

Evaluation of Parathyroid Hormones, Serum Calcium and Risk of Fracture in Premenopausal and Postmenopausal Women: A Hospital Based Study.

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ABSTRACT

Background: Osteoporosis is a progressive disorder of aging bone in both men and women, and osteoporotic fractures have become a major public health threat in recent years. **Methods:** Randomly selected 90 subjects, according to exclusion & inclusion criteria, with age in between 20-65 years. **Results:** Statistically not significant correlation between age with serum calcium, PTH and calcitonin in both pre-menopausal and postmenopausal women. **Conclusion:** Postmenopausal women have low calcium and calcitonin level along with higher parathyroid level which results in osteoporosis in female population after menopause.

Keywords: Pre & Postmenopausal women, serum calcium and Parathyroid hormones.

INTRODUCTION

Osteoporosis is a progressive disorder of aging bone in both men and women, and osteoporotic fractures have become a major public health threat in recent years.^[1,2] Globally more than 30 million people are affected by osteoporosis with about 1.5-2 million osteoporotic fragility fractures happening in every year.^[3-5] Menopause is associated with various physiological and biochemical changes that have effects on bone minerals and their metabolism. It has been shown that postmenopause is the most common cause of osteoporosis because of the effects of oestrogen deficiency, which increases the rate of bone remodelling, resulting in high turnover bone loss.^[6] It has been shown that after menopause, the woman loses an average of three percent of bone mineral density every year which leads to osteopenia and finally osteoporosis.^[7] Osteoporosis occurs due to a defect in attaining peak bone mass or it can be as a result of accelerated bone loss. In normal individuals, bone mass increases during skeletal growth to reach a peak between the ages of 20 years and 40 years but falls later on during their lifetime. In women there is an accelerated phase of bone loss after menopause due to oestrogen

deficiency, which causes bone resorption.^[8] Calcium is one of the most important mineral for bones; various evidences suggest that proper nutrition is important to maintain the health of bones and joints. Osteoporosis is characterised by imbalance of nutrition with endocrinal disorders.^[9] Concentration of calcium ions depends on different factors like absorption of calcium from the intestine, excretion of calcium from the kidney. Further, uptake and release of calcium from bone depends on various hormones and vitamin including parathyroid hormones (PTH), calcitonin Hormone and vitamin D.^[10] Quality, quantity and ratio of bone mineralization and turnover depend upon a number of hormones. Parathyroid hormone induces resorption of calcium from the bone and maintain the serum calcium level.^[11] Bone strength is predicted by both BMD and bone architecture.^[12] Oestrogen hormone inhibits the production of inflammatory maker IL 6 which in turn inhibits the osteoclast apoptosis and leads to decrease bone resorption resulting in re-modelling of bones in females. Therefore, deficiency of estrogens may cause longer life span of osteoclast.^[11] My aim was to evaluate the parathyroid hormones and serum calcium level in pre-menopausal and postmenopausal women and evaluate the risk of fracture in post menopausal women.

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MATERIALS AND METHODS

This Present study was conducted in the Department of Orthopaedics, World College of Medical Sciences Research and Hospital, Jhajjar in collaboration with the Department of Biochemistry, during the period from February 2017 to November 2018. Randomly selected 90 subjects, according to exclusion & inclusion criteria, with age in between 20-65 years, were categorized in two groups: Group: A - 45 pre-menopausal women within the ages of 20 years and 45 years. Group: B - 45 post-menopausal women within the ages of 50 years and 65 years.

Anthropometric and Biochemical estimation:

Height (Cm) and weight (Kg) of each subject was measured by the standard scale to determine the Body Mass Index. 5 ml of venous blood was collected from each participant. The samples were allowed to retract and then spun at 2500 rpm for 10 minutes to obtain serum samples to determine the serum calcium level, parathyroid hormones and calcitonin level by following methods:

1. Serum calcium was measured by colorimetric method (Erba kit).
2. Serum parathyroid hormone and calcitonin were estimated by enzyme linked immunosorbent assay (ELISA).
3. Bone Mineral Density Test BMD was measured by dual electron x-ray absorptiometry (DXA) at lumbar spine and femoral neck.[15] T-score = (subject's BMD value - Mean young normal BMD value) / (SD young normal BMD).[13]

Statistical analysis

All values were expressed as Mean±SD. We used student t-test and pearson's correlation coefficient to find the statistical significance. A p-value <0.05 was to be considered statistically significant.

RESULTS&DISCUSSION

The results of the assessment of parathyroid hormone and other parameters in pre-menopausal women and post-menopausal women are presented in tables and graph. Table 1 shows the statistically not significant difference between height, weight and BMI of pre-menopausal women and post-menopausal women. [Table 2 & Figure 1] shows the mean ± standard deviation (SD) when parathyroid hormone and other biochemical parameters were compared in premenopausal women and post-menopausal women. Serum calcium of post-menopausal women was significantly lower in comparison to pre-menopausal women. Further, PTH was significantly high in post-menopausal women in comparison to pre-menopausal women. There was statistically not significant difference between serum calcitonin level of post-menopausal women and pre-menopausal women.

[Table 3], Shows the statistically not significant correlation between age with serum calcium, PTH and calcitonin in both pre-menopausal and postmenopausal women. There was a significant difference between t score of post-menopausal women (-2.762±/-0.615 g/cm2) and premenopausal women (-1.471±/-0.523 g/cm2).

Table 1: Anthropometric measurements in Group A and Group B

| Variables | Group A (N=45) | Group B (N=45) |
|--------------|----------------|----------------|
| Age in years | 39±4.6 | 54±5.6 |
| Height in cm | 152.82±4.64 | 154.9±5.37* |
| Weight in Kg | 67.07±11.82 | 66.12±10.83* |
| BMI in Kg/m2 | 26.2± 4.38 | 26.9± 3.42* |

(Statistically Significant at p value <0.05) *NS: Statistically not Significant

Table 2: Serum calcium, parathyroid hormones and calcitonin in Group A and Group B

| Variables | Group A(N=45) | Group B (N=45) |
|--------------------------|---------------|----------------|
| Serum calcium (mg/dl) | 9.21±2.71 | 8.01±1.7 |
| Serum calcitonin (pg/ml) | 6.7± 1.56 | 5.1± 1.17* |
| Serum PTH (pg/ml) | 34.26±9.49 | 57.6±15.3 |

(Statistically Significant at p value <0.05) *NS: Statistically not Significant

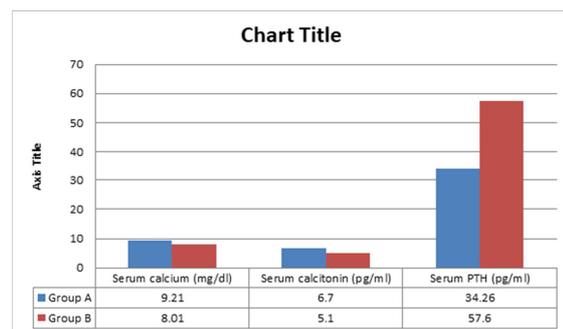


Figure 1: Serum calcium, parathyroid hormones and calcitonin in Group A and Group B

Table 3: Correlations of age with serum calcium, parathyroid hormone and calcitonin levels in Group A and Group B

| Variables | Pearson's correlation coefficient | | | |
|--------------------------|-----------------------------------|---------|----------------|---------|
| | Group A (N=45) | | Group B (N=45) | |
| | (r) | p-value | (r) | p-value |
| Age and serum calcium | 0.05 | 0.74 | -0.15 | 0.32 |
| Age and serum PTH | 0.26 | 0.08 | -0.14 | 0.35 |
| Age and serum calcitonin | -0.12 | 0.43 | 0.18 | 0.23 |

This study observed significant increase in parathyroid hormone but calcium and calcitonin level was decreased in post-menopausal women compared with pre-menopausal women. Serum calcium is an important mineral for the strength of bones and decrease of calcium leads to osteoporosis.[9] Results of the present study has revealed that there was significantly lower serum

calcium level in post-menopausal women in comparison to pre-menopausal women. The findings of the presents study are consistent with the previous study of Agarwal N et al and Kanis J et al in which they observed low level of serum calcium in postmenopausal women.^[14,15] This decrease of calcium in postmenopausal women may be due declining ovarian functions after menopause characterised by altered calcium metabolism along with reduction in bone mass.^[16] Moreover, decrease of oestrogen hormones may leads to decrease absorption of intestinal calcium as well as decreased conservation of renal calcium.^[17,18] This decrease of calcium can lead to osteoporosis which is one of the major causes of fracture in postmenopausal women.^[14] Further, present study recorded significant difference between the parathyroid hormones of postmenopausal women and premenopausal women which are very similar to the findings of the previous studies of Cammozi V et al and Safi S et al in which they observed that parathyroid hormone was significantly low in postmenopausal women.^[19,20] Parathyroid hormones gradually increased with the age in women and it has been found associated with increase turnover of bone.^[21] Furthermore, there was an insignificant difference in calcitonin level of postmenopausal women and premenopausal women. These findings are similar to the previous study of Taboulet J et al.^[22] Calcitonin has an anti resorptive effects on bones and it is bind with the osteoclast membrane.^[22] Decrease of oestrogen hormones may play an important role in age related rise of parathyroid hormones and bone turnover.^[23] In addition present study has shown that t score of postmenopausal women was significantly decreased in comparison to pre-menopausal women. These findings are consistent with the previous studies of Agarwal N et al and Kanis J et al.^[14,15] This decrease t score may be due to decrease of serum calcium and vitamin D leading to decrease in absorption of intestinal calcium along with increased parathyroid hormones level and increased bone turnover.^[24] Decrease of calcium ion with increase of parathyroid hormones may leads to osteoporosis in postmenopausal women. Moreover, decrease calcium level along with osteoporosis increase the incidence of bone fracture in postmenopausal women.^[25] Thus, any interference with action of parathyroid hormone could lead to increasing or decreasing of serum calcium and calcitonin. The effect of age on the parameters between the pre and post-menopausal women.

CONCLUSION

In conclusion, the postmenopausal women have low calcium and calcitonin level along with higher parathyroid level which results in osteoporosis in

female population after menopause. However, incidences of fractures can be decreased by maintaining calcium level in postmenopausal women.

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