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Serum Vitamin D, Serum Calcium & Serum Phosphorus in Post-Menopausal Women in Farrukhabad District, Uttar Pradesh, India

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ABSTRACT

Background: In the menopausal women, the osteoporosis is characterized by low bone mass leading to enhanced bone fragility and consequent increase in bone fracture risk. These risks are due to calcium & vitamin D deficiency, which occur due to less amount of estrogen production during menopausal age. Aims: To estimate the level of Vitamin D, Calcium & phosphorus in menopausal women. **Methods:** Serum vitamin D, calcium and phosphorus levels were measured in 155 postmenopausal women (46-60 years) by using standard methods. They have been compared with 155 premenopausal women (30-45 years) by using student t-test. **Results:** Serum vitamin D and calcium levels were significantly decreased in postmenopausal women ($p<0.0001$) as compared to premenopausal women; whereas the serum phosphorus level was found to be significantly increased in postmenopausal women ($p<0.0001$) as compared with premenopausal women. **Conclusion:** The present study findings indicate decreased levels of serum vitamin D & serum calcium and increased the level of serum phosphorus in postmenopausal women. These changes can be used as a good marker for identifying bone related disorders in postmenopausal women. Intimation with supplementation at an early stage may further prevent bone disorder in the later stage of menopause.

Keywords: Postmenopausal women, Premenopausal women, Vitamin D, Calcium, Phosphorus.

INTRODUCTION

Menopause is defined as the time of women life when there is adaptation of physical, emotional, mental and hormonal changes associated with the cessation of menstrual period. Some of the most common associative changes include interrupted sleep patterns, hot flashes and stress. [1] Menopause mostly occurs between the age of 45 – 50 years; the average age is 47. About 60 million Indian women are above the age of 55 years and a majority would spend 1/3rd of their life on postmenopausal stage. [2]
Calcium is the most important mineral in the human body, which accounts for about 99% in skeletal tissues, 0.9% in cells of soft tissues and 0.1% in bloodstream & extracellular fluid, where they have effects on the nervous system, muscular system, and cardiovascular system. Calcium is required for the maintenance of the skeletal system in women throughout life. During the menopausal phase, there is an increase in bone resorption rate of calcium that declines in bone mass due to fall in ovarian estrogen production.[3] The main role of calcium is to maintain bone health, especially in menopausal women. The calcium absorption is decreased due to the lack of vitamin D, resulting from the age-related declines in several functions. [3,4]
Declining in the ovarian function during menopause is accompanied by a decrease in bone mass and altered in calcium and vitamin D metabolism along with phosphorus. Estrogen stimulates the osteoblast by decreasing the number and activity of osteoclast which in turn affect the bone remodeling. [5] The reduced calcium absorption has been attributed to reducing in circulating vitamin D levels and to gastrointestinal resistance to its action. [6]
Accordingly, vitamin D is to help in maintaining the calcium balance of bone by promoting calcium absorption in the intestine by promoting bone resorption through an increase in osteoclast number. Vitamin D also maintains the level phosphorus for bone formation and allows proper function of PTH hormone to maintain serum calcium levels.[7] After the onset of menopause in women life, there is increased risk of osteoporosis, muscle weakness,

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cardiovascular risk, colorectal and breast cancer, diabetes, infections and neurological diseases.[8]
There is a wide range of prevalence of vitamin D and calcium deficiency due to low dietary intake in the Indian population, especially in postmenopausal women group. Osteoporosis is a serious problem the old age women come across is asymptomatic unless any further complication was seen. Early detection of an imbalance in serum vitamin D, calcium and phosphorus levels in menopausal women can be a useful tool to assist healthcare professionals for the therapeutic aspect and follow up. With this perspective, this comparative cross-sectional study of serum vitamin D, serum calcium and serum phosphorus levels in premenopausal and postmenopausal women was undertaken with the objective to evaluate serum vitamin D, serum calcium and serum phosphorus status among them.

MATERIALS AND METHODS

This was a cross-sectional type of study, carried out in the Department of Biochemistry, Santosh Medical College & Hospital, Ghaziabad in collaboration with Department of Biochemistry at Major S. D. Singh Medical College & Hospital, Farrukhabad, Uttar Pradesh, India. Total three hundred ten healthy women were included, out of which 155 were healthy pre-menopausal and 155 were post-menopausal women attending outpatient department of Obstetrics & Gynecology at Major S. D. Singh Medical College & Hospital, Farrukhabad, Uttar Pradesh, India and fulfilling the defined criteria were included in the study till the desired sample size is reached. Ethical committee and written informed consent were obtained from study subjects.

Inclusion criteria
The women were apparently healthy.

Control Group: - Women with the reproductive age group 30 – 45 years, with a normal menstrual cycle.
Study Group: - Post-menopausal women 46 – 60 years, with one year of amenorrhea and were not receiving any hormonal replacement therapy.

Exclusion criteria
The women with some sort of menstrual disorders e.g. Irregular menses, menorrhagia, with any bone fracture in previous 1 year, on hormonal replacement therapy, oral contraceptives, smoker, alcoholic, under any estrogen therapy or any supportive treatment for menopausal symptoms for at least 6 months prior to study, supplementation with nutritional antioxidants, diabetes, hypertension, malabsorption and any bone diseases were excluded from this study.

Biochemical Parameters:
Venous blood (5ml) was drawn from all participants and serum was separated. Serum was analyzed for the measurement of Vitamin D [Electro-Chemiluminascence binding assay, [10-14] Serum Calcium [O-Cresolphthalein Complex method and Serum Phosphorus [Modified Gomorri's Method. [15-18]

Statistical Analysis:
All data obtained from the estimations were expressed as the mean± standard deviation (SD) and student t-test was used for compare mean± SD between the groups.

RESULTS

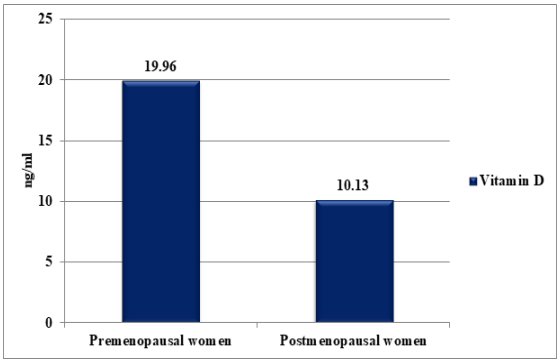

Figure 1: Mean & Standard deviation of Vitamin D level in Premenopausal women & Postmenopausal women.

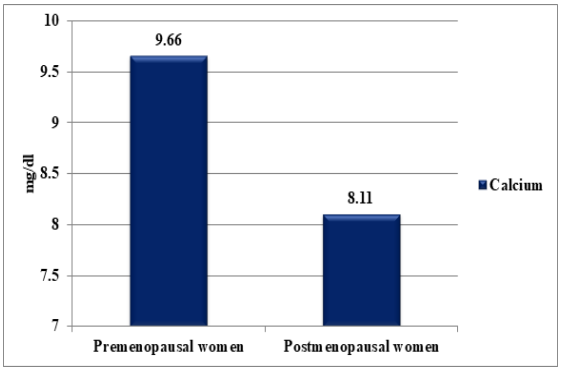

Figure 2: Mean & Standard deviation of Calcium level in Premenopausal women & Postmenopausal women.

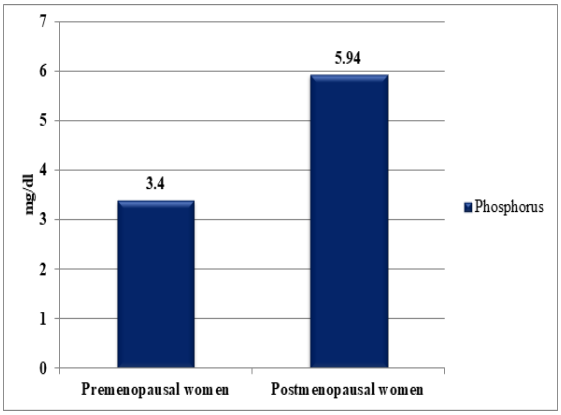

Figure 3: Mean & Standard deviation of Phosphorus level in Premenopausal women & Postmenopausal women.

Table 1: Bone marker levels of Premenopausal women & Postmenopausal women.

S. No.	Parameter	Premenopausal women	Postmenopausal women	p Value
1	Vitamin D (ng/ml)	19.96	10.13	< 0.0001
2	Calcium (mg/dl)	9.66	8.11	< 0.0001
3	Phosphorus (mg/dl)	3.4	5.94	< 0.0001

DISCUSSION

In a population based study in 200212 showed that valproic acid therapy did not change serum lipids, vitamin B12 and folic acid concentrations in epileptic children. In the study conducted by Yalçin it was observed that patients receiving carbamazepine showed increased serum high- density lipoprotein cholesterol (HDLC), [13] apolipoprotein A (Apo- A) and apolipoprotein B (Apo- B). Patients receiving valproic acid showed increased Apo- B levels only. Study carried out by Bhosale UA, it was found that all the antiepileptic were potentially toxic drugs and monotherapy should be considered as gold standard in antiepileptic therapy. [14]

In a study conducted on 49 epileptic patients it was indicated that patients using carbamazepine have significantly higher ALP than those using phenytoin and patients using sodium valproate have significantly higher ALP than those using phenytoin.[15] In a total of 40 freshly diagnosed epileptic children, suffering from idiopathic generalized tonic-clonic or partial seizures it was demonstrated that children receiving VPA for 6 months had lower serum levels of TC, triglycerides, LDL-C, VLDL-C, LDL-C / HDL-C ratio and higher HDL-C levels than controls. Hepatic enzyme inducing drugs such as carbamazepine may have adverse effect on serum lipid profile. This alteration of serum lipids may have clinical relevance with regard to the incidence of atherosclerosis with antiepileptic drugs. [16]

Pelkonen R showed that the serum cholesterol levels increased by 6 to 48% in patients during the first three months on phenytoin. [17] The mechanism by which phenytoin increases the serum cholesterol level can be explained by two theories. Phenytoin decreases the level of circulating thyroid hormones including free thyroxine and triiodothyronine, and the increase in serum cholesterol could be due to subclinical hypothyroidism. [18] Second theory is based on the phenobarbitone-like effect of phenytoin on hepatic microsomal enzymes. Phenobarbitone stimulates the hepatic synthesis of cholesterol and also increase the intestinal absorption of cholesterol. [19]

In a study by Hoda Yahya Tomoum et al, [20] which comprised of 22 children with idiopathic epilepsy were on either carbamazepine or valproate. Patients on carbamazepine showed increase in total cholesterol, low-density and high-density lipoproteins cholesterol, and decrease in apolipoprotein AI levels compared with controls.

In a cross-sectional study by Aditi Dhar et al it was found that children on valproate had significantly higher mean serum triglyceride and total cholesterol levels as compared to children on phenytoin monotherapy.[21] Dewan et al,[22] in 79 epileptic patients reported higher total cholesterol in children on phenytoin when compared to valproate and controls.

The present study was designed to investigate the effect of conventional antiepileptic drugs phenytoin and valproic acid on lipid profile parameters and liver function tests. The limitations of this study included lack of serial measurements, the unavailability of sibling's data, and long term follow-up of the enrolled children.

CONCLUSION

Evaluation of this prevalence study indicates that more case-control studies should be conducted in pediatric age group to formulate the guidelines for safe drug usage and its long term effect on the deranged parameters. Parents and doctors should work together to not only find the best treatment, but to keep checking to make sure it continues to be the best option. There is an urgent need of the hour to develop affordable drug delivery system of these antiepileptic drugs for general public and to diversify our interests towards mass health education to dispel the social stigma attached to the disease. New treatments are continually being developed. Hence, it's important to be an active partner in your child's care. Screening for neurobehavioral co morbidities should be an integral part of management in children with “active” epilepsy.

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