

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.

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 months, menopausal 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 Bhatrai 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 veinous 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 (Postmenopausal; mean 8.32, SD 0.619 vs. premenopausal; 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 (SD40.85) compared to that of premenopausal group 85.50 (SD 31.262).

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 postmenopausal women and serum calcium levels were actually decreased.

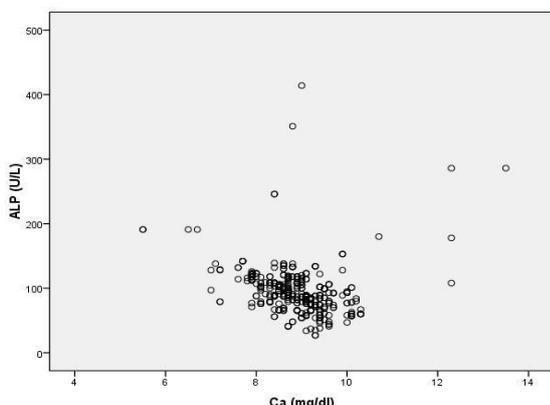


Fig. 1 Pearson correlation coefficient of the serum calcium and serum ALP level in pre-menopausal and post menopausal women.

DISCUSSION

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

The current 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 among postmenopausal women compared to premenopausal women. On contrary to this, some studies also reported that the serum calcium levels of the postmenopausal women were significantly higher than those of premenopausal women.^[8,13-15] However, this finding of our study is in line with study

performed by Bhale et al in an Indian study.^[16]

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

Additionally, 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]

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

Interestingly, this Our study showed depicted a significant negative correlation between ALP and calcium and ALP ($r = -0.147$), whereas serum ALP levels were elevated in post- menopausal women and serum calcium levels were significantly decreased which is was similar to the study of by Bhattra et al.^[7] Studies regarding the time elapsed (in years) since menopause found no significant correlation between ALP and serum calcium levels and ALP.^[21]

This study has a number of strengths as it is based on primary data with possibly limitations were indeed present in this study. This study had small sample size. It could not cover many other bone markers for example, like inorganic phosphate, total protein, total protein, bone mineral density, hydroxyproline. and bone mineral density vitamin D. Second, this study is limited to small very area of Rupandehi district 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 calcium ALP and serum ALP calcium in the

postmenopausal women. Hormonal therapy to prevent the bone mass reduction to of the concerned population may be suggested. Further, studies covering wider 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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