



Research Paper

A Comparative Study of Serum Calcium and Magnesium in Post-Menopausal and Pre- Menopausal Women

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Abstract

Background: Menopause is marked by decreased female sex hormones and many of the symptoms experienced during this phase may be related to changes in serum levels of certain trace minerals especially calcium and magnesium.

Aim: The main purpose of the study was to measure serum calcium and magnesium in postmenopausal women and to compare with that in pre-menopausal women.

Methods: Serum calcium and magnesium were estimated in 30 postmenopausal women and 30 premenopausal women, who were selected following inclusion and exclusion criteria. Statistical analysis was done by using Graph pad Quickcalcs calculator. Student's unpaired t test was done to compare between both groups and p-value was determined to know the statistical significance.

Results: Postmenopausal women were found to have lower serum calcium (8.659 ± 0.91) and serum magnesium (1.63 ± 0.16) when compared to premenopausal women who had serum calcium of (9.604 ± 0.70) and serum magnesium (2.48 ± 0.55). The lowered calcium and magnesium levels were found to be extremely statistically significant with a p-value of < 0.0001 .

Conclusion: Serum calcium and magnesium were decreased in post-menopausal women when compared to pre-menopausal women, which needs to be corrected to avoid certain postmenopausal symptoms and other serious health problems. This may improve cardiovascular and bone health in post menopausal women.

Introduction

Menopause which is complete cessation of menses, is inevitable in every woman's life. It marks the diminished ovarian reserve and subsequent decline in female sex hormones. Even in natural menopause, which is considered to be physiological, to the utter dismay, hormonal

disturbances lead to various health issues comprising of vasomotor symptoms like hot flushes, night sweats; neurological symptoms like anxiety, depression, mood swings, brain fog, sleep disturbances; genitourinary symptoms and weight gain. Decreased oestrogen production is also associated with increased cardiovascular risk and

decreased bone density leading to osteoporosis with associated increased risk for fractures.¹ Most of the postmenopausal symptoms, if not all can be attributed to changes in serum levels of certain trace minerals like calcium, magnesium, zinc and phosphorus which is brought about by altered hormonal balance. Thorough understanding of underlying physiological changes and mechanisms can be made use of in timely institution of simple, yet appropriate, corrective remedial measures which restores the near normal condition.

There are previous studies which suggest that certain physical symptoms are caused by altered calcium and magnesium metabolisms.^{2,3,4} Postmenopausal women because of hormonal imbalance are at greater risk of osteoporosis and cardiovascular diseases owing to changes in certain physiological and biochemical parameters. In this study an attempt is made to evaluate micronutrients like calcium and magnesium in postmenopausal women and to compare their levels in premenopausal women.

Materials and Methods

The present study was conducted on 30 postmenopausal women and 30 premenopausal women who were selected from general population based on inclusion and exclusion criteria. Informed consent was taken from all the subjects following ethical guidelines.

Results

Table-1. Mean age, serum calcium and magnesium levels in premenopausal women and postmenopausal women expressed as Mean±S.D.

Parameter	Pre-menopausal Women, n=30, Mean± S.D.	Post-menopausal Women, n=30, Mean± S.D.	P-value
Age (years)	33.23±5.28	58.93±5.13	
Serum calcium (mg/dl)	9.604±0.70	8.659±0.91	<0.0001
Serum magnesium (mg/dl)	2.48±0.55	1.63±0.16	<0.0001

The age of pre-menopausal women was 33.23±5.28 (Mean ± S.D.) and the age of post-menopausal women was 58.93±5.13 (Mean ± S.D.)

In the present study, mean of serum calcium was 9.604±0.70mg/dl in post-menopausal women and in pre-menopausal women it was

Inclusion Criteria

Post menopausal women: Normal healthy women of 50-70yrs age group who attained natural menopause.

Pre-menopausal women: Normal healthy women of reproductive age group 25-45 yrs.

Exclusion Criteria

- 1) Post menopausal women on hormone replacement therapy,
- 2) Subjects who have undergone hysterectomy or oophorectomy,
- 3) Chronic illnesses like diabetes or hypertension,
- 4) Endocrinal disorders,
- 5) H/o malignancy, tuberculosis, rheumatoid and renal diseases,
- 6) Subjects on calcium and magnesium supplementation,
- 7) Pregnant women

Collection of Blood Sample: After overnight fasting, about 5ml of blood was drawn from antecubital vein under strict aseptic conditions using sterile, disposable syringes. Centrifugation at the rate of 3000 rpm for 10 minutes was done and separated serum was used to estimate serum calcium and magnesium by photocalorimetry method. Statistical analysis was done by using Graph Pad Quickcalcs calculator. Parameters were expressed as Mean± S.D. (standard deviation). Comparison between 2 groups was analyzed by student's unpaired t-test and p-value < 0.01, was taken as statistically significant.

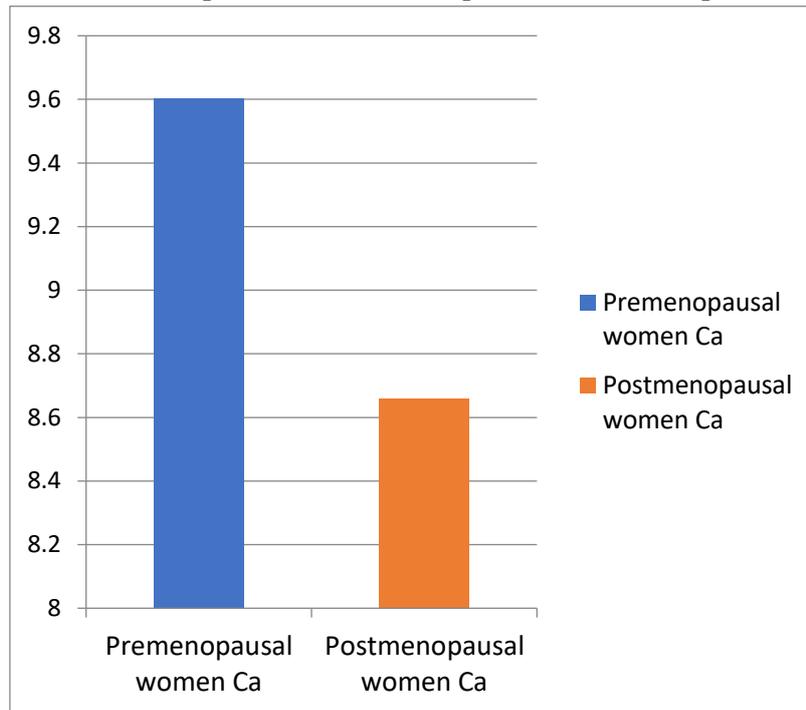
9.604±0.70mg/dl. So it's evident that serum calcium levels decreased in post menopausal women when compared to pre- menopausal

women which was statistically significant (P-value <0.0001). This result correlates with certain other studies.⁵⁻⁷ Estrogen deficiency causes calcium loss by altering calcium homeostasis through extraskeletal mode and also by decreasing intestinal absorption.

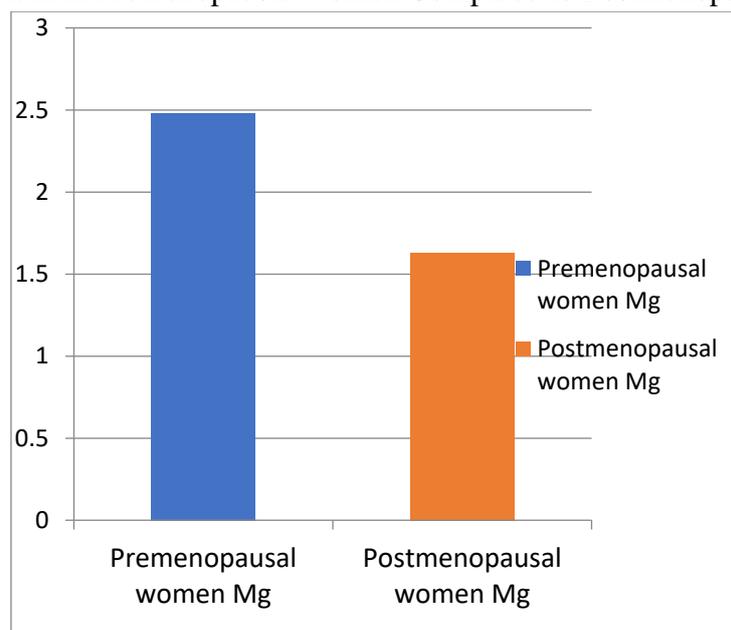
It was found in this study that serum magnesium levels also decreased from 2.48±0.55 mg/dl in

pre-menopausal women to 1.63± 0.16 in post-menopausal women with a p-value of <.0001 which was considered as extremely statistically significant. This corroborates with decreased magnesium levels in post- menopausal women in several other studies.⁸⁻¹⁰ This may be due to renal and gastro intestinal losses or may be due to deficient dietary intake

Graph-1. Serum Calcium in Premenopausal Women Compared to Postmenopausal Women



Graph-2. Serum Magnesium in Premenopausal Women Compared to Postmenopausal Women



Discussion

Oestrogen which plays important role in female reproductive physiology becomes deficient after menopause. Studies have shown that decreased oestrogen lowers the expression of intestinal calcium channels and calcium binding proteins which causes decreased calcium absorption from intestine.¹¹ Significantly low levels of serum calcium found in natural postmenopausal women can be attributed to decreased intestinal absorption of calcium secondary to decreased oestrogen associated with aging.¹²

Previous studies have shown that estrogen increases expression of apical calcium channels on renal tubular cells.¹³ There are studies which show that decreased levels of estrogen seen in natural postmenopausal women decrease the renal tubular reabsorption of calcium.¹⁴

Calcium is important structural component of bones and teeth. Calcium serves important functions like muscle contraction, transmission of nerve signals, blood clotting, release of hormones, transport of nutrients, maintenance of normal heart beat or rhythm & lessens symptoms of PMS. Calcium deficiency may be associated with cardiac rhythm disturbances, atheromatous plaques, increased total cholesterol and decreased HDL.¹⁵

Oestrogen increases renal reabsorption of magnesium which was evident from a study where postmenopausal women who were given oestrogen replacement therapy showed decreased urinary magnesium proving the role of oestrogen in magnesium reabsorption from kidneys.^{16,17}

Magnesium too subserves numerous functions. It acts as co-factor in more than 300 enzymatic reactions.¹⁸ It has important contribution in regulation of vascular tone, heart rhythm, platelet activated clotting mechanism and bone formation. In this context, it's worth noting that muscle contraction and relaxation, normal neurological functions, release of neurotransmitters and ATP metabolism are magnesium dependent. It was observed in a study that animals deficient in magnesium show altered insulin secretion and

sensitivity signalling possible role of magnesium in aetiology of diabetes mellitus. Magnesium is a natural calcium antagonist. It inhibits apoptosis triggered by calcium overload.

In present study serum calcium decreased in postmenopausal women which is in agreement with a recently conducted study.¹⁹ In certain other studies, it was observed that serum calcium increased, while magnesium levels decreased in post menopausal women, which is in slight contrast to the present study.²⁰ According to the study, estrogen deficiency decreases renal reabsorption of magnesium decreasing serum magnesium levels. It was shown in one of the study that serum calcium decreased, but in contrast to the present study ,serum magnesium increased in postmenopausal women when compared to premenopausal women.²¹ Also there was increased urinary calcium/ creatinine and urine magnesium/creatinine ratio.

Decrease in oestrogen causes decreased activity of osteoblasts and increased activity of osteoclasts causing demineralization and ultimately osteoporosis in postmenopausal women.^{22,23} In the present study, there was significant decrease in both serum calcium and magnesium levels in postmenopausal women. As a result of overall changes, postmenopausal women are more prone for fractures. This can be prevented by early interventional measures like calcium and magnesium supplementation,^{24,25} increased intake of diet rich in deficient nutrients and making related life style modifications. In a particular study, magnesium supplementation in postmenopausal women improved vitamin-D levels also.²⁶ So magnesium acts synergistically with vitamin-D, to improve overall bone health.

Conclusion

The present study revealed that serum calcium and magnesium were lower in postmenopausal women than in premenopausal women, which was proved to be with extreme statistical significance.

This study unravels the gross mineral deficiencies accompanying the so called physiological

transition of menopause and which can be implicated in debilitating health condition posing decreased work performance and general well-being in postmenopausal women. These deficiencies if neglected can lead to serious health hazards. This emphasizes the need for effective corrective measures, appropriately initiated so that it not only improves efficiency but also prevents otherwise on toward effects. Measures to Improve serum calcium and magnesium levels either through diet or medication in postmenopausal women improves their quality of life.

Much more large scale studies with increased sample size and in-depth studies if done increases the authenticity of the results. Increased awareness among the effected postmenopausal women may be of help in alleviating menopausal symptoms and preventing major health problems to some extent.

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