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A study evaluating the Vitamin D status in women of reproductive age group and postmenopausal women in a tertiary health care center in Dakshina Kannada District

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Abstract:

Background: Vitamin D is essential for bone health and the regulation of calcium and phosphorus metabolism. Despite its significance, vitamin D deficiency is prevalent globally, especially among women of reproductive age and postmenopausal women. In India, despite abundant sunlight, there is a high prevalence of vitamin D deficiency, attributed to limited sun exposure, cultural practices, and insufficient dietary intake.**Objectives; T**o determining the prevalence of vitamin D status and deficiency among women of reproductive age and postmenopausal women attending a tertiary health care center.

Methods: A prospective cross-sectional study involving 300 women (140 reproductive age and 160 postmenopausal) was conducted at the Department of Obstetrics and Gynecology, Tertiary Health Centre, Dakshina Kannada, over one year. Subjects were selected via convenient sampling. Inclusion criteria included reproductive age (20-45 years) and postmenopausal women (45-75 years). Exclusion criteria were women on vitamin D or calcium supplementation, those with malabsorption syndromes, inflammatory bowel disease, chronic diseases, or on medications affecting vitamin D metabolism. Serum 25-hydroxyvitamin D levels were measured, with deficiency defined as <10 ng/ml, insufficiency as 10-29 ng/ml, and normal levels as ≥30 ng/ml. Data were analyzed using SPSS version 22, employing chi-square tests for qualitative data and independent t-tests and Mann-Whitney U tests for quantitative data. A p-value <0.05 was considered statistically significant.

Results: The mean vitamin D3 levels were significantly lower in the reproductive age group (19.58 ± 11.26 IU/ml) compared to the postmenopausal group (23.22 ± 14.79 IU/ml) (P = 0.018). Despite this, 15% of reproductive age women and 11.3% of postmenopausal women were vitamin D deficient, while 71.4% and 71.1%, respectively, were insufficient. There was no significant difference in deficiency and insufficiency rates between the two groups.

Conclusion: Vitamin D levels were significantly lower in the reproductive age group, but both groups exhibited high rates of deficiency and insufficiency. These findings highlight the need for targeted public health strategies, including supplementation, dietary modifications, and lifestyle changes to improve vitamin D status among women.

Keywords: Vitamin D deficiency, reproductive age women, postmenopausal women

INTRODUCTION:

Vitamin D is a crucial nutrient essential for the maintenance of bone health and the regulation of calcium and phosphorus metabolism in the human body. Despite its significance, vitamin D deficiency is a widespread issue affecting diverse populations worldwide. Women, particularly those of reproductive age and postmenopausal women, are at increased risk for vitamin D deficiency due to various physiological and lifestyle factors.

Vitamin D deficiency in women of reproductive age can lead to several adverse health outcomes, including osteoporosis, increased risk of fractures, and potential complications during pregnancy, such as preeclampsia, gestational diabetes, and low birth weight in infants (1,2). Postmenopausal women are particularly vulnerable to vitamin D deficiency due to the decline in estrogen levels, which affects calcium absorption and bone mineral density, further exacerbating the risk of osteoporosis and fractures (3,4).

India, despite its abundant sunlight, has a high prevalence of vitamin D deficiency among its population. Factors contributing to this paradox include limited sun exposure due to cultural practices, clothing habits, indoor lifestyle, and increased urbanization (5). Furthermore, dietary intake of vitamin D is often insufficient, and there is a lack of awareness about the importance of vitamin D supplementation (6).

Previous studies conducted in various regions of India have reported a high prevalence of vitamin D deficiency among women. A study conducted in North India found that 76% of pregnant women and 81% of their newborns had vitamin D deficiency (7). Another study in South India reported that 70% of urban women and 58% of rural women had insufficient vitamin D levels (8). However, there is a paucity of data specifically focusing on the vitamin D status of women in Dakshina Kannada District, which underscores the need for region-specific research.

This study aims to fill this gap by evaluating the vitamin D status of women of reproductive age and postmenopausal women attending a tertiary health care center in Dakshina Kannada District. The objectives of the study was to determine the Vitamin D status and prevalence of vitamin D deficiency among reproductive and postmenopausal women attending the tertiary health care centre.

The findings of this study are expected to contribute to the existing body of knowledge and aid in the formulation of targeted public health strategies to address vitamin D deficiency among women. Improved understanding and management of vitamin D status in these demographic groups can have significant implications for the prevention of bone-related disorders and enhancement of overall health and well-being.

MATERIAL AND METHODS:

This is a prospectivecross-sectional study involving 300 women of which 140 women were in the reproductive age group (i.e. menstruatingwomen)and160 women were postmenopausal (i.e. cessation of menstruation for at least one year). Study was conducted in theDepartment of Obstetrics and Gynecology at a Tertiary Health centreinDakshina Kannada**,** for a period of 1 year. Subjects were selected by Convenient sampling method. **Inclusion criteria**:Reproductive age group (20 to 45 years who are still menstruating) and Postmenopausal women (45 to 75 years who have stopped menstruating for at least 1 year).

Exclusion criteria: Women on vitamin D supplementation, Women on calcium supplementation, Malabsorption syndrome and inflammatory bowel disease, Women on drugs which affect vitamin d absorption or metabolism like ketoconazole, isoniazid, phenytoin and rifampicin, Chronic diseases, History of thyroid or parathyroid disorders, those with metabolic bone diseases and Diagnosed with cancer.

Informed consent was obtained from all the subjects prior to the start of study. Institutional ethical clearance was obtained. A structured questionnaire was used to obtain data from the subjects. All the women were evaluated for serum levels of 25 Hydroxyvitamin D (25 – OHD) by collecting their blood samples. The blood samples underwent centrifugation for 3000 rpm before analyzing the Vitamin D levels. Vitamin D levels > 30ng/ml was considered to be normal. Levels between 10ng/ml to 29ng/ml was considered as Vitamin D insufficiency and levels <10ng/ml was considered as Vitamin D deficiency.

Statistical analysis: Data was analyzed using SPSS version 22 (IBM SPSS Statistics, Somers NY, USA) software. Categorical data was represented in the form of Frequencies and proportions. Chi-square test was used as test of significance for qualitative data. Continuous data was represented as mean and standard deviation. Normality of the continuous data, was tested by Kolmogorov–Smirnov test and the Shapiro–Wilk test. Independent t test was used as test of significance to identify the mean difference between two quantitative variables. Mann Whitney U test was used for Non-parametric data between two groups. p value of <0.05 was considered as statistically significant.(9,10).

RESULTS:

In the present study 140 women in the reproductive age group and 160 women in postmenopausal age group were studied. Mean age of subjects in Reproductive Age group was 37.49 ± 5.60 years [Range 23 - 47 years] and in post-menopausal group was 55.55 ± 6.25 years [Range 46 to 80 years]. There was significant difference in mean age between Reproductive Age group and Post menopause group.

Table 1: Vitamin D levels comparison between two groups

		Vitamin D3					P value
		Mean	SD	Minimum	Median	Maximum	
Group	Reproductive Age	19.58	11.26	4.5	16.7	61.8	0.018*
	Post menopause	23.22	14.79	3.2	19.8	82.7	
	Total	21.51	13.36	3.2	19.0	82.7	

Mann Whitney U test

Mean Vitamin D3 levels among subjects in Reproductive Age was 19.58 ± 11.26 [Median – 16.7, Range 4.5 to 61.8 IU/ml] and Post menopause group was 23.22 ± 14.79 [Median – 19.8, Range 3.2 to 82.7 IU/ml]. Mean Vitamin D3 levels was significantly lower in Reproductive Age compared to Post menopause women. There was significant difference in mean vitamin D levels between two groups [Table 1].

Table 2: Vitamin D Deficiency comparison between two groups

		Group						P value
		Reproductive Age		Post menopause		Total		
		Count	%	Count	%	Count	%	
Vitamin D Classification	Deficient	21	15.0%	18	11.3%	39	13.0%	0.462
	Insufficiency	100	71.4%	113	71.1%	213	71.2%	
	Normal	19	13.6%	28	17.6%	47	15.7%	
	Total	140	100.0%	159	100.0%	299	100.0%	

Pearson Chi-Square Tests

In the study among subjects in Reproductive Age group, 15% had deficiency, 71.4% had insufficiency and 13.6% had normal vitamin D levels and in Post-menopausal group, 11.3% had deficiency, 71.1% had insufficiency and 17.6% had normal vitamin D levels. There was no significant difference in Vitamin D levels between two groups [Table 2].

DISCUSSION:

The study aimed to compare vitamin D levels between women in the reproductive age group and postmenopausal women. The findings revealed that the mean vitamin D3 levels were significantly lower in the reproductive age group compared to postmenopausal women (19.58 ± 11.26 IU/ml vs. 23.22 ± 14.79 IU/ml, respectively; P = 0.018). This significant difference aligns with existing literature, although it adds a unique perspective by highlighting the variations within a specific population sample.

Holick et al. found that vitamin D deficiency is prevalent across various age groups but noted a higher prevalence among women of reproductive age due to factors such as lower sun exposure and dietary intake during childbearing years (11). Similarly, Yetley emphasized that postmenopausal women generally have higher vitamin D levels owing to increased supplementation and medical guidance aimed at preventing osteoporosis (12). Hirsch et al. observed similar trends, reporting lower vitamin D levels in premenopausal women compared to postmenopausal women, attributing this to hormonal differences that affect vitamin D metabolism (13).

Looker et al. discussed the impact of lifestyle and dietary habits on vitamin D status, noting that reproductive age women often have lower vitamin D levels due to lesser engagement in outdoor activities and lower intake of fortified foods (14). Chapuy et al. demonstrated that older women often have higher vitamin D levels due to proactive health measures like vitamin supplementation, which is less common among younger women (15). Nair and Maseeh reinforced the notion that vitamin D deficiency is a global health issue but highlighted that age-

related factors significantly influence serum levels, with older women more likely to take preventive measures against deficiency (16).

Lips reviewed several studies and concluded that postmenopausal women are more likely to have higher vitamin D levels due to better health awareness and regular screening practices for bone health (17). Dawson-Hughes et al. focused on the dietary habits of different age groups and found that younger women often do not meet the recommended dietary intake of vitamin D, contributing to lower serum levels compared to their older counterparts (18). Cashman et al. studied the seasonal variation in vitamin D levels and found that reproductive age women are less likely to maintain adequate levels during winter months, whereas older women often use supplements to mitigate this effect (19). Bouillon discussed the endocrine functions of vitamin D and noted that hormonal changes during menopause might increase the efficiency of vitamin D utilization, potentially explaining higher levels in postmenopausal women (20).

Despite the significant difference in mean vitamin D3 levels, the classification of vitamin D deficiency, insufficiency, and normal levels showed no significant difference between the two groups ($P = 0.462$). Specifically, 15% of reproductive age women were deficient compared to 11.3% of postmenopausal women. Both groups had similar rates of insufficiency (71.4% and 71.1%, respectively), and a slightly higher percentage of postmenopausal women had normal levels (17.6% vs. 13.6%). This finding contrasts with several studies, such as those by Holick et al. and Looker et al., who reported higher rates of deficiency in younger women (11,14). However, it aligns with Lips, who suggested that when controlled for lifestyle factors, the differences in deficiency rates might not be significant (17).

Menopause is known to be a factor for vitamin D insufficiency or deficiency as seen in the postmenopausal study group. An interesting observation in this study is that women in the reproductive age group are also equally affected by vitamin D deficiency or insufficiency, probably due to poor dietary intake, not taking calcium supplements regularly during pregnancy and lactation, or sedentary lifestyle requiring supplementation and treatment of deficiency or insufficiency. The study underscores the importance of monitoring vitamin D levels across different age groups. The higher mean levels in postmenopausal women reflect the impact of age-related health practices and hormonal changes on vitamin D metabolism. Future interventions should focus on improving vitamin D status among younger women through enhanced dietary guidance and increased awareness of supplementation benefits.

CONCLUSION:

The study compared Vitamin D levels between women in the reproductive age group and postmenopausal women, finding significantly lower levels in the reproductive group. Despite this, both groups exhibited similar rates of Vitamin D deficiency and insufficiency. These results highlight the widespread prevalence of Vitamin D insufficiency among women, regardless of age, and underscore the need for targeted public health interventions. Emphasis should be placed on Vitamin D supplementation, dietary modifications, and lifestyle changes to improve Vitamin D levels and enhance health outcomes for women across all age groups.

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