.

Method: The majority of women belonged to the middle socioeconomic status. 40 premenopausal and 40 postmenopausal women were classified for the comparative study. The previous history of every patient was recorded. Anthropological parameter included BMI, which was calculated based on height (cms) and weight (kg).

The biochemical profile was studied by collecting 5 ml of venous blood from each patient. Serum calcium was measured by the colorimetric method (Erba kit). Serum parathyroid hormone and calcitonin were estimated by enzyme-linked immunosorbent assay (ELISA), and the results were noted.

The duration of the study was January 2025 to October 2025.

Statistical Analysis: Anthropological parameters and biochemical parameters in both premenopausal and postmenopausal women were compared with the t-test. The statistical analysis was carried out using SPSS software.

Observation and Results

Table 1: Comparison of anthropological parameters in premenopausal and postmenopausal women

- Age (years): 35 (\pm 3.1) in premenopausal, 54 (\pm 2.3) in postmenopausal, t test: 31.1 and $p < 0.001$.
- Height (cms): 152.50 (\pm 4.78) in premenopausal, 152.30 (\pm 5.12) in postmenopausal women, t test: 0.45 and $p > 0.65$ (p value is insignificant).
- Weight (kg): 68.02 (\pm 9.77) in premenopausal, 63.08 (\pm 8.28) in postmenopausal women, t test was 2.92 and $p < 0.001$ (p value is highly significant).
- BMI: 26.2 (\pm 1.4) in premenopausal, 26.5 (\pm 1.2) in postmenopausal women; t test is 1.02 and $p > 0.30$ (p value is insignificant).

Table 2: Comparison of serum calcium, PTH, and calcitonin levels in premenopausal and postmenopausal women

- Serum calcium (mg/dl): 9.10 (\pm 0.82) in premenopausal women, 7.80 (\pm 0.28) in postmenopausal women; t test 9.4 and $p < 0.001$ (p value is highly significant).
- Serum calcitonin (pg/ml): 6.8 (\pm 1.89) in premenopausal women, 5.5 (\pm 0.58) in postmenopausal women; t test was 4.15 and $p < 0.001$ (p value: highly significant).
- Serum PTH (pg/ml): 33.10 (\pm 8.18) in premenopausal women, 55.10 (\pm 15.40) in postmenopausal women; t test was 7.98 and $p < 0.001$ (p value is highly significant).

Table 1: Comparison of Anthropometric parameters in premenopausal and postmenopausal women

Parameters	Premenopausal mean value (40)	Postmenopausal mean value (40)	t test	p value
Age (years)	35 (\pm 3.1)	54 (\pm 2.3)	31.1	$P < 0.001$
Height (cms)	152.50 (\pm 4.78)	152.30 (\pm 5.12)	0.45	$P > 0.65$
Weight (kg)	68.02 (\pm 9.77)	63.08 (\pm 8.28)	2.92	$P < 0.001$
BMI	26.2 (\pm 1.4)	26.5 (\pm 1.2)	1.02	$p > 0.30$

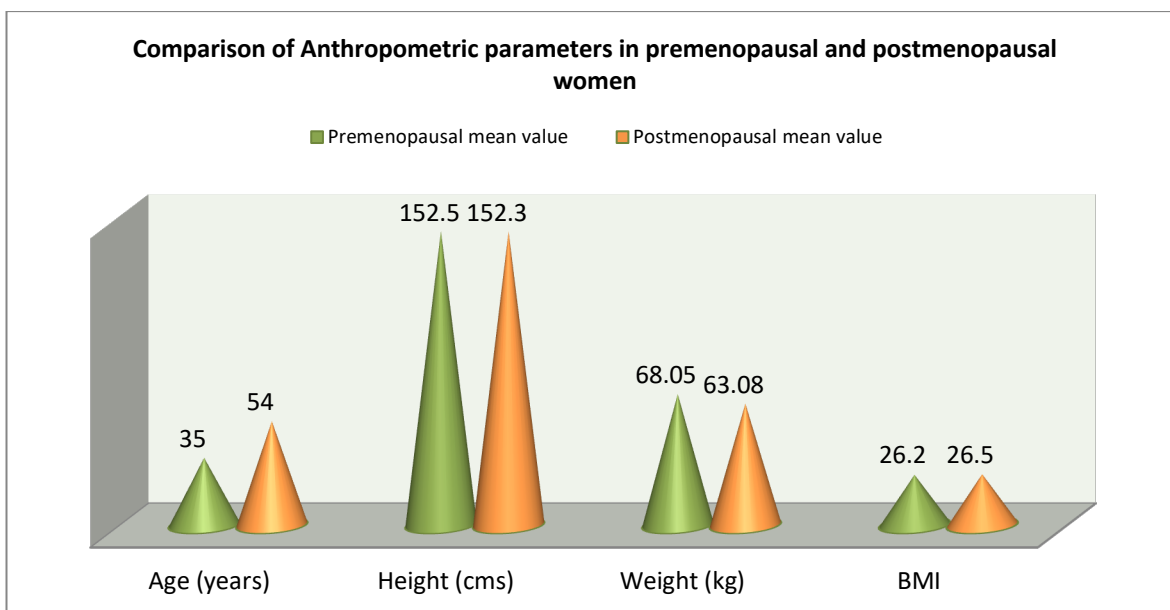


Figure 1: Comparison of Anthropometric parameters in premenopausal and postmenopausal women

Table 2: Comparison of serum calcium PTH and calcitonin in premenopausal and postmenopausal women

Parameters	Premenopausal mean value (40)	Postmenopausal mean value (40)	t test	p value
Serum calcium (mg/dl)	9.10 (\pm 0.82)	7.80 (\pm 0.28)	9.4	P<0.001
Serum calcitonin (pg/ml)	6.8 (\pm 1.89)	5.5 (\pm 0.58)	4.15	P<0.001
Serum PTH pg/ml	33.10 (\pm 8.18)	55.12 (\pm 15.40)	7.98	P<0.001

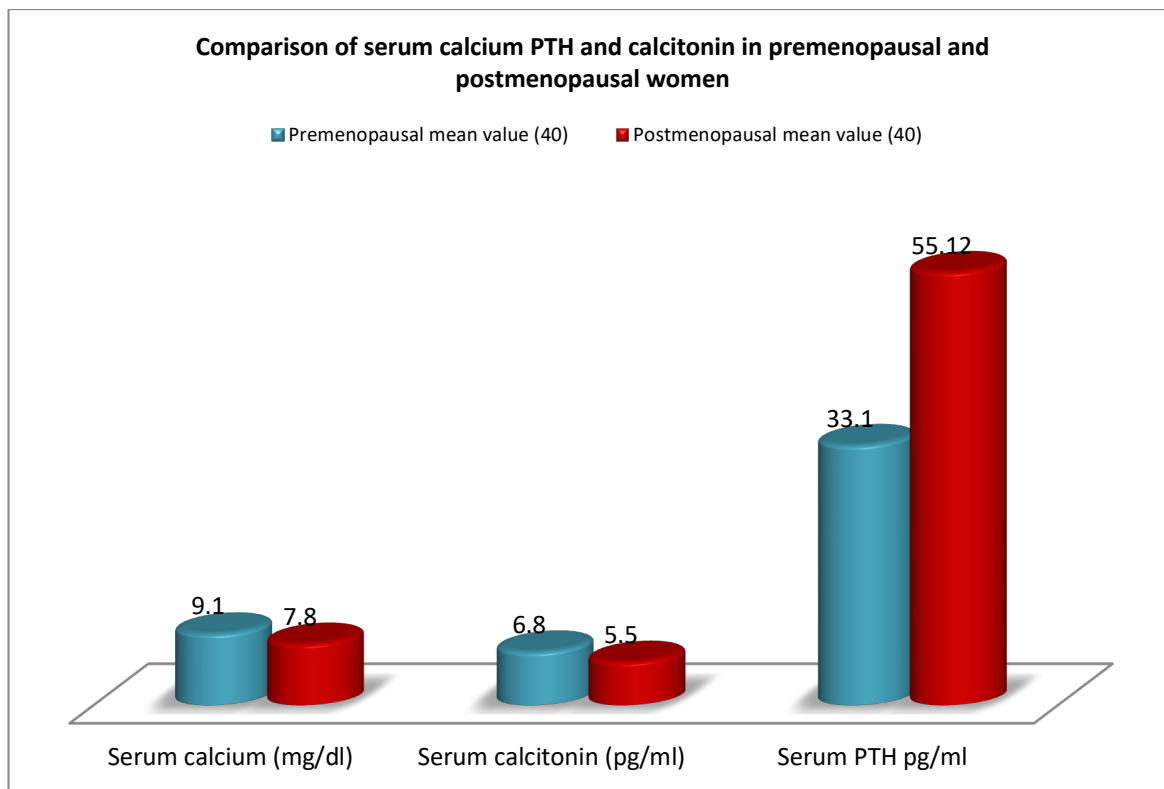


Figure 2: Comparison of serum calcium PTH and calcitonin in premenopausal and postmenopausal women

Discussion

In the present comparative study of serum calcium and hormone parameters (PTH) in premenopausal and postmenopausal women of Maharashtra. In the anthropological comparison study, except for height and BMI, all parameters have a significant p-value (p<0.001) (Table 1). In the comparative study of serum calcium, PTH, and calcitonin in premenopausal and menopausal women, there is a significant p-value (p<0.001) (Table 2). These findings are more or less in agreement with previous studies [5,6,7].

PTH is most responsible for maintaining serum ionized calcium concentration within a narrow range through its actions in the kidney to stimulate renal tubular calcium reabsorption and the conversion of 25-hydroxy vitamin D to 1,25-dihydroxy vitamin D, thereby increasing calcium absorption, and in the bone to increase bone turnover [8]. PTH acts in bone to increase bone.

PTH acts in bone to increase the number and activity of osteoblasts and increase bone turnover.

With sustained elevations in PTH, osteoclastic activity could exceed that of osteoblasts, which results in the net release of calcium from bone and a decrease in bone marrow density (BMD) and bone strength.

In healthy postmenopausal women, there was a decrease in calcium absorption, and that decrease could be due to a decline in either the active calcium transport or diffusion components of the calcium absorption system. It was also found that urinary calcium was significantly higher in postmenopausal women, and it was due to reduced tubular resorption [9]. It is also reported that serum calcium levels were significantly reduced in postmenopausal women due to decreased estrogen levels, resulting in increased synthesis of cytokines by osteoblasts, monocytes, and T cells, which stimulated bone resorption [10]. The low estrogen levels lead to low calcium levels in the body, which in turn increase PTH levels, which further lead to the release of calcium ions from bones [11]. This leads to the weakening of bones and makes them more susceptible to diseases like osteoporosis and

fractures. Parathyroid hormone is an important hormone in calcium turnover, with its main function being the maintenance of the calcium level in extracellular fluid. The secretion of parathyroid hormone is stimulated by hypocalcemia.

Decrease in hormones in females, especially estradiol, suppresses the intestinal absorption of calcium.

Summary and Conclusion

In the comparative study, postmenopausal women have low calcium levels and high serum PTH hormone, which leads to osteoporosis and fractures. Hence, calcium supplementation and a calcium nutrition diet are advocated for postmenopausal women. In severe hypocalcemia, HRT (hormonal replacement therapy) is also recommended under gynecological supervision. But this study further demands pathophysiological, environmental, genetic, and hormonal studies because the exact pathogenesis and factors that cause osteoporosis are still unclear.

Limitation of Study: Owing to the remote location of the research center, the small number of patients, and the lack of the latest technologies, we have limited findings and results.

This research paper has been approved by the ethical committee of visited Datta Meghe Medical College, Wanadongari, Hingna Nagpur, and Maharashtra-441110.

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