

Comparative Study of Serum Calcium Levels in Pre-Menopausal and Post-Menopausal Women of Marathwada RegionParveen Shabir Kavathekar¹, Ravindra Mahadev Survase²¹Assistant Professor, Department of Biochemistry, Government Medical College, Aurangabad, Maharashtra-431001²Assistant Professor, Department of Obstetrics and Gynaecology, Vilasrao Deshmukh Government Medical College, Latur, Maharashtra-413512

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Conflict of interest: Nil

Abstract:**Background:** In post-menopausal women, estrogen deficiency and age-related factors reduce calcium levels, which lead to osteoporosis and the non-fusion of bony fractures.**Method:** Out of 550 women, who participated in present study, 235 were pre-menopausal and 315 were post-menopausal. 3-5 ml of venous blood was collected from the median-cubital vein. Serum calcium was measured by OCPC (Ortho-Cresolphthalein-Complexone) method.**Results:** The mean value of pre-menopausal serum calcium was 8.7 (\pm 3.2) mg/dl and 7.5 (\pm 1.4) mg/dl in post-menopausal women; the Unpaired t test was 2.4 and $p < 0.002$ (the p value was highly significant).**Conclusion:** It is concluded that serum calcium levels are significantly lower in post-menopausal women; hence, they must be treated with calcium supplements to maintain their normal calcium levels and prevent osteoporosis.**Keywords:** Pre-menopausal, Post-menopausal, Osteoporosis, Serum Calcium level.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Calcium ions are an essential structural component of the human skeleton. There is growing evidence for the importance of bones and healthy joints. Nutritional imbalance with endocrine abnormalities may be involved in osteoporosis [1]. Extracellular calcium ion concentration is determined by the interaction of calcium absorption from the intestine, renal excretion of calcium and bone uptake and release of calcium, each of which is regulated by parathyroid hormone, vitamin D and calcitonin [2].

Bone mineralization and the rate of bone turnover are controlled by a number of hormones in the human body. The parathyroid hormone (PTH) causes bone resorption and helps to maintain blood calcium levels. Estrogens exert a major effect in women on bone re-modeling by inhibiting interleukin (IL)-6 production, which reduces bone resorption and also controls the timing of osteoclast apoptosis.

Estrogen deficiency, therefore, results in a longer life span for osteoclasts. In women, the two major causes of bone loss are estrogen deficiency after menopause and age-related processes [3]. Bone turnover increases to high levels in women soon after menopause. In addition, estrogen deficiency

may induce calcium loss through indirect effects on extra skeletal calcium homeostasis. Intestinal calcium absorption decreases in post-menopausal women [4]. Calcitonin reduces bone resorption and reduces bone loss. Like estrogen, calcitonin can cause a small increase in bone mass. Hence, an attempt was made to evaluate the calcium status in pre-menopausal and post-menopausal women.

Material and Method

Total 235 pre-menopausal and 315 post-menopausal women who visited the Central Clinical Laboratory of Government Medical College Aurangabad, Maharashtra volunteered to participate in the present study.

Inclusive Criteria: The women aged between 40-75 years old who gave their consent in writing for our study were selected for the study.

Exclusion Criteria: Surgical menopause due to hysterectomy, hypertensive, type-II DM, post-menopausal women on estrogen therapy, bone fractures and patients with thyroid medications were excluded from the study.

Method: The majority of the women belonged to lower middle socio-economic status. 3-5 ml of

venous blood was drawn aseptically from the antecubital vein of each subject. The collected blood was labeled with age and referred to the laboratory for the estimation of calcium in serum.

Calcium was measured by the OCPC (Ortho-Cresolphthalein-Complexone) method.

Duration of study: June 2022 to June 2023

Statistical analysis: The mean calcium level in patients based on age groups was studied. The serum calcium levels in pre and post-menopausal women were compared with a Unpaired t test. The statistical analysis was carried out in SPSS software.

Observation and Results

Table 1: Study of mean calcium levels in patients based on age groups – In 40-45 years age group 135 patients and their mean calcium value was 8.5 mg/dl, in 46-50 years calcium mean value was 8.3 mg/dl, in 51-55 years is 8.2 mg/dl, in 56-60 years is 8.1 mg/dl, in 61-65 years is 7.5 mg/dl, in 66-70 years is 7.3 mg/dl and in 71-75 years is 7.1 mg/dl.

Table 2: Comparative study of mean calcium values in both groups – Pre-menopausal women had 8.7 mg/dl (± 3.2) serum calcium and in 315 post-menopausal women the mean calcium level was 7.5 mg/dl (±1.4). Unpaired t test was 2.4 and p<0.002 and p value is highly significant.

Table 1: Study of Mean calcium level in patients based on age group

Age group (years)	Number of patients	Mean calcium level mg/dl
40-45	135	8.5
46-50	100	8.3
51-55	110	8.2
56-60	65	8.1
61-65	60	7.5
66-70	50	7.3
71-75	30	7.1

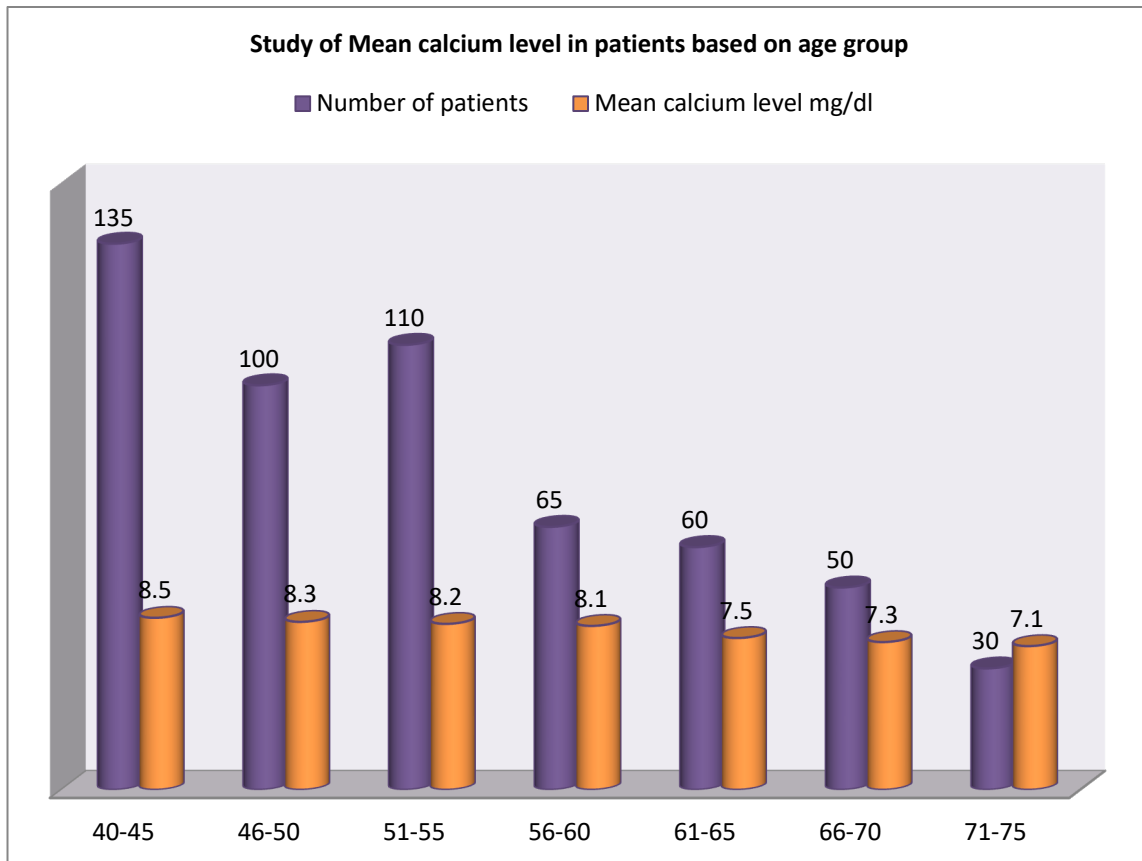


Figure 1: Study of Mean calcium level in patients based on age group

Table 2: Comparison of Mean calcium levels in both groups

Sl No	Patients groups	No. of patients	Mean value (±SD)	t test	p value
1	Pre-menopausal	235	8.7 (±3.2)	2.4	P<0.002
2	Post-menopausal	315	7.5 (±1.4)		

(P value is highly significant)

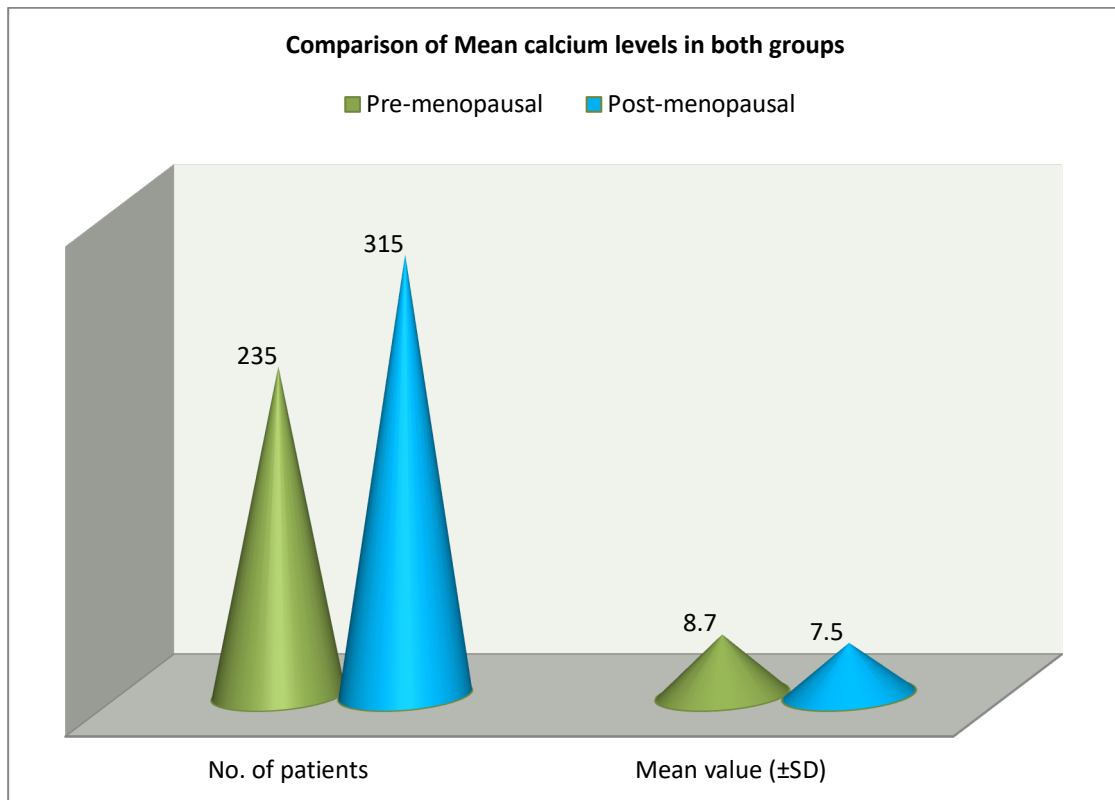


Figure 2: Comparison of Mean calcium levels in both groups

Discussion

In present comparative study of serum calcium in pre-menopausal and post-menopausal women in Marathwada region of Maharashtra State, 40-45 years aged women had serum calcium level of 8.5 (mg/dl), 46-50 years aged women had 8.3 (mg/dl), 51-55 years aged women had 8.2 (mg/dl), 56-60 years aged women had 8.1 (mg/dl), 61-65 years aged women had 7.5 (mg/dl), 66-70 years aged women had 7.3 (mg/dl) and 71-75 years aged women had 7.1 (mg/dl) (Table 1).

In the comparative study of 8.7 (\pm 3.2) mg/dl serum calcium in pre-menopausal women and 7.5 (\pm 1.4) mg/dl in post-menopausal women, the Unpaired t test was 2.4, and ($p < 0.02$) p value was highly significant (Table 2). These findings were more or less in agreement with previous studies [5,6,7].

It is reported that menopause at an earlier age is due to genetic and environmental factors, nutritional status, higher infection rates, higher parity and lower body mass index [8]. It is also observed that the hypothalamus coordinates food intake, satiety and energy expenditure. Depletion of estrogen and progesterone also plays an aggravating factor for early menopause, which leads to a considerable reduction in bone mineral density including serum calcium levels [9].

Alteration in mitochondrial oxidation during menopause is associated with lipotoxicity and

increased cardiovascular risk, mediated by the decline in estrogen in menopause [10].

Other factors that influence calcium homeostasis in menopause include increased urinary excretion of calcium, which is both menopausal and age-related. This occurs in the proximal convoluted tubule. Moreover, there is a decrease in intestinal absorption of calcium with declining levels of vitamin D. It is also reported that estrogen has a direct effect on calcium absorption, but in menopause, when estrogen is withdrawn, it leads to a significant reduction in calcium levels in post-menopausal women [11].

Hence, calcium supplementation is advocated in pre- and postmenopausal women to compensate for decreased calcium levels. In severe cases, hormone replacement therapy (HRT) is also implicated.

Summary and Conclusion

Present comparative study deals with calcium levels in pre-menopausal and post-menopausal women. There is a considerable reduction in calcium in post-menopausal women indicates negative calcium balance. It is a multi-factorial phenomenon. It is not only related with nutritional status but withdrawal of estrogen hormone.

The significant decrease in calcium leads to geriatric disease; hence, post-menopausal women must be made aware of osteoporosis and geriatric

disease awareness must be created by medico-social workers. Along with calcium levels vitamin D status of the post-menopausal women must be evaluated for better management. Calcium supplements must be given to maintain their normal calcium levels and prevent osteoporosis.

This research paper has been approved by the Institutional Ethical Committee of the Government Medical College in Aurangabad, Maharashtra.

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