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Comparative Study of Serum Phosphorus and ALP in Pre & Post – Menopausal Women

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ABSTRACT:

Background: An important public health concern on a global scale, osteoporosis is expected to get worse as life expectancy rises. The average life expectancy for Indian women is 68 years, and it is expected to increase to 73 years by 2020, according to WHO health data (2011).[1]

Decrease of bone density, deterioration to the bone's microstructure, increasing fragility, and a tendency toward fractures of fragility are the characteristics of osteoporosis, a condition of the bones. The disorder is more common in older postmenopausal women.[2]

Aim & objective: To comparison between serum Phosphorus and Alp in pre & post – menopausal women.

Material & method: The present study includes total 200 subjects that include 100 pre-menopausal women (age 35 to 45 years) and 100 post -menopause women (age 46 to 70 years). Blood samples were collected from the subjects that were obtained for Serum Phosphorus and ALP from Medicine /Orthopaedics/ Obstetrics and Gynaecology Wards. At the Index Medical College & Research Centre (IMCRC), Indore, and outpatient departments, every subject from both groups would be examined. This is a cross-sectional study of patients who visit the orthopedics and gynecology department of the IMCHRC in Indore.

Result: Serum ALP and serum phosphorus level (75.03 ± 17.14 and 3.61± 0.43) in premenopausal women and (98.1 ± 0.80 and 3.94 ± 0.42) respectively in post menopause women at P= 0.0001 and 0.0001 respectively which is statistically highly significant. Serum Alp and Serum phosphorus respectively higher in post-menopausal women compare to premenopausal women.

Conclusion: Serum Alp and serum phosphorus level higher in post-menopausal women compared to premenopausal women.

Key: Alkaline phosphatase, Osteofracture, Fracture Risk Assessment Tool, Bone turnover markers, Bone mineral density, Double energy- X- ray Absorptiometry**.**

INTRODUCTION

An important public health concern on a global scale, osteoporosis is expected to get worse as life expectancy rises. The average life expectancy for Indian women is 68 years, and it is expected to increase to 73 years by 2020, according to WHO health data (2011).[1]

Decrease of bone density, deterioration to the bone's microstructure, increasing fragility, and a tendency toward fractures of fragility are the characteristics of osteoporosis, a condition of the bones. The disorder is more common in older postmenopausal women.[2] Many older women have elevated metabolic states due to age and menopause. Due to a decrease in estrogen and an increase in inflammatory mediators, osteoclast activity rises after menopause; osteolysis outweighs osteoformation. In elderly women, osteoporosis can result in curvature of the spine, fragility fractures (usually in the distal radius, proximal humerus, and hip vertebral bodies), and chronic pain in the lumbar back and limbs.

Scholarly study indicates that DXA should be used as a diagnostic method for osteoporosis, with a threshold value of T value<-2.5 SD [3]. Even though race, location, fracture history, hormones, and other factors may affect the development of, it is still recommended to determine OF risk based on BMD. Biochemical markers linked to bone metabolism include hormones, cytokines, markers of bone formation and resorption, and indicators of calcium and phosphorus metabolism. With strong sensitivity and specificity, BTM has been utilized to diagnose osteoporosis and forecast fracture risk. It may also symbolize the state of bone turnover.

Indicators linked to bone formation include alkaline phosphatase (ALP), bone-specific ALP, osteoprotegerin, molecular fragment of osteocalcin N terminal (N-MID), type I procollagen carboxyl-terminal peptide (PICP), and aminoterminal propeptide of type I procollagen (PINP). Signs of bone resorption include urine hydroxyproline, tartrate-resistant acid phosphatase, and N- and C-telopeptides of type I collagen (NTX and CTX). Additionally, it was proposed that CTX and PINP be utilized as markers for bone formation and resorption, respectively [4].

The most commonly used biomarker for bone growth is serum alkaline phosphatase. The formation of osteoid tissue and the mineralization of bone depend on a common enzyme known as ALP. The serum ALP pool is made up of several dimeric isoforms from various organs, including the liver, bone, gut, spleen, kidney, and placenta [5].

Thus, the goal of the current study is to measure bone markers such as blood phosphorus and alkaline phosphatase (ALP) to assess the risk of rapid bone mass loss in post-menopausal women [6].

In light of the physiological changes associated with menopause, such as the decline in estrogen levels, this study aims to elucidate the variations in bone turnover rates and bone density between two groups. Because of the unique demographic and environmental features of Central India, this study may reveal some risk factors and health patterns that are not apparent in other regions. By identifying patterns of bone turnover and loss, this work may help focus prevention and treatment efforts for osteoporosis and other bone-related issues. Over time, this could lead to better health outcomes for women in this area.

MATERIAL AND METHODS

STUDY AREA

The study was conducted in the Department of Biochemistry, Department of Medicine/ Obstructive & gynecology and Orthopedics/ at Index Medical College and Hospital, indoor Madhya Pradesh. The samples are also collected from OPD and IPD ward at index hospital indoor Madhya Pradesh.

STUDY POPULATION

Group I (pre-menopause women):

100 pre-menopausal women (age 35 to 45 years).

Group II (post -menopause women):

100 post-menopausal women (age 46 to 70 years).

PATIENTS SELECTION

A total of 200 subjects were enrolled and were grouped as mentioned ahead.

Inclusion criteria: -

Pre-menopause women (aged 35-45 Years) Regular menses. No complications related to menstruation

Inclusion criteria: -

For post menopause women.

1. Post-menopause women (aged 46-70 Years)
2. Peri-menopause woman is considered (irregular menses that is before menopause) and more than 1yr of menopause women is preferred more.

Exclusion criteria: -

For both

1. Women with no fractures, any disease related bone, treatment with supplementation.

2. Calcitonin vitamin D, calcium Corticosteroids treatment within 6 months, diuretic or other medications that might interfere with water mineral or lipid metabolism.

3. Women treatment with estrogen or progesterone, irregular menses and women with history of hysterectomy and myomectomy will be excluded.

Study Type:

A cross-sectional study

Sample collection:

Total 5 ml of venous blood was collected under aseptic condition and was allowed to clot and urine sample was collected in sterile container. centrifuged at 3000rpm. Serum was obtained and was collected in a clean and dry, plain bulb to study following parameters Serum phosphorous and alkaline phosphatase were analyzed on AU 480 Fully auto-analyzer.

Biochemical analysis

Serum phosphorous and serum Alkaline phosphatase estimated by phosphomolybdate method and International Federation of Clinical Chemistry (IFCC)/kinetic method were analyzed on AU 480 Fully auto-analyzer.

Statistical analysis

Data collected was entered into Microsoft Excel Worksheet and statistically analyzed by using SPSS (Statistical Package for Social Sciences) version IBM 29. For quantitative data mean, standard mean, standard deviation, t-test and Karl Pearson's Coefficient of Correlation were calculated. P value < 0.05 (0.01) will be considered as statically significant (highly significant) at 95% confidence interval.

Result:

Table 1: Age-Wise Comparison between Pre and Post-menopausal Groups

	Age group	Mean± **SD**	P value
premenopausal	35-45	35.65± 5.22	0.0001
postmenopausal	46-70	59.18±4.87	

There was a huge age difference between the two groups, where the postmenopausal women averaged around 59.18 years and the premenopausal women around 35.65 years. (p= 0.0001)

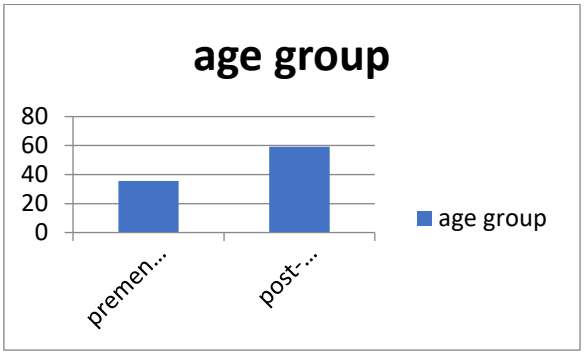
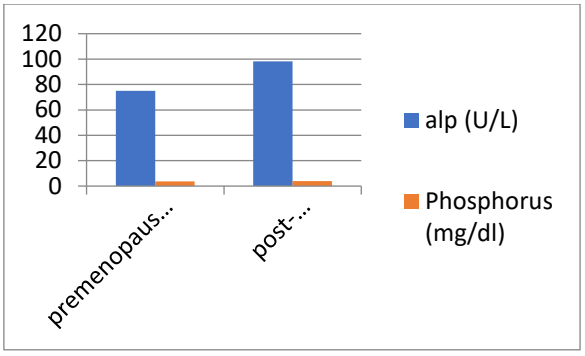


Table 2: Comparison between Pre and Post-menopausal Groups

Variables	**Premenopausal Women (N=100)** **Mean ± SD**	**Postmenopausal Women (N=100)** **Mean ± SD**	**P value**
ALP (U/L)	75.03±17.14	98.1±23.80	0.0001
Phosphorus(mg/dL)	3.617± 0.43	3.941±0.42	0.0001

ALP (Alkaline Phosphatase): Significantly higher in postmenopausal females (P value: 0.0001) which suggests a significant difference.

Phosphorus: Increased in postmenopausal women, significantly different (P value 0.0001).



Discussion:

Menopause is defined by a loss of skeletal mass produced by an imbalance between bone resorption (osteoclastic action) and bone creation (osteoblastic movement) due to a lack of estrogen. Women over the age of 45 go through menopause, which causes subtle bodily changes such as osteoporosis and genitourinary problems, both of which can be avoided to some extent. Meanwhile, bones are continually changing, as old bones are replaced by new ones. Another reason women have accelerated bone loss after menopause is a decrease in estrogen levels. It is critical to identify these ladies who are at risk of getting osteoporosis.

Marimuthu 2020 [7] et al., Mean age comparison between women before and after menopause. The average age was 33.32±6.16 years before menopause and 57.80±7.93 years after menopause. Compared to pre-menopausal women, post-menopausal women had a higher mean age. The statistical significance of this difference was very strong (p value <0.001).

Verma S K 2018 [8] et al. The mean age of women before and after menopause is compared. The mean age was 32.5±6.8 years for pre-menopausal women and 51.8±7.2 years for post-menopausal women. Compared to pre-menopausal women, post-menopausal women had a significantly greater mean age.

There was a significant age gap between the two groups **in this study,** with the premenopausal women averaging 35.65± 5.22 years and the postmenopausal women 59.18± 4.87 years. Similar studies have shown that post-menopausal women have a considerably greater mean age than pre-menopausal women (p value <0.0001).

Alkaline phosphatase

The mean serum ALP value in postmenopausal women is 178.69_29.90 IU/L, while in premenopausal women it is 113.06_25.48 IU/L, according to **Lakshmi D. 2021[9] et al**. Compared to premenopausal women, postmenopausal women had a higher mean serum ALP value. It is determined that the rise is highly significant (p value < 0.001).

Rai M. et al. 2018,[10] pre-menopausal women (75.00±10.06 U/L) and post-menopausal women (95.75±20.63 U/L) were compared to the mean alkaline phosphatase. Compared to pre-menopausal women, post-menopausal women had a significantly higher level of alkaline phosphatase. The statistical significance of this difference was very strong (p value <0.001).

The current study compared the mean alkaline phosphatase levels of pre-menopausal women (75.03±17.14U/L) with post-menopausal women (98.1±23.80 U/L). Post-menopausal women had a considerably higher level of alkaline phosphatase than pre-menopausal women. The statistical significance of this difference was quite high (p value <0.0001).

Serum Phosphorus

Bhadarge G 2020[11] et al, Serum phosphorus levels in premenopausal and postmenopausal individuals are compared. The pre-menopausal group had serum phosphorus levels of 4.68 ± 0.73 mg/dl, while the post-menopausal group had significantly lower values (p < 0.001).

Rai M. et al. 2018, [10] A comparison was made between the mean serum phosphorus levels of pre-menopausal women (2.79±0.57 mg/dl) and post-menopausal women (2.78±0.55 mg/dl). Compared to pre-menopausal women, post-menopausal women had a significantly lower serum phosphorus level. The statistical significance of this difference was very strong (p value <0.001)

Serum phosphorus levels in premenopausal and postmenopausal groups were compared in **our investigation**. Serum phosphorus levels were 3.617± 0.43 mg/dl in the pre-menopausal group and 3.941± 0.42 mg/dl in the post-menopausal group, with a significant increase in the latter. The statistical significance of this difference was very strong (p < 0.0001).

Conclusion:

Serum Alp and serum phosphorus level higher in post-menopausal women compared to premenopausal women..

Thus, the goal of the current study is to measure such as blood phosphorus and alkaline phosphatase (ALP) to assess the risk of rapid bone mass loss in post-menopausal women. Considering the physiological changes associated with menopause. Promote physical activity, raise awareness of osteoporosis, and provide resources for community screening and treatment to increase peak bone mass and decrease bone loss.

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