

The Effectiveness of Self-Instructional Module on Knowledge Regarding Vitamin D Deficiency Among Women in Selected Institutions, Bangalore

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Abstract

Background and Purpose of the Study: Vitamin D deficiency is a widespread but often overlooked global health concern, affecting more than one billion individuals worldwide. Insufficient levels of vitamin D have been linked to an elevated risk of developing various chronic illnesses. **Objectives:** The primary aim of this study was to assess women's baseline knowledge about vitamin D deficiency. It also sought to evaluate the effectiveness of a self-instructional module (SIM) in enhancing their knowledge by comparing the average pre-test and post-test scores. Additionally, the study examined whether there was any association between pre-test knowledge levels and selected socio-demographic variables. **Methods:** This quantitative research employed a pre-experimental, one-group pre-test post-test design, involving 60 women. Participants were selected using a non-probability convenience sampling technique. A structured knowledge questionnaire was used to gather data, and participants were provided with a self-instructional module on vitamin D deficiency. **Results:** The analysis showed that 73.3% of participants had inadequate knowledge in the pre-test. However, following the intervention, 90% demonstrated adequate knowledge in the post-test, indicating a substantial improvement. No significant association was found between pre-test knowledge scores and the socio-demographic variables examined. **Conclusion:** The findings suggest that the self-instructional module was effective in improving knowledge among women about vitamin D deficiency. A significant difference was observed between the pre-test and post-test knowledge scores, highlighting the usefulness of educational interventions in increasing awareness.

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INTRODUCTION

Maintaining a healthy lifestyle and consuming a balanced, nutrient-rich diet plays a vital role in promoting good health throughout an individual's life. Malnutrition, resulting from insufficient intake of calories, proteins, vitamins, and minerals, along with poor health conditions and low socio-economic status, continues to impact millions of women and adolescent girls globally. Health is a crucial factor that contributes significantly to overall well-being and economic progress, and it is especially important for women to sustain good health. Vitamin D deficiency is one of the most prevalent nutritional issues in India, often going

unnoticed and untreated. This deficiency affects individuals regardless of age, gender, race, or geographical location. Commonly referred to as the "sunshine vitamin", vitamin D is synthesized in the skin in response to sunlight and can also be obtained through food and supplements. Although classified as a vitamin, it functions more like a hormone in the body. Vitamin D is essential for bone and dental health, supports immune and nervous system function, aids in insulin regulation and diabetes management, and plays a role in cardiovascular and respiratory health. It also affects gene expression related to cancer development [1].

There is growing evidence linking low vitamin D levels to a range of non-skeletal health conditions, which may have far-reaching health consequences. Contributing factors to vitamin D deficiency include darker skin pigmentation, residence in higher latitudes, overuse of sunscreen, cultural clothing practices that limit sun exposure, sedentary lifestyle, staying indoors frequently, obesity, aging, chronic illnesses, air pollution, and genetic predisposition. The presence of vitamin D receptors in various tissues highlights its importance beyond just bone health [2].

In India, vitamin D deficiency has reached alarming levels. Recent research suggests that approximately 65–70% of the population is deficient, with an additional 15% having insufficient levels. A study involving 1,052 women visiting a clinic assessed their vitamin D status. The deficiency rate was 65.51% among women under 30 years and 61.83% among those over 30. Additionally, 89.92% of illiterate women were found to be deficient, compared to 43.9% of literate women. The condition was more prevalent among housewives (70%) compared to working women (40.56%), and among rural women (69.94%) compared to those with a monthly income of ₹10,000, where the prevalence was 61.96% [3].

Assessing the widespread prevalence of vitamin D deficiency in India is crucial, and it is imperative that both public and private healthcare sectors collaborate effectively to tackle this issue. There is a pressing need to implement educational initiatives that enhance public awareness about the consequences and prevention of vitamin D deficiency. To address this growing concern, vitamin D supplements should be made easily accessible, affordable, and convenient for the general population [4].

Furthermore, national public health strategies should focus on the fortification of commonly consumed foods such as milk, cooking oil, infant formulas, and breakfast cereals with vitamin D. Promoting daily exposure to sunlight, ideally at least 30 min of physical activity in the sun, should be encouraged as a preventive measure.

The primary aim of this study is to evaluate the effectiveness of a self-instructional module in enhancing women's knowledge about vitamin D deficiency [5].

MATERIALS AND METHODS

Study Design

The research design used for the present study is one group pretest-post-test design.

Subjects

The purposive sample of 60 elderly subjects were taken from selected institutions, Bangalore. Women who are willing to participate in the study, able to read and write English and available during the period of data collection are eligible for study. Participants who are above 60 years of age group, have attended awareness program regarding vitamin D deficiency within 6 months and are undergoing treatment for vitamin D deficiency were excluded.

Data Collection Procedure

Data collection was carried out in selected institutions located in Bangalore. Participants were chosen based on predefined inclusion criteria, with a total of 60 individuals included in the study. Informed

consent was obtained from each participant before initiating the research process. On the first day, a pre-test was administered, followed by the distribution of the self-instructional module. The post-test was conducted on the 8th day to evaluate the effectiveness of the intervention.

The tool was organized into two parts:

1. *Part-I*: Socio-demographic proforma.
2. *Part-II*: Structured knowledge questionnaire.

Part I: Socio-Demographic Proforma

This section consisted of 10 items such as age, religion, marital status, place of residence, educational qualification, monthly income in rupees, diet, duration of exposure to sunlight, usage of sunscreen, and previous information regarding vitamin D deficiency.

Part-II: Structured Knowledge Questionnaire

A structured knowledge questionnaire was developed based on a comprehensive review of existing literature and inputs from subject matter experts, with the goal of assessing women's knowledge concerning vitamin D deficiency. The tool comprised 34 multiple-choice questions categorized into three key domains.

- *Section A*: Included 10 questions covering the introduction and essential functions of vitamin D.
- *Section B*: Consisted of 7 questions focusing on the definition, causes, and pathophysiology.
- *Section C*: Contained 17 questions addressing the management and prevention of vitamin D deficiency.

Each question had four answer options: one correct and three distractors. A score of 1 was awarded for each correct answer, and 0 for incorrect ones. The maximum achievable score was 34.

RESULTS

Analysis is organized under the following headings.

- *Section I*: Description of socio demographic variables in frequency and percentage.
- *Section II*: Analysis and interpretation of overall and aspect wise Pretest knowledge scores of women regarding vitamin D deficiency.
- *Section III*: Analysis and interpretation of overall and aspect wise Post-test knowledge scores of women regarding vitamin D deficiency.
- *Section IV*: Analysis and interpretation of effectiveness of SIM by comparing mean pretest and post-test knowledge scores regarding vitamin D deficiency among women.
- *Section V*: Analysis and interpretation of association between the mean pretest knowledge scores of women regarding vitamin D deficiency with selected socio-demographic variables.

Section I: Description of Socio Demographic Variables in Frequency and Percentage

Table 1 shows that the majority of women (18 (30%)) were in the age group of 41–50 years, 17 (28.3%) were from the age group of 31–40 years, followed by 15 (25.0%) of 21–30 years, and remaining 10 (16.7%) in the age group of 51–60 years; majority of women (43 out of 60, 71.7%) were Christians. Around 75% (45 out of 60) of the participants were married. Majority of women (71.7% (43 out of 60)) were from urban areas. Majority of the subjects (56.7% (34 out of 60)) had completed Bachelor's degree. Among all the participants, 48.3% (29 out of 60) had mixed diet, whereas 46.67% (28 out of 60) of the subjects never used sunscreen lotions. More than half of the population (83.3% (50 out of 60)) had no previous knowledge.

Section II: Analysis and Interpretation of Overall and Aspect wise Pretest Knowledge Scores of Women Regarding Vitamin D Deficiency

Table 2 and Figure 1 shows the aspect wise mean pre-test knowledge scores of women regarding vitamin D deficiency. It is evidenced that the subjects have high knowledge scores on the aspect of

General information regarding vitamin D and its functions with a mean percentage score of 56.83% with a standard deviation of 21.35%. It was further followed by the aspect of definition, causes, pathophysiology, clinical manifestation with the mean percentage score of 42.61% and a standard deviation of 20.79%, and in the aspect of diagnostic findings, complications, management and prevention with a mean percentage score of 38.43% and a standard deviation of 11.22%.

Table 1. Sociodemographic characteristics of the study participants (N=60).

Variable	Category	Frequency (n)	Percentage (%)
Age group (in years)	21–30	15	25.0
	31–40	17	28.3
	41–50	18	30.0
	51–60	10	16.7
Religion	Christian	43	71.7
	Other	17	28.3
Marital status	Married	45	75.0
	Unmarried	15	25.0
Area of residence	Urban	43	71.7
	Rural	17	28.3
Educational qualification	Bachelor's Degree	34	56.7
	Other	26	43.3
Type of diet	Mixed Diet	29	48.3
	Vegetarian/Other	31	51.7
Use of sunscreen lotion	Never Used	28	46.7
	Used (sometimes/regularly)	32	53.3
Previous knowledge (on topic)	No	50	83.3
	Yes	10	16.7

Table 2. Aspect-wise mean pre-test knowledge scores of women regarding vitamin D deficiency (N=60).

S.N.	Knowledge Aspect	Mean (%)	Standard Deviation (\pm SD)
1	General Information Regarding Vitamin D and Its Function	56.83	21.35
2	Definition, Causes, Pathophysiology, and Clinical Manifestations	42.61	20.79
3	Diagnostic Findings, Complications, Management, and Prevention	38.43	11.22

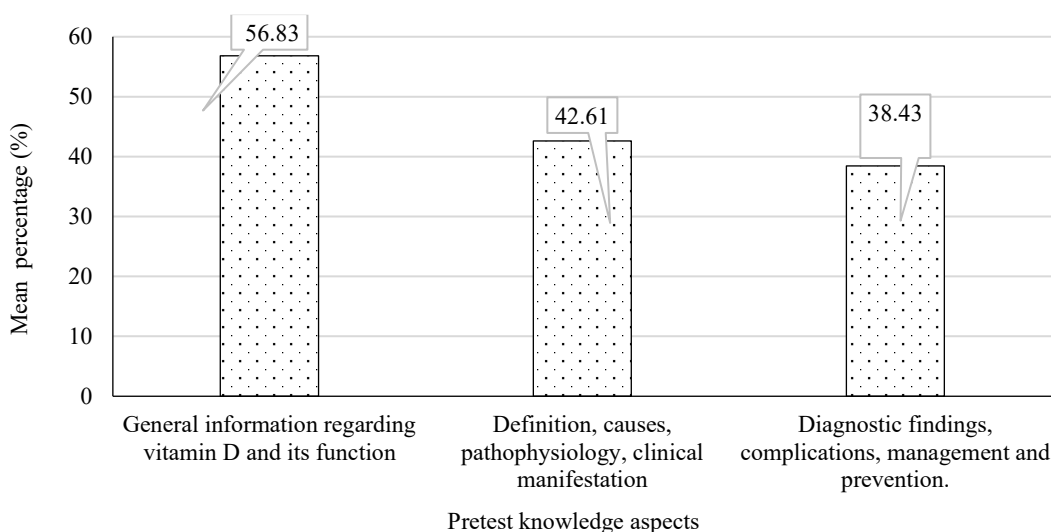


Figure 1. Aspect wise pre-test mean knowledge scores of respondents on vitamin D deficiency.

Section III: Analysis and Interpretation of Overall and Aspect Wise Post-test Knowledge Scores of Women Regarding Vitamin D Deficiency

Table 3 and Figure 2 present the domain-wise post-test mean knowledge scores of participants concerning vitamin D deficiency. The findings indicate that participants achieved the highest post-test scores in the area of general information about vitamin D deficiency, with a mean percentage of 90.16% and a standard deviation (SD) of 13.59%.

This was closely followed by the domain covering definition, causes, pathophysiology, and clinical manifestations, which had a mean percentage score of 89.76% and an SD of 16.6%. The lowest mean score was observed in the area of diagnostic findings, complications, management, and prevention, with a mean percentage of 88.6% and a standard deviation of 9.85%.

Overall, the post-test results clearly demonstrate that participants gained adequate knowledge across all assessed areas following the self-instructional module, highlighting its effectiveness in enhancing awareness about vitamin D deficiency.

Section IV: Evaluation of the Effectiveness of the Self-Instructional Module (SIM) by Comparing Mean Pre-Test and Post-test Knowledge Scores on Vitamin D Deficiency Among Women

Table 4 presents the comparison between the pre-test and post-test mean knowledge scores of the participants. The analysis reveals that the mean post-test score was 30.37, whereas the mean pre-test score stood at 15.2. A paired 't' test was conducted to assess the statistical significance of the difference in scores. The calculated 't' value was 22.34, which is statistically significant at the 0.05 level, with 59 degrees of freedom.

Table 3. Domain-wise post-test mean knowledge scores of participants on vitamin D deficiency (N=60).

S.N.	Knowledge Domain	Mean (%)	Standard Deviation (±SD)
1	General Information about Vitamin D Deficiency	90.16	13.59
2	Definition, Causes, Pathophysiology, and Clinical Manifestations	89.76	16.60
3	Diagnostic Findings, Complications, Management, and Prevention	88.60	9.85

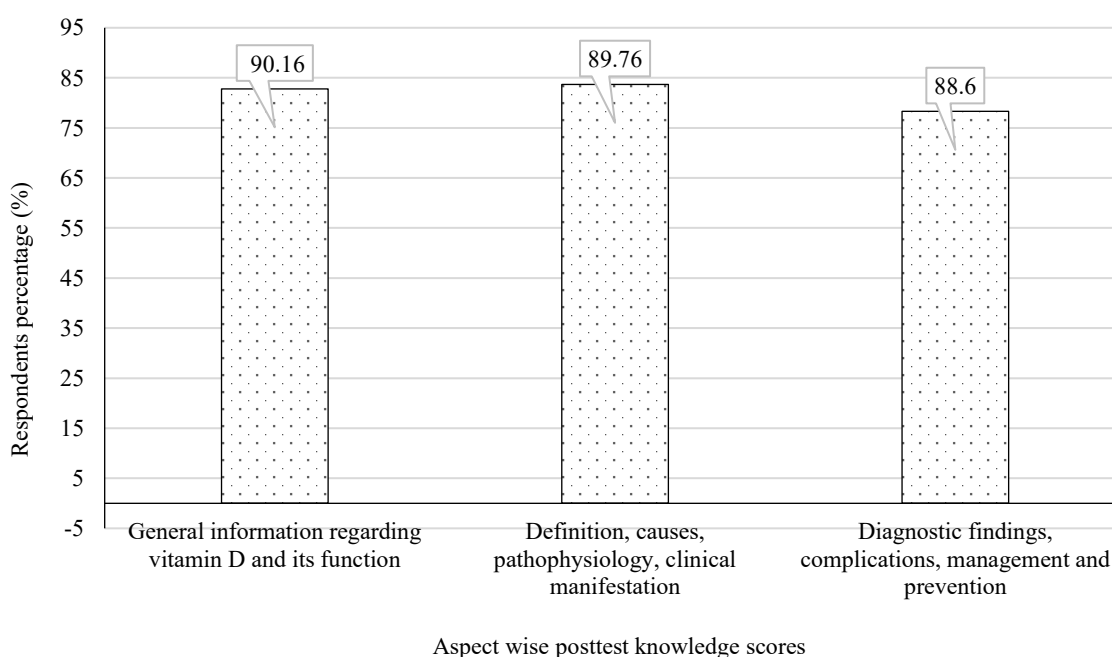


Figure 2. The aspect wise post-test mean knowledge scores of respondents on vitamin D deficiency.

This significant difference between pre- and post-test scores indicates a marked improvement in knowledge following the intervention. As a result, the null hypothesis is rejected, and the research hypothesis is accepted, confirming that the Self-Instructional Module (SIM) was effective in enhancing women's understanding of vitamin D deficiency.

Section V: Analysis and Interpretation of Association Between the Mean Pretest Knowledge Scores of Women Regarding Vitamin D Deficiency with Selected Socio-demographic Variables

From Table 5 it is evident that with regard to age (χ^2)=8.643, religion (χ^2)=2.103, marital status (χ^2)=2.8, Residence (χ^2)=4.455, educational qualification (χ^2)=4.706, Income (χ^2)=2.531, Diet (χ^2)=1.129, Exposure to sunlight (χ^2)=5, Use of sunscreen (χ^2)=4.599, and knowledge on vitamin D deficiency χ^2 =0.393. Thus, the null hypothesis is accepted and research hypothesis is rejected.

Table 4. The overall pretest and post-test knowledge scores of respondents on vitamin D deficiency (N=60).

Aspects	Max. Score	Knowledge Scores				Paired 't' Test
		Mean	SD	Mean (%)	SD (%)	
Pretest	34	15.2	4.14	44.7	12.16	*22.34
Post-test	34	30.37	3.075	89.31	9.04	
Enhancement	34	15.17	2.91	44.61	8.57	

*Significant at 5% level, $t(0.05, 59df)=1.96$.

Table 5. Association between pre-test knowledge scores of women regarding vitamin D deficiency and selected socio-demographic variables (N=60).

Demographic variable	Category	Samples	Knowledge level						χ^2 value	P value
			Inadequate		Moderate		Adequate			
			n	%	n	%	n	%		
Age in years	21-30	15	13	22	2	3	0	0	8.643NS	P>0.05
	31-40	17	11	18	6	10	0	0		
	41-50	18	12	20	6	10	0	0		
	51-60	10	8	13	1	2	1	2		
Religion	Hindu	12	9	15	3	5	0	0	2.103NS	P>0.05
	Muslim	1	1	2	0	0	0	0		
	Christian	43	32	53	10	17	1	2		
	Others	4	2	3	2	3	0	0		
Marital status	Single	9	6	10	3	5	0	0	2.8 NS	P>0.05
	Married	45	32	53	12	20	1	2		
	Divorced	1	1	2	0	0	0	0		
	Widow	5	5	8	0	0	0	0		
Residence	Urban	43	30	50	13	22	0	0	4.455 NS	P>0.05
	Rural	17	14	23	2	3	1	2		
Education	Diploma	11	8	13	2	3	1	2	4.706 NS	P>0.05
	Bachelors	34	25	42	9	15	0	0		
	Masters and above	15	11	18	4	7	0	0		
Income (Rs.)	<10,000	22	17	28	5	8	0	0	2.531 NS	P>0.05
	10,001-20,000	28	21	35	6	10	1	2		
	>20,001	10	6	10	4	7	0	0		
Diet	Vegetarian	7	5	8	2	3	0	0		P>0.05

	Non-vegetarian	24	18	30	6	10	0	0	1.129 NS	
	Mixed Diet	29	21	35	7	12	1	2		
Exposure to sunlight	<30 min	33	22	37	11	18	0	0	5.653 NS	P>0.05
	30 min–1 h	23	19	32	3	5	1	2		
	1–2 h	2	2	3	0	0	0	0		
	>2 h	2	1	2	1	2	0	0		
Use sunscreen	Once a day	18	14	23	4	7	0	0	4.599 NS	P>0.05
	Twice a day	7	5	8	2	3	0	0		
	1 to 4 times a day	7	7	12	0	0	0	0		
	Never applied	28	18	30	9	15	1	2		
Previous information	Yes	10	8	13	2	3	0	0	0.393 NS	P>0.05
	No	50	36	60	13	22	1	2		

NS: Non-Significant.

DISCUSSION

Socio-demographic Characteristics of the Women

The findings of the study indicate that the majority of women (18 (30%)) were in the age group of 41–50 years, 17 (28.3%) were from the age group of 31–40 years, followed by 15 (25.0%) of 21–30 years, and remaining 10 (16.7%) in the age group of 51–60 years; majority of women (43 out of 60, 71.7%) were Christians. Around 75% (45 out of 60) of the participants were married. Majority of women (71.7% (43 out of 60)) were from urban. Majority of the subjects (56.7% (34 out of 60)) had completed Bachelor's degree. Among all the participants, 48.3% (29 out of 60) had mixed diet, whereas 46.67% (28 out of 60) of the subjects never used sunscreen lotions. More than half of the population (83.3% (50 out of 60)) had no previous knowledge [6–9].

Pre-Test Knowledge Scores on Vitamin D Deficiency Among Women

The findings of the current study reveal that participants had insufficient knowledge about vitamin D deficiency during the pre-test phase. A significant portion of the respondents, 44 women (73%), exhibited inadequate knowledge, while 15 (25%) demonstrated moderately adequate knowledge. Only 1 participant (1.7%) was found to have adequate knowledge before the educational intervention.

These results align with those from a study conducted by Kavitha *et al.*, which also reported limited awareness among participants about the benefits of vitamin D supplementation [10].

Post-Test Knowledge Scores on Vitamin D Deficiency

Post-intervention results showed a notable improvement in the participants' knowledge. Out of the 60 women, 54 (90%) attained adequate knowledge, and 6 (10%) achieved moderately adequate knowledge. Importantly, none of the participants recorded inadequate knowledge after receiving the educational module.

These findings are consistent with a study by Bhattacharya *et al.*, where the post-test mean knowledge score (19.11±3.38) significantly increased compared to the pre-test score (8.66±2.45) [11].

Evaluation of the Effectiveness of the Self-Instructional Module (SIM)

A comparison between the pre-test and post-test knowledge levels clearly indicated improvement. The mean pre-test score was 15.17 with a standard deviation of ±2.91, while the mean percentage increase in knowledge was 44.61% with a standard deviation of ±8.57.

The paired 't' test yielded a 't' value of 22.34 (t_{59} df=1.96), which is statistically significant at the 0.05 level, indicating a substantial increase in knowledge due to the SIM.

These results are supported by a study conducted by Nwozichi *et al.*, which found a significant increase in knowledge, with the mean pre-test score at 16.03 (SD=2.951) and post-test score at 28.22 (SD=3.273), validating the effectiveness of self-instructional modules [12].

Association Between Pre-Test Knowledge Scores and Socio-Demographic Variables

The study examined associations between participants' pre-test knowledge and various demographic factors including age ($\chi^2=8.643$), religion ($\chi^2=2.103$), marital status ($\chi^2=2.8$), residence ($\chi^2=4.455$), education level ($\chi^2=4.706$), monthly income ($\chi^2=2.531$), dietary habits ($\chi^2=1.129$), sun exposure ($\chi^2=5.653$), use of sunscreen ($\chi^2=4.599$), and prior awareness of vitamin D deficiency ($\chi^2=0.393$).

However, no statistically significant association was found between any of these variables and the participants' pre-test knowledge scores [12].

This outcome is supported by a similar study which also concluded that there was no significant link between knowledge levels and baseline characteristics such as age, religion, income, diet, or sunscreen usage [9, 10].

CONCLUSION

The findings of the study indicated that most of the women demonstrated insufficient knowledge about vitamin D deficiency in the pre-test phase. However, the study confirmed that the use of a self-instructional module was an effective educational approach to enhance their understanding of the condition. These outcomes highlight important implications for nursing education, clinical practice, healthcare administration, and future research.

Conflict of Interest

The authors have no conflict of interest regarding this investigation.

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