



## SERUM CALCIUM AND ALKALINE PHOSPHATASE LEVEL AMONG PRE-MENOPAUSAL AND POST-MENOPAUSAL WOMEN ATTENDING IN SUBHIMALYAN PERIPHERAL INSTITUTES A CO-RELATIONAL STUDY

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### ABSTRACT

The bone turnover markers and their consequences to poor health outcome among the post-menopausal women have well been understood elsewhere, but its not well researched in our part of world. **Objective:**

Aim of this study was to assess the association of the bone turnover markers in pre- vs post- menopausal women attending our peripheral health institutes in sub-Himalayan region. **Methods:** It was a cross-sectional study which was conducted during September 2021 to February 2022 in a total of 200 study participants in our subhimalyan peripheral institutes CH Bhawarna and RH Bilaspur with an equal number of pre- and post-menopausal women (100 each of the test and control group). Blood samples for both the pre-menopausal vs post-menopausal women were collected and then analyzed for selected bone turnover markers. Descriptive statistics correlation statistics were employed for our study. Data were then analyzed using SPSS software. **Results:** This study identified that the low serum calcium level. (Post-menopausal; mean 8.32, SD vs. pre-menopausal; mean 9.32,  $SD \leq 2$ ) and high alkaline phosphatase (ALP) level in postmenopausal women compared to that of its counterparts [post-menopausal group 105.5 compared to that of pre-menopausal group 85.50]. There was a negative correlation which was significant between serum calcium and alkaline phosphatase. **Conclusion:** As the result of this study showed a significant decrease in the serum calcium and increase in the serum ALP among normal postmenopausal women suggesting an elevated bone turnover which may result into bone mass reduction, hormonal therapy to prevent bone mass reduction to concerned population may be suggested. Studies covering bone markers in a larger population size are recommended.

### KEYWORDS :

#### INTRODUCTION

Menopause is the condition in which there is permanent cessation of menstruation resulting from the reduced ovarian hormone secretion that occurs naturally. Natural menopause is not at all associated with a pathological cause and is recognized after 12 months of continuous amenorrhea. (1)

Based over the menstrual bleeding patterns over the previous 12 monthmenopausal status is then classified as premenopausal or at least 12 menstruations in the past 12 months with no change in regularity/ perimenopausal menses in the past 3 months with change in regularity/ or 3 or more menses with change in regularity within the past 12 months and postmenopausal no menses within the past 12 months. (2,3) Serum calcium and Alkaline Phosphatase (ALP) are bone turnover markers which helps in bone formation and also mineralization. (4)

Osteoporosis is highly important public health problem in older adults and most common in postmenopausal life which gives rise to morbidity and markedly reduces the quality of life in this population. (5) Menopause and ageing is known to be associated with accelerated loss of the cortical bone. Bone loss occurs when the balance between resorption and formation is upset and resorption is more than formation resulting in a negative remodeling balance. (6)

A number of studies over bone turn associated with disproportion of alkaline phosphatase (ALP) and calcium among the postmenopausal women has well been documented. (7,8) A previously published paper also revealed that ageing and menopause altered the metabolism of serum ALP and calcium. (8)

Similarly in their study Bhattra et al. reported decreased level of serum calcium in the postmenopausal women compared to that of premenopausal women and ALP level were found to be slightly higher among the postmenopausal women. (7)

Another study from similar sub himalyan region from Nepal had also demonstrated the moderately reduced serum calcium in the post-menopausal women and also slightly increased serum ALP in early postmenopausal women. (9).

With our current knowledge and understanding the current study is aimed to assess the association of the bone turnover markers in postmenopausal women in our subhimalyan region.

#### MATERIALS AND METHODS

This was the cross-sectional study performed during September 2021 to February 2022. The study setting was sub himalyan peripheral institutes of RH Bilaspur and CH Bhawarna. A total of 200 study participants were involved in the present study with an equal number of premenopausal and postmenopausal women (100 each of the test and the control group). Pre-menopausal women were aged from 14 to 40 years of age group while postmenopausal were of all above 45 years of age. Exclusion criteria were Oral contraceptives, Smokers, Pregnancy and Alcoholics.

#### Sample collection

A well written and informed consent was taken. The blood samples from both the premenopausal and postmenopausal women were then collected by venous puncture using 21S WG needle. Blood samples were then allowed to clot and centrifuged at about 3000 RPM for upto 10 minutes for proper separation of cells from the serum and then analyzed within next 24 hour of collection. Serum Calcium level were then estimated using the colorimetric method while ALP activity was determined using the enzymatic methods by semi-automated chemistry analyzer. Other relevant data of women like age/menstrual cycle were then recorded through a comprehensive questionnaire.

Data was analysed using SPSS software. Descriptive statistics such as percentage, frequency, mean and standard deviation were employed in the study. Bivariate analyses were then used to assess the association between serum alkaline phosphatase and calcium between the test and the control group. Additionally, Pearson's correlation test was also employed to assess the correlation between the calcium and alkaline phosphate variation among the subject women. A written and informed consent was obtained from each of the study subjects and all personal identifiers were removed before data was analyzed.

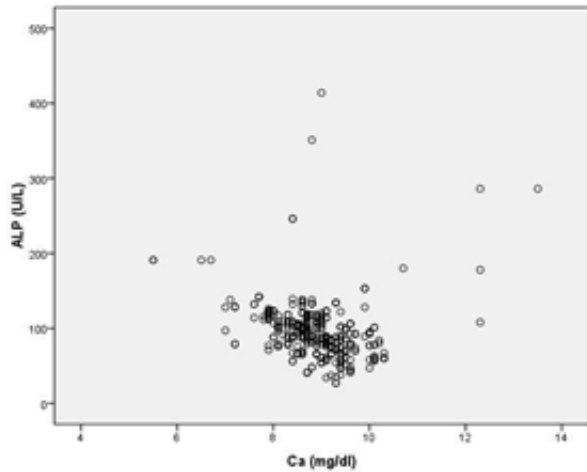
#### RESULT

Table 1 demonstrates the variations of the serum calcium and alkaline phosphatase among. The premenopausal and postmenopausal women. The statistical association was found significant with reduced serum calcium levels among postmenopausal women compared to that of premenopausal women (Post-menopausal; mean 8.32, SD 0.619 vs. pre-

**Table 1. Differentials of the calcium and alkaline phosphatase among the pre- and post-menopausal women**

Variables	Post-menopausal (n=100) (>45 years)				Pre-menopausal (n=100) (14-40 years)				p
	Minimum	Maximum	Mean	SD	Minimum	Maximum	Mean	SD	
Ca (mg/dl)	6.2	9.9	8.32	Sd≤2	8.3	14.1	9.32	SD≤2	0.000
ALP (U/L)	42	415	105.5	40.84	27	285	85.50	31.262	0.000

Fig. 1 shows a significant negative correlation between ALP and calcium ( $r = -0.147$ ). Whereas serum ALP levels were elevated in the postmenopausal women and serum calcium levels were actually decreased.



**Fig. 1 Pearson correlation coefficient of the serum calcium and serum ALP level in pre-menopausal and post menopausal women**

## DISCUSSION

Health as well as menopausal problems among the postmenopausal women are numerous and draws the attention of health authority. (10) Bone turnover leads to poor health consequences in post-menopausal women and is common in both developing and the developed world. (1,10,11) Its a dynamic process which increases at the postmenopausal life as a consequence of the estrogen deficiency. (12)

Our study identified that the changes in serum calcium levels in both the test and the control group. There was a statistically significant association with the reduced serum calcium levels in the postmenopausal women compared to that of premenopausal women. On contrary to this, some studies also reported that the serum calcium levels of the postmenopausal women were significantly higher than that of premenopausal women. (8,13-15) However findings of our study is in the line with study performed by Bhale et al. (16)

The logic behind the increased serum calcium level is the reduction in the bone mass accompanied with metabolism due to decline in the ovarian function. Estrogen deficiency that usually occurs among post-menopausal women which leads to calcium loss due to decreased renal calcium conservation and decreased intestinal calcium absorption and decreased renal calcium conservation. (17-19) Hormones as well as calcium therapy may be highly beneficial for menopausal women in this regard.

Again result of this study demonstrated that the serum ALP levels were significantly higher in the post-menopausal group as compared to that of pre-menopausal group which is actually consistent with the study of Bhattra et al. and Onyeukwu et al. (8) and also accorded with Bhattra et al. (7)

menopausal; mean 9.32, SD 0.793, ( $P=0.000$ ). However, serum calcium level in both of the groups was found to be within the normal reference range. Result of this study demonstrated additionally that the serum ALP levels were significantly higher in ( $P = 0.000$ ) in postmenopausal group 105.5 (SD 40.85) compared to that of premenopausal group 85.50 (SD 31.262).

Many literatures demonstrated that estrogen deficiency which is universal during menopause, induces the synthesis of cytokines by monocytes, osteoblasts, monocytes, and T cells and therefore stimulates bone resorption by increasing the osteoclastic activity. This action leads to modification of the reabsorption, excretion, and resorption of calcium, reabsorption which leads to increased circulating levels of calcium ion. (20-23)

Our study depicted a significant negative correlation between ALP and calcium, whereas serum ALP levels were elevated in post-menopausal women and serum calcium levels were significantly decreased which was similar to the study by Bhattra et al. (7) Studies regarding the time relapsed (in years) since menopause found no significant correlation between ALP and serum calcium levels and ALP. (21)

limitations were indeed present in this study. This study had small sample size. It could not cover many other bone markers like inorganic phosphate, total protein, bone mineral density, hydroxyproline and bone mineral density vitamin D. Second, this study is limited to very area of our sub himalyan region.

Further a study covering larger sample size, larger area and many other bone markers is recommended.

## CONCLUSION

This study identified that there is a significant increase in serum ALP and decrease in serum calcium and increase in serum ALP among the normal postmenopausal women suggesting an elevated bone turnover which may result into bone mass reduction. Additionally, there was a significant negative correlation between serum ALP and serum ALP in the postmenopausal women. Hormonal therapy to prevent the bone mass reduction of the concerned population is suggested. Further, studies that cover wider range of bone markers in a larger population to support the generalizability of this study are recommended in coming days.

## Disclosure

The authors declared that there are no conflicts of interest in this study.

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