

ASSESSMENT OF URIC ACID IN POST-MENOPAUSAL OSTEOPOROTIC WOMEN

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ABSTRACT

Objective: Osteoporosis is a quite common in post-menopausal women due to estrogen deficiency. Uric acid (UA) concentration has found some controversial association with bone mineral density (BMD). Hence, the role of UA may be beneficial to know due to the sign and symptoms presented by osteoporosis patients.

Methods: A total of 79 post-menopausal women were recruited without having a previous history of osteoporosis or the secondary osteoporosis. Their BMD was estimated by estimating T-score and Z-score at the tibia and radius level. Total calcium ionized calcium, serum phosphate, alkaline phosphatase (ALP), and UA level were estimated by a colorimetric method.

Results and Conclusions: There were 38 women having osteoporosis and remaining 41 with pre-osteoporosis or osteopenia. Significant results were obtained between these groups. Total calcium and ionized calcium were higher in osteopenic group and the result highly significant (<0.001). Serum concentration of phosphate and ALP were significantly (<0.01) higher in the osteoporotic group. The UA level was significantly higher (<0.001) in the osteoporotic women. There were positive association (standardized $\beta=0.265$, $p=0.018$) serum UA and ALP in the study group. In conclusion, post-menopausal women with pre-osteoporosis as well as osteoporosis are characterized by elevated concentration of UA. The role of UA in bone loss disorder could not be neglected as hyperuricemia may give rise to several other life-threatening diseases associated with this, in coming future.

Keywords: Osteoporosis, Osteopenia, Uric acid, Bone mineral density.

INTRODUCTION

Osteoporosis, the most common condition in aging and elderly nowadays, most frequently occurs in women compared with men [1]. Osteoporosis frequently occurs in post-menopausal women, characterized by estrogen deficiency, which plays a fundamental role in skeletal growth and bone homeostasis [2]. It is a condition characterized by decreasing the density of bones and its strength resulting in fragile bones, more rapidly occurred in women after menopause, due to deficiency of calcium and vitamin D, poor vision, poor health, hormonal changes, personal history of fracture [3]. Usually, osteoporosis referred as silent disorder, but symptoms such as severe back pains, joint pains, and loss of height may be present, especially in post-menopausal women [4]. Uric acid (UA), also known as a strong endogenous antioxidant [5], has shown controversial association with bone mineral density (BMD) showed by various observational studies [6,7]. It may also be linked with coronary heart diseases and oxidative stress [8,9], which is also quite common with increasing age due to sedentary lifestyle [10]. Elevated concentration of UA may cause kidney stones, arthritis, and gout in later stages [11]. The assessment of UA is not very well studied in post-menopausal women, especially in the pre-osteoporosis stages. Hence, the aim of this study was the assessment of UA and bone mineral markers in post-menopausal women.

METHODS

It was a cross-sectional study, carried out in the Department of Biochemistry, TSM Medical and Hospital, Lucknow, Uttar Pradesh, India. A total of 79 post-menopausal women were recruited for the study. The age group criterion for the study group population was 50-60 years of age. The post-menopausal women having kidney stones, cardiovascular risk, diabetes mellitus, taking calcium supplements, hormonal therapy, family history of osteoporosis, and secondary osteoporosis were excluded from the study.

BMD status was measured in post-menopausal women for diagnosis of osteoporosis and osteopenia in all the participants. BMD usually reported as T-score and Z-score was checked at the tibia and radius level in both the groups [12]. Total calcium (Ca) (8.5-10.5 mg/dl), ionized Ca (4.6-5.4 mg/dl), serum phosphate (1.6-6.8 mg/dl), and serum alkaline phosphatase (ALP) (60-170 IU/L) were measured in all the study populations by Colorimetric method [13]. UA level (2.4-5.7 mg/dl) was also estimated in the aforesaid study population by a colorimetric method [14].

Statistical analysis

The statistical software IBM 20.0 SPSS (statistical package for social sciences) was used for statistical analysis. All the variables were expressed in mean \pm standard deviation. The unpaired Student's t-test was used to differentiate the different variables between the groups. An association between serum UA and ALP was observed by linear regression analysis. A p value <0.01 and <0.05 were considered statistically highly significant and significant, respectively.

RESULTS

In total, 79 post-menopausal women were recruited for the study. In which 38 women with osteoporosis, and remaining 41 women were having osteopenia (symptoms are not fully developed as in osteoporosis) termed as Class-I and Class-II, respectively. Significant results were observed in this study among various parameters in different groups. The serum concentration of total Ca and ionized Ca were highly significant (<0.001) between the groups. These levels were lower in Class I compared to Class II. The findings of Serum phosphate and ALP was also significant (<0.01) between the groups. The level of UA was highly significant (<0.001). The level was higher in Class I comparative to Class II (Table 1). The UA level was positively and significantly associated with ALP in the study population (standardized $\beta=0.26$, $p=0.035$) (Table 2).

Table 1: Baseline parameters in different groups

Serial number	Parameters	Class I	Class II	p value
1	Age	60.63±12.13	57.04±5.97	0.096
2	Total calcium	8.47±1.30	9.34±0.73	<0.001
3	Ionized calcium	4.31±0.54	4.69±0.36	<0.001
4	Serum phosphate	4.22±1.28	3.47±0.88	0.003
5	Alkaline phosphatase	156.21±38.61	135.58±28.31	0.008
6	Uric acid	6.15±1.28	4.88±1.33	<0.001

All the variables in mean±SD. p<0.05 was significant by Student's *t*-test.
SD: Standard deviation

Table 2: Uric acid association with alkaline phosphatase

Serial number	Parameter	Standardized β	p value
1	Alkaline phosphatase	0.265	0.018

A linear regression analysis shows the association between two parameters.
p<0.05 was significant

DISCUSSION

In this study, the most significant results were obtained among the various parameters in this study population. This study specifies that post-menopausal women having osteoporosis and with developing the risk of osteoporosis or in osteopenia supported by Christenson *et al.* study [15], in which they suggested women over the age of 50 have increased the risk of osteoporosis due to hormonal influence of estrogen on bone health. Elevated concentration of ALP in this study supported by Mukaiyama *et al.* study, in which they concluded that the elevated concentration of ALP is caused by higher bone turnover [16]. Japanese post-menopausal women manifested the positive association between UA and ALP by Ishii *et al.* [17] similar to this study. In support of this study, Lin *et al.* observed that serum UA has a strong protective effect at least against osteopenia and osteoporosis in males and post-menopausal women (age ≥ 50 years) [18]. Study based on Korean man concluded that higher serum UA may act as a protective factor against osteoporotic fractures [19] and for bone metabolism in primary osteoporosis [20]. In addition, a longitudinal study concluded that UA levels appear to be protective for bone loss but not dependent on changes in body composition in post-menopausal women [21]. However, experimental evidence has also shown that serum UA may have beneficial effects on bone metabolism as antioxidant in post-menopausal women [22].

CONCLUSION

The outcome of this study reveals that elevated concentration of UA is a more prominent in post-menopausal women with osteoporosis as well as osteopenia. The positive association between increased concentration of ALP and UA also justifies these findings. Hyperuricemia, in the initial phase of pre-osteoporosis or osteopenia in post-menopause, might occur in the form of gout in the later stage of life. Hence, the developing risk of hyperuricemia could not be avoided, UA assessment should be taken while treating the patient having pre-osteoporosis and osteoporosis. The only limitation to this study was its sample size, large population-based study should be conducted to establish this fact.

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