

## SERUM CALCIUM LEVELS AN EARLY INDICATOR OF OSTEOPOROSIS IN MENOPAUSE

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### **Abstract**

Calcium is an integral component of the skeleton. It acts as a reservoir of calcium for all essential activities of the body. Menopause can initiate osteoporosis through elevated bone remodeling, which occurs predominantly in postmenopausal women. There seems to be an increased risk of fractures in post-menopausal women due to estrogen reduction.

Thus, the present study was undertaken to observe the serum calcium and alkaline phosphatase (ALP) levels in post-menopausal women as these substances are biochemical markers of bone metabolism. In this study, 125 samples were taken out of which 76 were premenopausal and 49 postmenopausal. Serum calcium and serum ALP were measured in the blood samples of both groups. The findings demonstrated that the serum calcium level was significantly lower in the post-menopausal group than in the pre-menopausal group, while the ALP level was slightly higher. Therefore, an increase in bone turnover accelerates bone mass reduction in post-menopausal women, whereas a decrease in bone turnover is associated with the preservation of bone mass.

### **Introduction**

Rigidity to the skeleton is provided by the calcium salts and they also play an important role in the metabolic processes. Calcium circulating in the ECF is mainly obtained from the bone mineral reservoir. Calcium enters the ECF from the gut by absorption and from bone by resorption. Calcium leaves the ECF via the gastrointestinal tract, kidneys, and skin and enters into bone *via* bone formation. The rate of calcium absorption from the gastrointestinal tract has to balance the rate of all losses from the body if the skeleton is to be preserved. Due to an obligatory urinary calcium excretion in menopausal women they seem to be more prone to osteoporosis. Estrogen is another important factor that promotes intestinal absorption of calcium and suppresses bone resorption. Estrogen supplementation in the postmenopausal women also helps in maintaining bone integrity.

It is estimated that approximately 30% of all postmenopausal women have osteoporosis in the United States and Europe and at least 40% suffer from fragility bones and fractures [1]. Nutrition and physical activity are two important lifestyle changes that can reduce the risk of osteoporosis [2]. In other words, adequate intake of calcium has been suggested to be the best approach for the maintenance of healthy bones during this stage of life in a woman [3]. Calcium is obtained both from dairy and non-dairy sources. The recommended dietary allowance is 600 mg/day for adult women and most studies

report that the Indian diet does not meet this requirement. To worsen this Indian diet also seems to have a considerable amount of phytate and oxalate in the fibre rich foods which seem to retard the absorption of calcium.

This study aims to assess the serum calcium and alkaline phosphatase levels of different age groups of women – in the age groups 25 – 75 (premenopausal and postmenopausal). This will highlight the group which requires calcium supplementation and also establish the relationship between estrogen and osteoporosis in the study.

### Materials and Methods

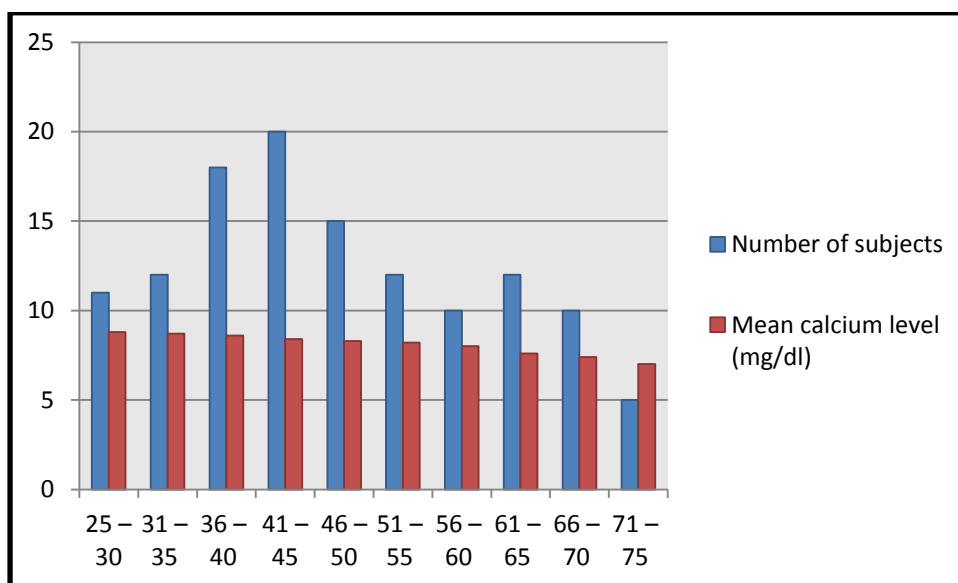
This cross-sectional study was conducted in women of age 25–75 years at the Department of sarvapalli Radhakrishnan medical college, after permission from ethical committee. Data source subjects were selected from the Outpatient Department of physiology Women having hypertension, diabetes mellitus, history of hormones replacement therapy, and fracture were excluded from the study. Informed consent from each subject was taken. 3–5 ml of venous blood was drawn aseptically from antecubital vein of each subject. The blood sample was collected clean plain labeled tube and transferred to laboratory for the estimation of calcium ion and alkaline phosphatase (ALP) were analyzed by a Hitachi 717, auto analyzer RXT Technician system. Statistical analysis was conducted using the SPSS software, version 11.5. The results are expressed as mean  $\pm$  SD.

### Results and discussion

A total of 125 patients were inducted in the study. They were subjects who attended both the obstetrics and gynecology and orthopedic outpatient departments. Out of the 125, 68 were premenopausal and 57 were postmenopausal women. From the tables 1 and 2 it is clear that mean serum calcium was significantly decreased in postmenopausal women. Table 2 also shows the levels of alkaline phosphates in both groups of subjects.

**Table 1. Mean calcium level in subjects based on age group**

| Age group (year) | Number of subjects | Mean calcium level (mg/dl) |
|------------------|--------------------|----------------------------|
| 25 – 30          | 11                 | 8.8                        |
| 31 – 35          | 12                 | 8.7                        |
| 36 – 40          | 18                 | 8.6                        |
| 41 – 45          | 20                 | 8.4                        |
| 46 – 50          | 15                 | 8.3                        |
| 51 – 55          | 12                 | 8.2                        |
| 56 – 60          | 10                 | 8.0                        |
| 61 – 65          | 12                 | 7.6                        |
| 66 – 70          | 10                 | 7.4                        |
| 71 – 75          | 05                 | 7.0                        |

**Chart-1 Mean calcium level in subjects based on age group****Table 2 Mean calcium and alkaline phosphates levels in both groups**

| Details of subjects | Number of subjects | Mean calcium level | Alkaline phosphatase (IU/L) |
|---------------------|--------------------|--------------------|-----------------------------|
| Premenopausal       | 76                 | 8.56 ±0.18         | 87.2 ±24.2                  |
| Postmenopausal      | 49                 | 7.64 ±0.08         | 109.5±40.5                  |

Menopause is the cessation of menstruation which is the result of reduced ovarian production of estradiol, the most biologically active form of estrogen [4]. Menopause is also associated with various endocrinological, physiological, anatomical and psychological changes. The decline in circulating levels of  $17\beta$ -estradiol is the predominant factor influencing the accelerated bone loss and increased remodeling activity associated with menopause [5,6].

The calcium levels in the postmenopausal group was significantly less than the premenopausal group of subjects. A woman's calcium requirement increases at menopause (or whenever estrogen is lost). This is because calcium absorption efficiency and renal conservation are both estrogen dependent, and both deteriorate in the estrogen-deprived state. Adequate amounts of calcium intake are necessary for bone health because deficiency of calcium is a risk factor for osteoporosis. Low level of serum calcium may also be due to insufficient intake of vitamin D.

The osteoblastic activity is measured by serum alkaline phosphatase, this is used as an index of bone formation. High levels of serum alkaline phosphatase activity encountered in osteoporosis might be a result of the action of the osteoblastic cells; which try to rebuild bone that is being resorbed by the uncontrolled activity of osteoclasts. The results of the

study indicate that bone regeneration is taking place or is being attempted alkaline phosphatase is participating in the initiation of bone mineralization [7,8,9].

In post-menopausal women, an increase in bone turnover accelerates bone mass reduction. Our study reveals that serum calcium levels are significantly reduced in post-menopausal women, whereas serum ALP levels are significantly increased.

### References

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