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SERUM OSTEOCALCIN LEVELS IN POSTMENOPAUSAL OSTEOPOROSIS WOMEN – A CROSS SECTIONAL STUDY.

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ABSTRACT

Background: Increase in health care facilities increased life expectancy resulted in increase in number of older population worldwide. India had the second number of elderly (60+) population in the world with 3.3 million in 1971 to 7.66 million in 2001 and as high as 17 millions in 2011 with 49.3% males and 50.7% females. 1 out of 3 females in India suffers from osteoporosis, making India one of the largest affected countries in the world.Materials and methods: for this study we evaluated serum osteocalcin as marker for osteoporosis in 45 newly diagnosed postmenopausal osteoporotic women and in 56 age matched control group, who are not suffering from osteoporosis.Results: we observed significantly higher levels of serum osteocalcin in study population 21.4 $\pm$ 3.8 ng/ml when compared to control group 18.9 $\pm$ 4.6 ng/ml ($P<0.01$).Conclusion: from this study we observed osteocalcin as beast marker for bone turnover in osteoporosis, hence also can be used as marker for diagnostic and prognosis marker in PMO (post menopausal osteoporosis)

KEYWORDS: post menopausal osteoporosis; osteocalcin;

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INTRODUCTION

Increase in health care facilities increased life expectancy resulted in increase in number of older population worldwide including developing countries like India. As per Suvalaxmi Chakrabarti et al (1) India had the second number of elderly (60+) population in the world with 3.3 million in 1971 to 7.66 million in 2001 and as high as 17 millions in 2011 with 49.3% males and 50.7% females. 1 out of 3 females in India suffers from osteoporosis, making India one of the largest affected countries in the world (2). Osteoporosis is one of the major health problems arising in women entering menopausal age. Osteoporosis and the potential serious consequences of osteoporotic fractures increase with advancing age of population (3). Asian women are highly prone to osteoporotic fractures compared to crustaceans (4). As per WHO osteoporosis is second to cardiovascular diseases as leading health care problem worldwide (5). The menopause is the consequence of the exhaustion of ovarian follicles which results in decreased production of estrogen or other hormones. Estrogen depletion is strongest risk factor for early development of osteoporosis in women with menopause. Of three approaches to diagnose osteoporosis namely bone density measurement, bone biopsy and biochemical assessment later is advantageous with cost effective, non invasive and also has prognostic importance. Recent data revealed the diagnostic importance of bone forming cells secreting matrix GLA protein called Osteocalcin. It is 49 amino acids small protein with 3 gamma carboxyglutamic acid residues play an important role in bone formation (6). No studies are available on the levels of osteocalcin in correlation of osteoporosis in postmenopausal women of central India population; hence we aimed this study to assess levels of osteocalcin and its diagnostic application in postmenopausal osteoporosis.

MATERIALS AND METHODS

The present study was conducted at dept. of Orthopedics, L.N.Medical College-Bhopal INDIA. It is approved by Institutional Ethical Committee. For this study we invited voluntary participation of 56 women with postmenopausal osteoporosis, age group between 45-55 years and grouped them as study group. Age matched 45 post menopausal women without osteoporosis was selected as control population. From all participants written consent was taken. All the participants were advised for overnight fasting and on the next day morning 2 ml of venous blood was drawn and serum was isolated and stored at -80^0c till biochemical investigations were done. We measured serum calcium using ready available colorimetric kits (BIOSYSTEMS) by Biosystems A25 fully automatic analyzer with coefficient of variation CV <8% and serum Osteocalcin by ELISA method (INVITROGEN) with CV <6%.

Statistical analysis

All the results were expressed as mean $\pm$ SD. Simple unpaired t test was applied to see the statistical difference of biomarkers between two groups. P value <0.05 was considered as significant and p <0.01 as highly significant. Data was analyzed using SPSS version 19 Chicago.

RESULTS

In the present study we observed statistically significant low serum calcium (9.2 $\pm$ 1.6 mg/dl) in osteoporosis women when compared to control (9.6 $\pm$ 1.2 mg/dl) with p <0.05. serum osteocalcin levels are very high in osteoporosis group 21.4 $\pm$ 3.8 ng/ml when compared to their normal counterparts 13.9 $\pm$ 4.6 ng/ml with p<0.01.

DISCUSSION

The characteristic feature of menopause is reduction in skeletal mass caused by an imbalance between bone formation and bone resorption due to loss of ovarian function. In support of this statement we in the present study observed low levels of serum calcium in PMO (postmenopausal osteoporosis) when compared to normal menopausal women. The same decrease in serum calcium in menopause was also observed by Lori J Sokoll et al in their study on 402 menopausal women (7). The low serum calcium might be due to increased urinary loss of calcium in PMO. Estrogen deficiency may induce calcium loss due to decreased intestinal calcium absorption and decreased renal calcium conservation (8). Serum osteocalcin levels were significantly higher in PMO when compared to controls. The same high levels in PMO was also observed by Lie T. Merijanti Susanto (9). Osteocalcin is synthesized in the skeleton by osteoblasts. Osteocalcin has high affinity for calcium and exhibits a compact calcium dependent alpha helical confirmation in which the gamma carboxyglutamic acid residues bind and promote absorption to hydroxyapatite in bone matrix (10), thus mineralization of bone will takes place. In PMO women due to the deficiency of calcium which was also observed in this study, may leads to lower hydroxyapatite formation and decreased rate of bone mineralization, hence free osteocalcin may be available freely in circulation thus explaining the increased serum osteocalcin concentration in osteoporetic women. The advantage of using osteocalcin as biochemical marker for osteoporosis and bone turnover is its tissue specificity.

Table 1
showing biochemical parameters in control and osteoporosis groups.

Parameters	Control group N= 45	Osteoporosis group N= 56	P value
Serum calcium mg/dl	9.6 ± 1.2	9.2 ± 1.6	<0.05*
Serum osteocalcin ng/ml	18.9 ± 4.6	21.4 ± 3.8	<0.01**

All the values are expressed as mean ± SD. *P<0.05, **P<0.01.

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