**ORIGINAL RESEARCH** 

# Serum calcium levels among the premenopausal and postmenopousal women: a crossectional study

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Received: 03 March, 2025

Accepted: 27 March, 2025

Published: 07 April, 2025

## ABSTRACT

**Background and objectives:** Calcium is one of the most essential micronutrients that plays a crucial role in maintaining the bone health. Deficiency of calcium and vitamin D3 results in increased risk of osteoporosis. Osteoporosis is the most common conditions affecting the bone health in women of reproductive age group and especially the postmenopausal women. Objectives of the present study were to estimate the serum calcium levels of premenopausal and postmenopausal women attending the OPD in Department of Dentistry and Gynaecology, Gulbarga Institute of Medical Sciences, to determine the difference in the serum calcium levels between pre and postmenopausal women. **Methods:** Total of 60 subjects who visited the OPD Department of Dentistry and out patient department of Gynaecology, were included in the study and were categorized in to two groups as group 1 and group 2 Premenopausal and Post-menopausal groups respectively, blood samples were collected from antecubital vein for assessment of serum calcium levels. **Results:** Results of the present study showed that there is decreased levels of serum calcium levels among the Group 2 i.e postmenopausal Group 8.025 mg/dl compared to Group 1 i.e premenopausal group 9.413 mg/dl. And this difference of serum calcium levels among the premenopausal women and post menopausal women is statistically significant with a p-value of 0.001. **Conclusion:** From the observations of the present study it can be concluded that there is significant difference in the serum calcium levels among the pre and post menopausal women.

Key words: Premenopausal women, postmenopausal women, serum calcium, osteoporosis.

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## INTRODUCTION

Calcium is one of the essential micronutrients that plays a crucial role in maintaining the bone health. It is the structural foundation of bone. Increasing evidence from the research demonstrates the strong association between nutrition bone health and joints.<sup>1</sup> Deficiency of calcium and vitamin D3 results in

increased risk of osteoporosis. It is defined as the disease characterized by low bone mass and microarchitectural disorientation resulting in increased bone fragility thus leading to increased risk of bone fractures.<sup>2</sup>

Bone is a dynamic connective tissue that undergoes, continuous remodelling. Many cells play important

role in this process of remodelling such as are osteoblasts, osteoclasts, osteocytes, etc. osteoclasts and osteoblasts are the principal cell types engaged in bone resorption and deposition. <sup>3</sup>

Skeletal mineralization and rate of bone turnover is maintained by various hormones.Estrogen plays an very important role in maintaining the bone homeostasis, but during postmenopausal period lack of estrogen production contributes to increased risk of osteoporosis.<sup>4</sup>

In addition estrogen also helps in enhancing the renal absorption of calcium which is again effected in postmenopausal women thus negatively effecting the bone mass and the calcium balance.<sup>5</sup>

Hence this study was undertaken to estimate the difference in the serum calcium levels of pre and postmenopausal women.

## MATERIALS AND METHODOLOGY

#### Inclusion criteria

- 1. Premenopausal women with age group of 25-45yrs
- 2. Postmenopausal women with age group of 45 60 yrs

#### **Exclusion criteria**

- 1. Subjects with underlying systemic diseases
- 2. Subjects on hormonal replacement therapy
- 3. Subjects with habitual history of tobacco use in any form
- 4. Subjects with long term use of any drugs that may affect the serum calcium levels.
- 5. Type Of Study: Crossectional study

#### Study design: Crossectional study

**Study location:** Gulbarga Institute Of Medical SciencesKalaburagi outpatient department of Dentistry and Obstetrics and Gynaecology.

## **Data Collection and Data collection tools**

After explaining the study details to the subjects, informed consent was taken from the study participants. Relevant data was collected by the questionnaire to obtain the demographic data and the medical history. Blood samples were collected from antecubital vein to estimate the serum calcium levels by using 2ml syringe and a tourniquet.All the data collected was subjected to statistical analysis by unpaired students 't' test. Ethical clearance was obtained from the Institutional Ethical committee.

**Study Period:** Duration of the study was for 3months from June 2024 to Augst 2024.

**Sample Size:** Total of 60 subjects were included in the study and categorized as Group A and Group B, Premenopausal and Postmenopausal group respectively.

**Mode Of Sample Selection**: Systemic random sampling method was followed for the sample selection.

## **CLINICAL PROCEDURE**

For the subjects visiting the outpatient department of Dentistry and Gynaecology GIMS Hospital kalaburgi, a detailed history was taken, after explaining the study details and obtaining the informed consent, venous blood samples for investigations were collected for estimation of serum calcium levels for all the subjects categorized as group 1 and group 2. respectively. Blood sample was collected in the plane vacutainer's and these collected samples were sent to Medical Research UnitGulbarga institute of medical sciences kalaburgi for the analysis.

Analysis for serum calcium was done by using ELISA kit CALCIUM (ARSENAZO) AGGAPPE. This kit works on the principle that at a neutral pH the Ca2+ form with Arsenazo III a complex, the colour intensity of which is directly proportional to the concentration of calcium in the sample. Reagent Preparation

## **Statistical Analysis**

To determine the serum calcium levels among the pre and post menopausal women all the data obtained was subjected to statistical analysis by using The Mann-Whitney U test.

The Mann-Whitney U test: It is a non-parametric statistical test used to compare two independent groups to determine if there is a significant difference between them. It's an alternative to the t-test when:

## RESULTS

A total number of 60 subjects, comprising of 30 premenopausal and 30 postmenopausal participated in this study. Subjects were classified into two groups based on their menopausal history as Premenopausal i.e. Group 1 and post-menopausal subjects as Group 2. The age group of the study participants ranged from 30 to 60 years. The mean age of the subjects in group 1 and group 2 were 33.9 yrs and 60.37 yrs respectively (Table 1 A , B) . Group 1 included the subjects less than 45 years of age and the group to included the study participants with age equal to or greater than 45 years.

Estimation of Serum calcium levels among the Group 1 showed that the mean serum calcium levels was 9.413 mg/dl with standard deviation of 0.369 and Std. Error Mean of 0.067.

Serum calcium levels among the Group 2 showed that the mean serum calcium levels was 8.025mg/dl among postmenopausal women. with standard deviation of 0.229 and Std. Error Mean of 0.041.

The statistical test used is non – parametric test: Mann-Whitney U Test.

Ho (Null hypothesis): It states that there is no difference in mean serum calcium level across the pre and post menopausal age group

Observations from the present study shows that p value is less than 0.05

Since p - value is less than 0.05, we reject the null hypothesis, therefore there is a significant difference in mean serum calcium level across the pre and post menopausal age group.

## TABLE 1.A AGE DISTRIBUTION

GROUPS	Age group	Frequency	Percent
<b>GROUP 1</b>	< 45 Years	30	50.0
<b>GROUP 2</b>	> or = 45 Years	30	50.0
	Total	60	100.0

## TABLE 1.B AGE DISTRIBUTION

GROUPS	Descriptive	Mean	Mode	Std. Deviation
GROUP 1	<45 Years	33.9 Years	30Years	5.53 Years
GROUP 2	> or $=$ 45 Years	60.37 Years	60 Years	8.46 Years

## TABLE 2

## SERUM CALCIUM LEVELS

SERUM CALCIUM LEVELS	Age group	Ν	Mean	Std. Deviation	Std. Error Mean
GROUP 1	< 45 Years	30	9.413	0.369	0.067
GROUP 2	> or $=$ 45 Years	30	8.025	0.229	0.041

#### STATISTICAL TESTS DONE

Independent-Samples Mann-Whitney U Test Summary		
Total N	60	
Mann-Whitney U	4.000	
Wilcoxon W	469.000	
Test Statistic	4.000	
Standard Error	67.505	
Standardized Test Statistic	-6.607	
P-Value	.0001	

## Independent-Samples Mann-Whitney U Test



# Age\_Group

## DISCUSSION

Calcium is the most important mineral content of human body and it is the fifth most abundant element that is essential for human life. Calcium plays a key role in maintaining various physiological process in human body such as contraction of muscles, transmission of nerve impulse, blood coagulation, and secretion of various hormones.

More than 99% of calcium is stored in skeletal system as hydroxyapatite and human skeletal system acts as the calcium reservoir and also helps in maintaining

the calcium homeostasis thus regulating the serum calcium within the normal range  $(8-10\text{mg}\cdot\text{dL})^6$ 

The recommended daily allowance (RDA) in adults is 1000–1200 mg/dl (249.5–299.4 mmol/l. serum calcium level is influenced by various factors such as diet, vitamin D deficiency, age, gender, sun exposure, chronic smoking, physical activity and also various hormones too paly a important role in maintain calcium homeostasis. the main hormones that are involved in calcium homeostasis are Vitamin D, Calcitonin, Parathyroid Hormone, and Estrogen.<sup>7</sup>

Deficiency of serum calcium results in the negative impact on bone health leading to increased risk of osteoporosis. osteoporosis is an increasing health concern associated with aging especially the postmenopausal women. With increase in the life expectancy and increasing old age population the prevalence of women diagnosed with osteoporosis is also increasing. evidence from studies conducted in small groups spread across the country, suggest that of the 230 million Indians expected to be over the age of 50 years in 2015, 20% are osteoporotic women.<sup>8</sup>

The pathophysiology for osteoporosis is the imbalance between osteoblastic bone formation and osteoclastic bone resorption activity .This osteoblast and osteoclastic activity in turn is regulated by various pathways, including molecular the RANK/RANKL/OPG signalling axis, cytokines, and integrins. Interleukin 1 plays a key role that is involved in bone resorption and osteoclastic activity. Estrogen in turn regulates the activity of estrogen.<sup>9</sup> Lack of estrogen production during postmenopausal phase of women thus has the additional affect on bone loss in addition to age related bone loss, thus increasing the risk of osteoporosis.

Results of the present study showed that there is decreased levels of serum calcium among the the group 2 i.e postmenopausal group 8.025 mg/dl compared to group 1 i.e premenopausal group 9.413 mg/dl. And this difference of serum calcium levels among the premenopausal women and post menopausal women is statistically significant. Both the values were within the normal reference range, but the difference was statistically significant with a p-value of 0.001.

Results of the present study are in agreement with the previous study by M Tabassum et all werein even they observed that serum calcium level was significantly higher in the premenopausal group than in the postmenopausal group.<sup>10</sup>

In another study by Chetana K Patwa et al it was observed that Mean serum calcium level in postmenopausal women  $(8.96\pm0.661)$  found lower than that in premenopausal women  $(9.49\pm0.63)$  and the difference was statistically significant.<sup>11</sup>

In a study by Parveen Shabir Kavathekar done to assess the serum calcium levels among the pre and post menopausal women it was observed that the mean serum calcium levels are significantly lower in post-menopausal women.<sup>12</sup>

However, results of another study by L.N. Achie et al, showed that a lower mean age at menopause, a higher BMI, a longer waist circumference for the postmenopausal subjects (which was significant) with lower mean serum calcium levels (that was not significant) as compared with their premenopausal subjects however these differences were not significant (p>0.05).<sup>13</sup>

In as cross-sectional study by Anita Kumari et al it was observed from the results of the study that Mean serum calcium was significantly decreased in postmenopausal women compared to premenopausal women.<sup>14</sup>

In another study by Megha Bhonde Bagade it was observed that the serum calcium levels among the postmenopausal women were significantly lower than the premenopausal women.<sup>15</sup>

Thus it could be inferred from the finding of our study that serum calcium levels among the postmenopausal women were significantly lower than the premenopausal women. Hence, we can recommend the calcium supplements in post menopausal women to improve the quality of life by improving the bone health and reducing the risk of osteoporosis and age related bony fracture.

However there are multiple factors that need to be considered in maintaining the bone health, that includes not just the calcium supplements but also the supplements to compensate for vitamin D deficiency and Hormonal replacement therapy to compensate for estrogen deficiency. Hence there is requirements of further studies with large sample size that not only considers the serum calcium but also the other parameters that play a role in maintaining the bone health.

## CONCLUSION

Results of the present study indicated that there was decreased serum calcium levels among the compared postmenopausal women to the premenopausal women. There was statically significant difference in the serum calcium levels among the two groups. Considering the observations from the present study we can recommend the calcium supplements in postmenopausal group that may help in reducing the osteoporosis, hence the risk of osteoporotic fractures in postmenopausal women.

## ACKNOWLEDGEMENT

Authors Acknowledge the Department of Health Research New Delhi India, for providing the facilities at Multidisciplinary Research Unit for the study and the statistician for the assistance.

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