

STUDY OF SERUM TOTAL CALCIUM, IONIZED CALCIUM AND TOTAL PROTEIN  
CONCENTRATIONS IN POSTMENOPAUSAL WOMEN<sup>1</sup>Dr.SK.Deepthi and <sup>2</sup>Dr.G.Amar Raghu Narayan<sup>1</sup>Department of Biochemistry and <sup>2</sup>Plastic surgery, Narayana Medical College and Hospital, Nellore, A.P,  
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**ABSTRACT:** Menopause and ageing is associated with accelerated loss of cortical bone. Osteoporotic fractures are common cause of morbidity and mortality in adult Indian women due to ageing. This study was conducted to evaluate the levels of serum calcium, ionized calcium and total protein levels in postmenopausal women and to assess its relation with ageing. Study includes 70 women (40 post menopausal and 30 premenopausal women) serum alkaline phosphatase, serum calcium, ionized calcium and total proteins, serum albumin were estimated in both cases and controls. There is decrease in serum calcium in postmenopausal; women when compared to premenopausal women. There was no significant change in ionized calcium in both cases and controls. ALP is highly significant  $P < 0.001$ . In postmenopausal women suggesting there is high alkaline phosphatase activity in postmenopausal women as a result of the inhibitory effects of estrogen on bone turnover rate which is dependent on age and body mass index. Decrease in serum albumin was seen in postmenopausal women which is the reason for decrease in serum calcium level which is inturn related to ageing effect.

**Key words:** ALP – Alkaline Phosphatase, Osteoporosis, Serum calcium, ionized calcium.

## INTRODUCTION

Menopause is the permanent cessation of menstruation due to loss of ovarian follicular function, which results in decreased production of estradiol and other hormones. Menopause and aging is associated with accelerated loss of cortical bone. Bone loss occurs when the balance between formation and resorption is upset and resorption is excessive resulting in a negative remodeling balance. (Ashuma.Such deva 2005) Despite its seemingly static appearance bone is a remarkably labile tissue and bone turnover is a dynamic process which increases in postmenopausal period as a consequence of estrogen deficiency (Uemura, J. Clin. endocrinol 2000). Osteoporosis is a major health and economic problem among postmenopausal women. This silently progressing metabolic bone disease is widely prevalent in India, and osteoporotic fractures are a common cause of morbidity and mortality in adult Indian men and women (Gupta A Med J Ind 1996). Expert Groups peg the number of osteoporosis patients in India at approximately 36 million in 2013(Facts and Statistics 2003). The prevalence of osteoporosis increases with age for all sites, and by WHO definition up to 70% of women over the age of 80yrs have osteoporosis (Osteoporosis in postmenopausal women 2001).

Calcium is an important mineral component in our diet.99% of Calcium in the human body is distributed in the skeleton. The1% which is extra skeletal, is present in every cell in the body, and in the extracellular fluid (ECF). Ionized Calcium concentration in the ECF is 4.8%mg/dl and total calcium is approximately double. Serum calcium is maintained within a narrow normal range, chiefly by resorption from the skeleton and alteration of urinary calcium loss and absorption from gut (V.Bhatia 2008). The secretion of parathormone affects these changes when ECF calcium is sensed to be low by the calcium receptor in the parathormone gland (Brown EM 1977). Serum total but not ionized calcium concentration increased significantly at menopause.

This increase in the protein bound component of total calcium in postmenopausal women were associated with increase in serum globulin concentration. Serum total calcium declined with age within pre and postmenopausal groups. This was associated with an age related decrease in serum albumin concentration in all women (Doumas BT 1975). There was no obvious disturbance of calcium homeostasis and with total serum calcium concentration that were normal after adjustment for albumin concentration had low serum ionised calcium concentrations<sup>9</sup>. Present study is to evaluate levels of serum total and ionized calcium concentrations and to compare the levels with serum estrogen in postmenopausal and premenopausal women along with serum albumin and globulin concentration in most of the women. It has been shown to provide valuable information for the diagnosis and monitoring of metabolic bone disease and to detect the overall effect of menopause and ageing on serum total, ionized calcium concentration.

**MATERIAL METHODOLOGY**

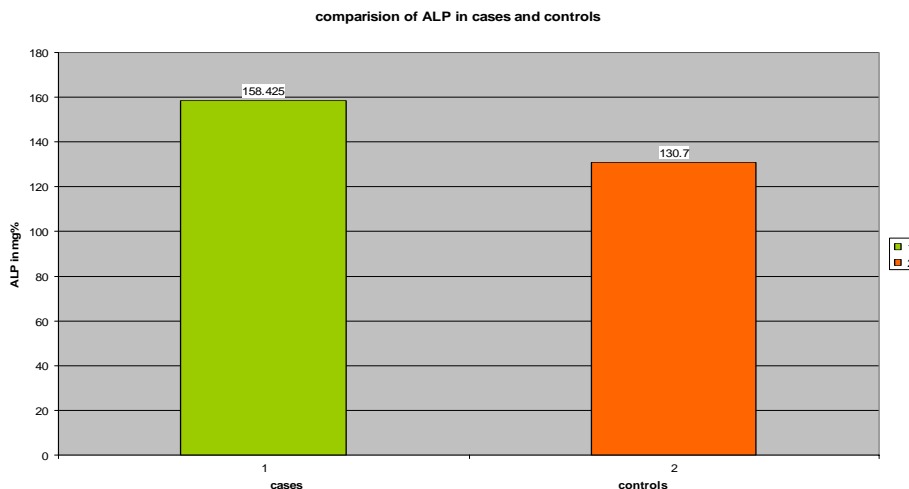
A cross-sectional study was done in 70 women, 30 pre and 40 post-menopausal women at department of biochemistry, Narayana Medical College, Hospital, Nellore. The institutional ethical committee approved the study and informed consent was obtained from each participant in the study. 4ml of random blood sample was collected in a plain bulb from each participant. Serum was separated immediately by centrifuging at 3000 rpm from 10 min and analyzed for patients for total calcium (OCPC Connerty HV, 1966), ionizedcalcium (by Blood gas analyzer), albumin (Bromocresol green Method), (Varley H 1988) alkaline phosphatase (king and Armstrong) albumin, total protein (Biuret Method) (Lori J.Sokoll 1989). The data obtained will be analyzed and the differences in the mean of various parameters were compared using student's t-test. Statistical analysis was performed using software SPSS windows.

**RESULTS**

Data analysis was done using statistical method of SPSS version 11.0 study variables were expressed in terms of mean ± standard deviation (S.D) variability across the study groups for each of the variable was assessed using non parametric test Mann Whitney’s test. The p value <0/05 was considered as significant. (Table 1 and 2, Figure-1).

**Table-1: comparison of serum calcium ionized calcium total protein and albumin in cases (postmenopausal women) and controls (Premenopausal women)**

Parameters	Cases	controls
Total Serum Calcium (mg/dl)	7.13 ± 0.68	7.87 ± 0.61
Ionized cal (mmol/l)	1.26 ± 0.31	1.24 ± 0.28
Total protein (g/dl)	6.02 ± 0.32	6.17 ± 0.23
Albumin (g/dl)	3.62 ± 0.33	4.01 ± 0.47



**Figure: I shows the mean ALP levels in post meno pausal and pre meno pausal are 158.42±37.02 and 130.70±21.97 respectively P value 0.001. There is highly significant elevation in ALP levels in post meno pausal in comparison with pre meno pausal.**

**Table-2: Comparison of Alkaline Phosphatase Levels between cases (post meno pausal) and Controls (pre menopausal) IU/lit**

Parameters	Cases n = 40	Control n = 30	P value	T value
ALP	158.42±37.02	130.70±21.97	0.001	3.644

**DISCUSSION**

In general women lose about 1% of their bone density per year during after menopause. However nearly 35% of women lose bone at a faster rate during the late premenopausal period. Serum alkaline phosphatase is the most commonly used marker of bone formation. ALP is a ubiquitous enzyme that plays important role in osteoid formation and mineralization. Mean ALP levels in post menopausal and premenopausal are 158.42 ± 37.02 and 130.70±21.97 respectively our study ALP levels were high in postmenopausal women when compared to premenopausal women p value <0.0001 which was significant(Ashuma .Such Deva 2005) ( Dogan.E c.Posaci 1978).

Ionized calcium levels were not changed in postmenopausal women. When & compared to remenopausal women not signification p value >0.0001 (SJ Butler clinical research 1984). Total calcium was decreased in postmenopausal women which was significant p value <0.05. Serum total calcium declined with age within the postmenopausal women (p value 0.04) which was significant.

This was associated with an age related decrease in serum albumin concentration in postmenopausal women p value <0.001 thus menopause and ageing effect serum total calcium concentration. Total serum calcium concentration has been reported previously to have no relationship or to decline with ageing this decline has been attributed to an age related decrease in the concentration of albumin, a protein that binds calcium in the serum.

In this study we are intended to know the effect of menopause on ioinised calcium, changes observed are related to serum concentrations of the calcium binding proteins, albumin and globulin, in the same women.

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