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Evaluation of serum calcium, dietary intake and lifestyle factors in post-menopausal women

Divya Shashi Oraon[1], Dr.Virginia Paul[2], Dr.Anisha Verma[3]
[1] Research Scholar, Department of Food Nutrition and Public Health, Ethelind College of Home Science, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India
[2] Professor, Department of Food Nutrition and Public Health, Ethelind College of Home Science, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India
[3] Assistant Professor, Department of Food Nutrition and Public Health, Ethelind College of Home Science, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Abstract
In female, at the age of 40–50 years, the monthly menstrual cycle becomes irregular, ovulation fails to occur during many cycles, and ultimately, there is cessation of the cycle which is called menopause. Indian diets are predominantly vegetarian, and the contribution of dairy products to the overall calcium intake is minimal in the lower socioeconomic classes.
Aim: to assess the serum calcium, dietary calcium intake, life style factor and awareness among postmenopausal women aged more than 50-60 years.
Methods: total 32 postmenopausal women aged between 50-60 years were selected for the study, anthropometric measurement using BMI, lifestyle factor, Awareness, serum calcium was recorded and compared with NCBI (2010), and nutrient intake was taken and compared with RDA, ICMR (2010).
Statistical tools: Mean, frequency, percentage, standard deviation, T-test were applied.
Result: serum calcium level was significantly low in age of 56-60. Most of them were vegetarian, dietary calcium intake was poor among postmenopausal women with minimal physical activity. Only, 46.87 percent women were aware about calcium and 40.62 percent women had knowledge about source of calcium.
Conclusion: serum calcium level was significantly decreased in postmenopausal women aged 56-60 years than in women aged between 50-55 years of age. Poor dietary calcium intake and lack of knowledge increases the risk of osteoporosis among postmenopausal women.

Keywords: Postmenopausal women, serum Calcium, menopause, Calcium intake, Awareness

1. Introduction
Calcium ion is an essential structural component of the skeleton. There is growing evidence for the importance of nutrition in the maintenance of bones and joints health. Nutrition imbalance with endocrine abnormalities may be involved in osteoporosis [1]. Calcium deficiency can lead to exacerbate, mood problems such as irritability, anxiety, depression, sleep difficulties. If there is a calcium deficient diet, body starts using calcium from bones to ensure normal cell function, which ultimately leads to weakened bones or osteoporosis. Women are at greater risk than men of developing osteoporosis.
In female, at the age of 40–50 years, the monthly menstrual cycle becomes irregular, ovulation fails to occur during many cycles, and ultimately, there is cessation of the cycle which is called menopause. Indian diets are predominantly vegetarian, and the contribution of dairy products to the overall calcium intake is minimal in the lower socioeconomic classes.
This study was done with the objectives:
- To assess the serum calcium, dietary calcium intake and Lifestyle factors among postmenopausal women aged more than 50-60 years.
- To create awareness among post-menopausal women regarding calcium through developed education materials.

Methods and Materials
- **Unit of Study:** Total 32 post-menopausal women aged between 50-60 years were selected.
- **Development and description of the tool:** Random Sampling Method was used and structured interview schedule was developed.
- **Method of data collection:** Data regarding the respondent, background characteristics, personal, lifestyle habits and behaviors were collected by interview method. The collected data included details like age, occupational status, education level, socio economic status, and physical activity level. Biochemical, clinical and dietary assessment was done.
- **Criteria for Selection of Sample**

Inclusion criteria
The inclusion criteria for the present study were:
- Women who was willing to participate.
- Women who can understand and speak Hindi and English.
- Women of age between 50-60 years.

Exclusion criteria
The exclusion criteria for the present study were:
- Women who was critically ill.
- Women who was psychological ill.

- Women whose age was less than 50 and more than 60 years.
- Women who will not available when randomly selected.
- **3Anthropometric assessment-** BMI was calculated using formula weight (kg)/height (meter^2).
- **Clinical assessment:** Clinical sign & symptoms related to deficiency of calcium was assessed. Clinical assessment like fatigue, Palpitation, hot flushes, Bone & joint pain, Dysphagia, gag reflux, flatulence, weakness, headache, insomnia, Blurred vision, etc. was recorded.
- **Biochemical estimation:** Hemoglobin & Serum Calcium estimation was done comparing with standard reference given by WHO (2011) [2]. and NCBI bookshelf (2004) [3].
- **Dietary pattern:** Including 24 hrs dietary recall, food consumption frequency, dietary habbits**,** was noted down and compared with RDA, ICMR (2010) [4].
- **Statistical analysis:** Frequency and Mean, T-test, SD test was applied in the study.

Results and Discussions

Table 1: Distribution of respondents according to General Profile

S. No.	General Information		Frequency (N=32)	Percent
1.	Age (yrs.)	50-55	14	43.75
		56-60	18	56.25
2.	Family type	Nuclear	16	50
		Joint	16	50
3.	No. of family member	>5	16	50
		<5	16	50
4.	Education qualification	Illiterate	6	18.75
		High school	2	6.25
		Matric	14	43.75
		Intermediate	2	6.25
		Graduate	8	25
5.	Occupation	Unemployed	6	18.75
		Homemaker	20	62.5
		Farmer	1	3.12
		Shop owner	5	15.62
6.	Family SES (Socio economic Status)	Upper	3	9.37
		Upper middle	13	40.62
		Lower middle	12	37.5
		Upper lower	4	12.5
		Lower	0	0

Table 1 shows distribution of respondents according to general information. Out of total respondents, 43.75 percent women were aged between 50-55 years and 56.25 percent women were aged between 56-60 years.

Family type and Size: 50 percent were belong to nuclear family with less than 5 person and 50 percent were belong to joint family with more than 5 person (50%). Similar study conducted by NIN, ICMR (2011) [5]. concluded that milk and milk product are expensive commoditize, and amount purchased by the lower socioeconomic classes are likely to effect the intake of milk.

Education qualification: out of total respondents, 443.75 percent respondents were educated till matric, followed by 25 percent women were graduate, 18.75 percent women were illiterate and 6.25 percent women were educated till Intermediate.

Occupation: study reveals that majority of women (62.5%) were housewives and 18.75 percent were currently unemployed whereas, 16.62 percent women were working as shop owner and least of women i.e. 3.12 percent women were farmer.

Socioeconomic status: When compared with Kuppuswamy scale 2019 [6], it is found that most of them i.e. were upper middle socioeconomic group, followed by lower middle group i.e. 37.5 percent, 37.5 percent respondents were under lower middle income group, 12.5 percent women were from upper lower income group, 9.25 percent were belong to upper group and none of them were from lower socioeconomic group.

A study which was done by Wise [7]. also showed that adverse socio-economic conditions across the lifespan may be associated with an increased rate of entry of women into peri- menopause. Poor knowledge regarding DCI (OR: 6.083; 95% CI: 1.92‑19.30) and a low Kuppuswamy's socioeconomic status (SES) score for the family (OR: 3.77; 95% CI: 1.51‑9.38) were significantly associated with a low DCI. Other risk factors like age, employment, occupational status, and dietary habits were not significantly associated with a low DCI. Logistic regression analysis also revealed that a low knowledge score and a low SES score for the family (adjusted OR: 4.00; 95% CI: 1.32‑12.11) were significant risk factors after adjusting the other factors.

Table 2: Distribution of respondents according to Anthropometric measurements

S. No.	Anthropometric measurements	Mean
1.	Height (cm)	152.5
2.	Weight (kg)	65.8
3.	BMI (Kg/m^2)	29.2

Table 2 indicate the mean value of height and weight of post-menopausal women, where mean height (cm) was 152.5 and mean weight was 65.8 kg on that note, BMI was 29.2 kg/m^2.

Similar study shows that postmenopausal women has an increased tendency to gain weight due to withdrawal of

estrogen that brings changes in fat distribution, together with physical inactivity leads this major cause [8].

Table 3: Distribution of the respondents according to weight.

S.No.	Weight	Mean n (%)
1.	Normal	3(9.37%)
2.	Overweight	16(50%)
3.	Obesity Grade I	12(37.5%)
4.	Obesity Grade II	1(3.12 %)

Table 3 shows the distribution of the respondents according to weight. The data revealed that 50 per cent women were overweight, followed by 37.5 per cent of the women were in the category grade I obesity, 9.37 per cent had normal weight and 3.12 per cent were Grade II obese. Similar study shows that postmenopausal status is associated with higher prevalence of obesity, as 44 percent of postmenopausal women are overweight among whom 23 percent are obese [9].

Table 4: Mean serum Calcium level of the selected respondents

S.No.	Particulars	Mean calcium level	S.D
1.	50-55 years (14)	8.1±5.6	6.30
2.	56-60 years (18)	7.8±7.3	6.85

Table 4 shows the mean calcium level of the selected respondents, where, mean serum calcium was significantly decreased in postmenopausal women aged 56-60 years as Compared to that premenopausal women. Aged between 50-55 years.

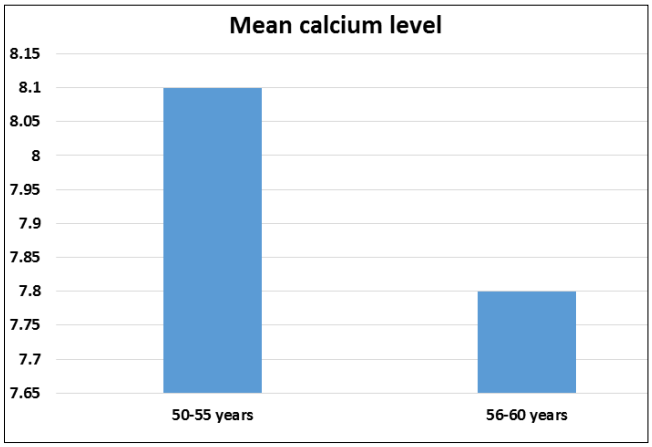

Fig 1: Serum calcium among respondents

Figure 1 shows the mean serum calcium of the respondents. The graph shows significant decrease in calcium level in age group 56-60 years as compared to age group 50-55 years. A study was conducted in Jharkhand where a total of 100 patients from obstetrics and gynaecology, medicine, and orthopaedic outpatient department were enrolled in the study. Of 100, 42 were premenopausal and 48 were postmenopausal women. Mean serum calcium was significantly decreased in postmenopausal compared to that premenopausal [10].

Table 5: Distribution of respondents according to the lifestyle factors

S. No.	Particulars		Mean (%)
1.	Nature of work	Sedentary	32(100)
2.	Physical activity	Walking	16 (50)
		Yoga	10(31.25)
		Light exercise	6 (18.75)
3.	Sleeping time	4 hours	13(40.62)
		5 hours	10(31.25)
		6 hours	7(21.8)
		7 hours	3(9.37)
4.	Means of Communication	Walking	10 (31.25)
		Public Transport	20 (62.5)
		Own Vehicle	2 (6.25)
5.	Suffering from any disease	Yes	30 (93.75)
		No	2 (6.25)
	Symptoms	Fatigue	18 (56.25)
		Drowsiness	14(43.75)
		Joint pain	12 (37.5)
		Palpitation	4(12.5)
		Hot flashes	8(25)
		Headache	7 (21.8)
		insomnia	0 (0)
		Blurred vision	19 (59.37)
7.	Menopause status	Menopause transition	13 (40.62)
8.	Diseases	Early menopause	12 (37.5)
		Late menopause	7 (21.8)
		Diabetes	29 (93.75)
		Hypertension	27 (84.37)
		Heart Disease	15 (46.87)
		Arthritis	2 (6.25)
		Osteoporosis	5 (15.62)
		Thyroid	2 (6.25)
		Any other	1 (3.12)
9.	Medication if any	Yes	30 (68.75)
		no	2 (6.25)
10.	Surgery if any	Yes	5 (15.6)
		No	27 (84.37)

Table 5 showed the life style factor adopted by postmenopausal women. Out of total respondents, 100 percent women were having sedentary lifestyle.

Physical activity: Out of total respondents, 50 percent women preferred walking as physical activity followed by Yoga (31.25%) and light exercise (18.75 %).Multiple studies showed that poor dietary calcium intake along with low physical activity is the two major risk determinant for osteoporosis and fracture [11, 12, 13] (LeBoff *et al.* 1998, Wickham *et al*. 1988, Chan, 1996).

Sleeping time: Out of total respondents, 40.62 percent women were sleep for 4 hours, 31 percent respondents were sleeping for 5 hours, 21.8 percent women were sleeping for 6 hours and 9.37 percent women were sleeping 7 hours in a day.

Means of communication: Out of total respondents, 62.5 percent women preferred public transport as means of communication followed by 31.25 percent women preferred walking and only 6.25 percent women were using own vehicle.

Disease status and Sign symptoms: Out of total respondents, most of the women i.e. 68.75 suffering from various disease, Postmenopausal women may shows some symptoms due to less physical activity and diseases, most of respondents i.e. 56.25 percent women were showing sign of fatigue, 43.75 percent were feeling drowsiness, 37.5 percent were having Joint pain, 12.5percent were showing Palpitation, 25 percent women were showing hot flashes and 21.8 percent women felt headache. Similar study was conducted in Pune showed a loss of interest in 93 percent women faced pressure in head/ headache, weight gain (in 67 % women) and hot flushes in 54 percent women [14]. (Bagga *et al*. 2004).

Menopause status: Out of total respondents, 40 per cent women were in menopause transition, 37.5 per cent were in early menopause and 21.8 per cent women were in late post menopause.

Diseases: Out of total respondents**,** most of them were suffering from diseases like Diabetes (93.75 %), hypertension (84.37 %), heart disease (46.87 %), osteoporosis (15.6 %), arthritis, thyroid (6.25 %) and any other (3.12). According to American Heart Association**,** while decline in estrogen due to menopause may increase the risk of cardiovascular disease. Due to disease, 68.75 percent respondents were taking medications of different diseases.

Medication: Out of total, 68.75 percent women were taking medicine for different diseases and only 6.25 percent women were not taking any kind of medicine.

History of surgery: Out of total, 15.6 percent respondents were having history of surgery, rest of the 84.37 percent women have not gone through any kind of surgery.

Table 6: Distribution of respondents according to Knowledge regarding Calcium

S. No.	Knowledge/Awareness status	Mean (N=32)	Percent
1.	Knowledge about calcium	15	46.87
2.	Knowledge about importance of calcium	6	18.75
3.	Basic knowledge about risk factors of calcium deficiency	3	9.37
4.	Important effects of calcium	3	9.37
5.	Knowledge about sources of calcium	13	40.62

Table 6 describes the knowledge/awareness level among post-menopausal women**.** The above table shows that there is immense lack of knowledge/Awareness among women of postmenopausal age. Out of total only 46.87 percent women have knowledge about calcium and 40.62 percent women knows the sources of calcium but only 18.75 percent women have some knowledge about the importance of calcium, and only 9.37 percent women knows basic knowledge about risk factors of calcium deficiency and important effects of calcium. Another study reveal that Health education on the importance of calcium intake in diet and knowledge on calcium rich dietary sources would go a long way in improving the current scenario as those with poor knowledge, and low socioeconomic status was 4–5 time higher risk for consuming low calcium in their diet when compare to other [15].

Table 7: Distribution of respondents according to dietary assessment

S. No.	Dietary assessment		Frequency (N=32)	Percent
1.	Type of Diet	Vegetarian	28	87.5
		Non- vegetarian	02	6.25
		Ovo-vegetarian	02	6.25
2.	Meals per day	2 Meals	06	18.75
		3 Meals	15	46.8
		4 Meals	11	34.37
3.	Salt consumption	>5 gm / day	15	46.87
		< 5 gm/day	17	53.12

Type of Diet: where most of the women were following vegetarian diet (87.5 %) followed by non-vegetarian and ovo-vegetarian diet (6.25 %). Similar study reveal that Indian diets are predominantly vegetarian, and the contribution of dairy products to the overall calcium intake is minimal in the lower socioeconomic classes [16].

Frequency of meals: out of total respondents, 46.8 per cent women had 3 meals a day and 34.37 per cent women had 4 meals a day, 18.75 percent women had only 2 meals per day.

Salt Consumption: Salt consumption was recorded of postmenopausal women and it was found that 53.12 percent women had more than 5 gm salt per day whereas, 46.87 percent women were observed to intake salt less than 5 gm/day.

Table 8: Mean Daily Nutrient Intake

Nutrient Intake	RDA (2010)	Intake	Difference	t-value	t-tab	Result
Energy (Kcal)	1900	2010	+110	5.27	2.776	S
Protein (g/d)	55	42	-13	0.08	2.776	NS
Fat (g/d)	20	30	+10	2.81	2.776	S
Carbohydrate*	261	310	+49	3.45	2.776	S
Calcium (mg/d)	600	422	-178	1.57	2.776	NS
Iron (mg/d)	21	18	-3	0.01	2.776	NS

*****Approximate value ICMR (2010)

Table 8 shows the mean daily nutrient intake where, intake of protein, calcium and iron was deficit whereas the consumption of fat and carbohydrate and hence overall energy consumption was high and inconsistent which led to the obesity among post- menopausal women. The majority of women (74.5%) studied, both in our study and in similar studies conducted in India, had a poor intake of calcium in their diet and are therefore, at an increased risk for these conditions. Though calcium supplementation in elderly postmenopausal women has proven benefits for bone density, only 11 women (10.4%) were taking calcium supplements [17].

Conclusion

On the basis of the result of the present study, it is concluded that serum calcium level was significantly decreased in postmenopausal women aged 56-60 years than in women aged between 50-55 years of age with lack of physical activity. Absence of knowledge and practice have been noticed which significantly results in poor intake of dietary calcium. It can be recommended that calcium supplementation can be given as a prophylaxis to prevent the long-term bone loss and to decrease the risk of fracture and osteoporosis in postmenopausal.

Recommendation

- Women health education regarding calcium-rich diet must be given to postmenopausal women, especially those from low socioeconomic status.
- Dietary calcium should be take included in diet on daily basis.
- Supplementation of calcium is needed.

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