

Study of serum calcium levels in premenopausal women and postmenopausal women

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Abstract

Background: Menopause is a phase from where bone mineralisation becomes critical because of various physiological and hormonal changes. Oestrogen deficiency and age related processes alter the rate of calcium turnover in bone that aging woman faces. Osteoporosis especially in postmenopausal women is a well documented problem. In India lack of nutritional and health awareness makes its prevalence like tip of iceberg phenomenon. It is asymptomatic until any serious complication occur. However it is a gift of today's medical science that complications like bone fragility, fractures and morbidity can be prevented by careful screening and early treatment. **Objectives:** To evaluate and compare serum Calcium levels in premenopausal and postmenopausal women. To find out any effect of postmenopausal hormonal changes on serum Calcium levels in women. **Method:** 30 premenopausal women of age group 20-30 years and 30 postmenopausal women of age group 50-60 years evaluated for serum Calcium level by Arsenazo method performed on semi-automated biochemistry analyser. **Statistical Analysis:** Unpaired student's 't' test. **Result:** Mean serum calcium level in postmenopausal women (8.96 ± 0.66) found lower than that in premenopausal women (9.49 ± 0.63) and the difference was statistically significant. **Conclusion:** Postmenopausal women should be monitored for serum Calcium levels for reducing risk of thyroid dysfunction.

Key Words: Premenopausal women, postmenopausal women, Serum Calcium.

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INTRODUCTION

Calcium ion is an essential structural component of the skeleton. Skeletal mineralization and rate of bone turnover are controlled by a number of hormones. In women the two major causes of bone resorption are oestrogen deficiency and age related processes. The process of bone loss starts at menopause which is 2-5% per year due to declining estrogens levels and is seen in the first 5-7 years after menopause. Later age-related

bone loss occurs at a rate of 1% per year affects the cortical and trabecular bone.¹ There is wide prevalence of vitamin D deficiency and low dietary calcium intake in Indian population, especially in postmenopausal women. Osteoporosis a serious potential problem that aging woman faces is asymptomatic unless any complication occurs. Early detection of imbalance in serum calcium levels can be a useful tool to assist healthcare professionals for the therapeutic aspect and follow up. With this perspective, this comparative cross sectional study of serum calcium levels in premenopausal and postmenopausal women was undertaken with the objective to evaluate serum calcium status among them.

MATERIAL AND METHODS

Present study was conducted among volunteer patients attending the outpatient department of Medical College. IEC approval was taken. 30 Premenopausal women of age group 20-30 years and 30 postmenopausal women of age group 50-60 years were included. Patient with history of major chronic illness e.g. diabetes mellitus,

hypertension, any other endocrinal disorder, or patient on Hormone Replacement Therapy or on drug altering serum calcium level, Operated patients of oophorectomy, women who have not achieved puberty yet or pregnant woman or premature menopause were excluded. In each group serum calcium levels were estimated and analyzed. In each group serum calcium was estimated by Arsenazo method performed on semi-automated biochemistry analyser. Statistical analysis was done using SPSS version 10. For each parameter, the mean value and standard deviation were calculated. Statistical tests used were as per the requirement of data. 'Unpaired t test' was applied to test whether the differences in means were statistically significant or not. Serum calcium level between 8.4-11.5 mg/dl are considered normal.

OBSERVATION AND RESULTS

Table 1: Shows serum calcium levels in premenopausal and postmenopausal women.

	Premenopausal Women	Postmenopausal Women	'P' Value
Sr. CALCIUM			
Mean \pm SD (mg/dl)	9.49 \pm 0.63	8.96 \pm 0.66	0.002
Range (mg/dl)	8.3 TO 10.8	7.8 TO 10.5	

** p < 0.05: statistically significant.

DISCUSSION

In the present study, the serum calcium levels were significantly reduced in the post-menopausal group i.e. 8.96 mg% (SD 0.66) when compared to the premenopausal group i.e. 9.49 mg% (SD 0.63). Declining ovarian function during menopause is accompanied by decrease in bone mass and altered calcium metabolism. Estrogens affect bone re-modelling by stimulating osteoblast, decreasing number and activity of osteoclast and synthesizing cytokine affecting bone resorption. In postmenopausal women, the mechanism by which ovarian hormones modulate negative calcium balance is not fully understood however oestrogen deficiency may induce calcium loss due to decreased intestinal calcium absorption and decreased renal calcium conservation, with a possible rise in gut calcium excretion.² Estrogen deficiency induces calciuria by increasing the filtered load of Ca^{2+} . Estrogen receptors have been demonstrated on renal tubules³ and it may directly act on kidney to promote renal calcium conservation. Estrogen also had shown effect on parathyroid gland receptors to enhance PTH secretions and indirectly acting for renal calcium conservation.⁴ The reduced calcium absorption has been attributed variously to reduced circulating 1,25 dihydroxyvitamin D levels and to gastrointestinal

resistance to its action.⁵ A decrease in intestinal 1,25 dihydroxyvitamin D receptor number following ovariectomy may contribute to reduced intestinal calcium absorption.⁶ Oestradiol also appears to be acting directly on the gut receptor to stimulate calcium absorption. Some studies have indicated that there are significant changes to intestinal weight per unit length following ovariectomy, which may alter the characteristics of passive, paracellular calcium transport. Study by B.E. Christopher Nordin *et al.*⁷ in healthy postmenopausal women had found a late age-related decrease in calcium absorption and that decrease could be due to a decline in either the active calcium transport or diffusion component of the calcium absorption system. They also found that urinary calcium was significantly higher in postmenopausal women and it was due to reduced tubular resorption.⁸ In developing country like India calcium intake and awareness about calcium requirement in postmenopausal period is very less. Inadequate calcium and vitamin D lead to reduced intestinal calcium absorption, increased serum parathyroid hormone concentration and bone loss. Some studies have shown lower serum calcium levels in postmenopausal women than premenopausal women: In one of the studies in India done by Tirth Bhattari *et al.*⁹ found that the serum calcium levels were significantly reduced in the postmenopausal group compared to premenopausal women. They attributed these findings to the decreased estrogen levels resulting in the increased synthesis of cytokines by osteoblasts, monocytes and T cells and thereby stimulate bone resorption. Meena Desai *et al.*¹⁰ studied in Indian women found lower mean serum calcium and significant increase in IL-6 (Interleukin-6) in postmenopausal women than premenopausal women which is positively correlated with bone turnover markers and negatively with bone mineral density. These changes occurred in first 5 years after menopause, thus indicating that bone loss is confined to first decade of menopause. Hamid Javaid Qureshi *et al.*¹¹ studied in Pakistan found significantly lower serum calcium and significantly higher serum parathyroid hormone levels in postmenopausal women indicating increase bone turnover compared to premenopausal women. Serum calcitonin level was not significantly different in the two groups. However some studies have shown higher/similar serum calcium levels in postmenopausal older women than premenopausal women. Muni Radha Jadaa *et al.*¹² study showed slightly higher mean serum calcium among postmenopausal group compared to premenopausal women. However they found significant reduced bone density in postmenopausal women. M. Suresh *et al.*¹³ found statistically no significant difference between serum calcium levels in both the groups. However they found the risk of bone resorption is greater in early years

of menopause than late years. C.V. Harinarayan *et al.*¹⁴ studied Vitamin D and BMD from south India found Prevalence of osteoporosis was much lower in the young reproductive women than in postmenopausal women. However there was no significant difference found in serum calcium levels between both the groups. Other previous studies by them shown that low dietary calcium intake along with low vitamin D status of an individual, predisposes to mild secondary hyperparathyroidism with increased bone turnover resulting in osteopenia. This study indicate calcium and vitamin D supplementation should be an integral part of therapy of osteoporosis.

CONCLUSION

In postmenopausal women significant decrease in serum calcium level indicate remarkable risk towards negative calcium balance. They should be monitored for serum calcium levels, for reducing the risk of bone resorption. Though normal serum calcium does not rule out risk of accelerated bone loss or osteoporosis, however decreased serum calcium may significantly play a role in therapeutic and follow up management. Along with serum calcium level, vitamin D status and Bone Mineral Density can be helpful to find susceptible postmenopausal women.

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