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Vitamin D Knowledge, Attitudes, and Practices among Nurses and Patients in Tertiary Care Hospitals: Implications for Nursing-Led Patient Education

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Abstract

Differences in knowledge and practices related to vitamin D may reduce the effectiveness of preventive interventions. The study is carried out to assess nurses and patients' knowledge, practices, and attitudes toward vitamin D in tertiary healthcare facility. Nurses and patients of such tertiary care hospital-based units above 18 years were included in the cross-sectional study. A validated questionnaire was used to extract the personal characteristics of the samples and to assess knowledge, practices, and attitudes with regard to vitamin D The data were analyzed using SPSS version 25 with independent t-tests, chi-square tests, analysis of variance (ANOVA) at $p < 0.05$ level. Nurses demonstrated a higher level of knowledge compared to patients, particularly in the domains of calcium absorption and bone health, as well as dietary sources of vitamin D. Both groups expressed positive perceptions of vitamin D, and nurses exhibited a higher degree of consensus regarding their responsibility to educate patients. A discrepancy was observed between nurses' and patients' perceptions regarding the assessment of vitamin D levels, with 46.6% of nurses reporting that they routinely assess their patients' levels. The study showed that less than half of the patients followed the recommended practices. Only a few of them took supplements and got enough sun. The results showed a strong connection between age and education levels, on one side, and knowledge, attitudes, and actions, on the other. Both patients and nurses had trouble applying vitamin D in practice, but nurses had more knowledge and were more positive about it.

Keywords: *Knowledge Attitudes and Practices, Nurses, Nursing-Led Education, Patients, Tertiary Care Hospitals, Vitamin D.*

Introduction

Vitamin D is one of the essential fat-soluble vitamins, produced in the skin after exposure to sunlight [1]. Foods such as fatty fish and egg yolks are sources of vitamin D [2, 3]. People in Asia suffer from vitamin D deficiency [4], which has led them to overuse vitamin D supplements (2-4), resulting in vitamin D toxicity due to their lack of exposure to sunlight or poor diet [5-7]. Vitamin deficiency is caused by insufficient or incorrect consumption or poor absorption at a time when the body needs the vitamin, leading to numerous complications in body systems such as the digestive and liver systems, which in turn leads to metabolic problems [8]. Vitamin D deficiency remains a widespread medical problem throughout the world [8], and therefore one of the most important measures to reduce this problem is to raise public awareness about the importance of this vitamin [8, 9].

Levels of knowledge and practices related to vitamin D, as well as attitudes, vary greatly, which is consistent with the importance of the

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vitamin. This variation occurs among most populations, as some surveys of adults in the Middle East have revealed a low level of awareness among the general public about the sources and benefits of vitamin D, as well as practices related to it [10]. Surveys conducted on adults in the Middle East have revealed a lack of awareness among the general public about the sources and benefits of vitamin D, in addition to their practices not being at an acceptable level with regard to nutritional supplements and exposure to sunlight [10]. Similarly, a study in Oman showed that university students' knowledge of vitamin D was moderate and their health practices were insufficient to address vitamin D deficiency [11]. Additional research in clinical environments has demonstrated a deficiency in knowledge regarding vitamin D among healthcare professionals and has advocated for the implementation of programmers to enhance understanding and management of vitamin D [12]. To implement such programs, context-specific assessments are needed to understand attitudes and practices regarding vitamin D, particularly in healthcare settings where every care giver must influence patients to improve health outcomes [11, 12].

Statistics in Iraq indicate that nurses and patients have limited knowledge and practical experience with vitamin D in tertiary care hospitals. Despite the limited scope of knowledge, a recent study in Baghdad found that most people have good knowledge of vitamin D but remain unaware of the factors that affect it. vitamin D absorption and its sources [13]. Such knowledge gaps can lead to unhealthy behaviors that reduce the effectiveness of clinical interventions, which in turn can make nurses less likely to provide information aimed at improving patient knowledge in different settings [14]. Numerous studies have investigated the knowledge and practices of nurses and patients regarding vitamin D individually, but no study has compared them. Therefore, this study aimed to compare the knowledge, practices, and attitudes of nurses and patients toward vitamin D in tertiary hospitals.

Materials and Methods

A cross-sectional design was carried out to compare knowledge, attitudes, and practices (KAP) related to vitamin D among nurses and patients in tertiary care facilities in medical, surgical, and critical care units. The study sample were randomly selected 477 adult patients and nurses from medical, surgical, and critical care units then divided into two groups by using Cochran's approach for cross-sectional research at a 95% confidence level, the sample size was found by assuming the most variability ($p = 0.5$) and a margin of error of 0.05. The researcher excludes nurses on leave or engaged in administrative duties, while those employed in the selected units with a minimum of six months of clinical experience in their current department. All participants in the research were required to be 18 years or older and capable and willing to complete the questionnaire; those with serious mental illness or other conditions that precluded participation were excluded.

A comprehensive questionnaire was used to collect data, using relevant literature and previous KAP studies. The survey started with simple questions about the patients and nurses, then went on to questions regarding vitamin D knowledge, how important it is, health education, and protocols for testing, counselling, and taking vitamin D supplements. Five-point Likert scales were used to measure attitudes and actions, whereas one point was given for each right response to a question about knowledge. The poll also questions patients about their vitamin D experiences, such as whether they followed their supplement prescriptions and if they felt better.

Nursing and nutrition specialists evaluated the questionnaire to confirm its content validity, and a pilot study involving about 10%

of the population assessed its clarity and reliability. Using Cronbach's alpha, we looked at the internal consistency and found that a value of 0.70 or above was acceptable. The researcher told the research participants what it was about and gained their written consent after the appropriate hospital review boards given their ethical approval. After that, questionnaires were sent out and collected. Then, they were reviewed to make sure they were complete before being analyzed.

The researcher used SPSS version 25 to look at the data. The researcher utilized many types of descriptive statistics to summarize the data, such percentages, means, standard deviations, and frequencies. Inferential statistics were used to compare the KAP evaluations of nurses and patients, as well as to investigate the relationships among knowledge, attitudes, and practices. These included analysis of variance, chi-square tests, Pearson or Spearman correlation coefficients, and independent t-tests. A p-value of less than 0.05 was utilized. It was completely up to the participants whether or not to take part, their data was kept private and anonymous, and they may quit the study at any time without consequence. All of these things were considered while making ethical decisions.

Results

Nurses showed higher levels of correct responses across most knowledge items, particularly regarding the role of vitamin D in calcium absorption and bone health (75.2% vs. 57.6%) and dietary sources of vitamin D (83.1% vs. 65.1%) as shown in (Table 1).

Table 1. Comparison Between Nurses' and Patients' Knowledge of Vitamin D

Question	True		False		I Don't Know	
	Nurse	Patient	Nurse	Patient	Nurse	Patient
Vitamin D is essential for calcium absorption and bone health.	75.2	57.6	14.2	40.3	10.6	2.1
Sun exposure is the main natural source of Vitamin D.	87.3	75.5	6.4	18.3	6.4	6.2
Vitamin D deficiency can contribute to osteoporosis.	63.1	43.4	15.6	34.5	21.3	22.1
Vitamin D plays a role in immune system regulation.	59.3	62.7	25.8	16.6	14.8	20.7
Food sources such as fatty fish, egg yolks, and fortified dairy provide Vitamin D.	83.1	65.1	6.4	24.8	10.6	10.1
Vitamin D deficiency may affect cardiovascular health.	44.5	50.2	23.3	16.6	32.2	33.2

The results showed that nurses had more positive attitudes than patients toward vitamin D, especially regarding vitamin D relationship to general health and its role in promoting health as (72.1%) and patients (73.0%) agreed that adequate vitamin D levels are important for overall health. Nurses demonstrated stronger agreement regarding their role in educating patients about vitamin D compared with patients (65.6% vs. 56.4%) (Table 2).

Table 2. Comparison of Nurses' and Patients' Attitudes Toward Vitamin D

	Nurse			Patient		
	Positive	**Negative**	**Neutral**	**Positive**	**Negative**	**Neutral**
Adequate Vitamin D levels are important for overall health.	72.1	17.3	10.6	63	26.6	10.4
Education about Vitamin D can improve health outcomes.	66.1	10.6	23.3	68.9	20.8	10.4
Nurses play an important role in educating patients about Vitamin D.	65.6	15.3	19.1	56.4	14.5	29.0
I feel confident discussing Vitamin D-related issues with healthcare providers.	57.2	25.4	17.4	52.4	10.3	37.3
Raising awareness about Vitamin D deficiency should be part of routine healthcare.	68.2	12.7	19.1	58.5	12.5	27

Overall, nurses demonstrate better practices than patients across most items. A high proportion of nurses report good practice in recommending Vitamin D supplementation (68.8%) and educating patients about its importance (53%), while assessing patients' Vitamin D intake or status shows a comparatively lower level of good practice (46.6%). In patients, adherence-related behaviours are fair. Over half (58.1%) heed advice from health professionals, whereas obtaining sunlight exposure on a regular basis exhibits lower good practice (39.8%). The percentage of eating or eating foods/supplements rich in vitamin D is moderate (41.5%), suggesting partial adherence, not full adherence (Table 3).

Table 3. Comparison of Responses to Vitamin D Practices Among Nurses and Patients

	Practice	**Good**	**Moderate**	**Poor**
Nurse	I assess patients' Vitamin D intake or status.	46.6	29.7	23.7
Patient	I follow advice given by nurses or healthcare providers regarding Vitamin D.	58.1	20.7	21.2
Nurse	I educate patients about the importance of Vitamin D.	53	21.6	25.4
Patient	expose myself to sunlight regularly.	39.8	37.3	22.8
Nurse	I recommend Vitamin D supplementation when appropriate.	68.8	16.9	14.8
Patient	I consume foods rich in Vitamin D or take supplements as prescribed.	47.7	41.5	10.8

Age was found to have a significant relationship with patient outcomes ($F = 3.948$, $p = 0.021$), with most patients (64.7%) with optimal results having a mean age of 37.5 ± 8.19 years. Gender was not found to have a statistically significant relationship with patient outcomes despite having a higher proportion of patients in each category ($F = 3.382$, $p = 0.067$). Education had a strong and highly significant relationship with patient outcomes ($F = 14.402$, $p < 0.001$), with higher education being linked to optimal results and lower education to acceptable or suboptimal results. However, Vitamin D supplements were not found to have a statistically significant relationship with patient outcomes ($F = 0.918$, $p = 0.134$), although there was a slight trend towards improved patient results (Table 4).

Table 4. Differences in Patients' Level of Knowledge and Demographic Data (n=241)

			Patients				
Variables			**Good**	**Accept**	**Poor**	**F**	**P-value**
Age	Mean= 37.5	SD=8.19	64.7	20.7	14.5	3.948	0.021
		%	Good	Accept	Poor	F	P-value
Gender	Male	79.3	50.2	16.5	12.4	3.382	0.067
	Female	20.7	14.6	4.2	2.1		
Education	Not read	4.1	0	2.1	2.1	14.402	0.0001
	Primary	2.1	0	0	2.1		
	Secondary	18.7	10.3	2.1	6.4		
	Institute	54.4	35.6	16.9	2.1		
	Bachelor	20.7	20.3	0	2.1		
Supplements	Yes	49.8	42.5	6.2	6.1	0.918	0.134
	No	50.2	33.6	2.1	9.3		

Apart from gender, all other demographic parameters were affected patients level of attitudes in the studied group. Age was found to have a statistically significant relationship with patient outcomes of a higher proportion of patients in each category ($F = 21.410$, $p = 0.0001$). Education had a strong and highly significant relationship with patient outcomes ($F = 36.742$, $p < 0.001$), with higher education being linked to optimal results and lower education to acceptable or suboptimal results. Moreover, Vitamin D supplements were found to have a statistically significant relationship with patient outcomes ($F = 19.992$, $p = 0.0001$), (Table 5).

Table 5. Differences in Patients' Level of Attitudes and Demographic Data (n=241)

Attitude with demographic data			**Patients**			
Variables			**Positive**	**Negative**	**F**	**P value**
Age	Mean=37.5	SD=8.19	73.1	26.9	21.410	0.0001
		%	Positive	Negative	F	P-value
Gender	Male	79.3	58.5	20.7	1.057	0.305
	Female	20.7	14.5	6.3		
Education	Not read	4.1	0	4.2	36.742	0.0001
	Primary	2.1	2.1	0		
	Secondary	18.7	10.4	8.3		
	Institute	54.4	41.9	12.6		
	Bachelor	20.7	22.6	2.1		
Supplements	Yes	49.8	33.2	16.7	19.992	0.0001
	No	50.2	39.8	10.3		

Age was found to have a highly significant association with patients' attitudes toward Vitamin D, with a majority of patients (73.1%) holding positive attitudes. Similarly, a strong association was observed between patients' education levels and their attitudes, with higher education levels being associated with more positive perceptions. Furthermore, Vitamin D supplement use was observed to have a significant association with patients' attitudes, with patients taking supplements holding more positive attitudes. However, gender was not observed to have a significant association with patients' attitudes. Based on the results, it can be concluded that age, education, and Vitamin D supplement use are

important determining factors for patients' attitudes toward Vitamin D, but gender lacks any significant influence (Table 6).

Table 6. Differences in Patients' Practices and Demographic Data (n= 241)

with demographic data			**Patients**				
Variables			**Good**	**Fair**	**Poor**	**F**	**P-value**
Age	Mean=37.5	SD=8.19	78.8	14.9	6.3	2.077	0.151
		%	Good	Fair	Poor	F	P-value
Gender	Male	79.3	62.2	10.7	6.2	1.057	0.305
	Female	20.7	16.5	4.1	0		
Education	Not read	4.1	0	4.1	0	36.743	0.0001
	Primary	2.1	2.1	0	0		
	Secondary	18.7	14.5	2.1	2.1		
	Institute	54.4	43.5	6.6	4.1		
	Bachelor	20.7	18.6	2.1	0		
Supplements	Yes	49.8	41.4	8.2	0	4.973	0.027
	No	50.2	37.3	6.6	6.2		

Age and gender did not have significant associations with the levels of practice of the patients related to Vitamin D ($F = 2.077$, $p = 0.151$; $F = 1.057$, $p = 0.305$). In contrast, educational level was highly significantly associated with practice ($F = 36.743$, $p < 0.001$), with higher education linked to better practices. Vitamin D supplement use was also significantly related to practice levels ($F = 4.973$, $p = 0.027$), as supplement users demonstrated better practices than non-users. Overall, education and supplement use were key determinants of good Vitamin D–related practices among patients (Table 7).

Table 7. Differences in Nurses' Level of Knowledge and Demographic Data (n= 236).

Knowledge with			**Nurses**				
			Good	**Accept**	**Poor**	**F**	**P-value**
Age	Mean=27.4	SD=5.29	76.7	16.9	6.4	4.086	0.018
		%	Good	Accept	Poor	F	P-value
Gender	Male	51.3	40.6	8.4	2.1	1.088	0.339
	Female	48.7	36.1	8.4	4.2		
Education	Secondary	4.2	2.1	2.1	0	6.349	0.002
	Institute	51.3	36.4	10.6	4.2		
	Bachelor	44.5	38.1	4.2	2.1		
Experiences	< 1 year	4.2	4.2	0	0	2.393	0.094
	1-5 years	76.7	59.7	10.6	6.3		
	6-10 years	12.7	6.3	6.3	0		
	> 10 years	6.4	6.3	0	0		

Age, gender, and years of experience showed significant associations with nurses' attitudes toward Vitamin D ($F = 4.086$, $p = 0.018$; $F = 6.393$, $p = 0.012$; $F = 32.942$, $p < 0.001$). Most nurses (65.7%) demonstrated positive attitudes, particularly those aged around the mean of 27.4 ± 5.29 years and those with 1–5 years of experience. In contrast, educational level was not significantly related to attitude ($F = 0.481$, $p = 0.489$). Overall, demographic and experiential factors, rather than formal education, were key determinants of nurses' attitudes toward Vitamin D (Table 8).

Table 8. Differences in Nurses' Level of Attitudes and Demographic Data (n= 236)

			Nurses			
			Positive	**Negative**	**F**	**P-value**
Age	Mean=27.4	SD=5.29	65.7	34.3	4.086	0.018
		%	Positive	Negative	F	P-value
Gender	Male	51.3	29.6	21.6	6.393	0.012
	Female	48.7	36	12.7		
Education	Secondary	4.2	29.6	21.6	0.481	0.489
	Institute	51.3	36	12.7		
	Bachelor	44.5	29.6	21.6		
Experiences	< 1 year	4.2	0	4.2	32.942	0.0001
	1-5 years	76.7	48.7	27.9		
	6-10 years	12.7	10.6	2.1		
	> 10 years	6.4	6.3	0		

Age, gender, and educational level showed significant associations with nurses' practice related to Vitamin D ($F = 4.086$, $p = 0.018$; $F = 12.990$, $p < 0.001$; $F = 11.494$, $p < 0.001$). However, a large proportion of nurses (42.8%) demonstrated poor practices despite a relatively young average age of 27.4 ± 5.29 years. Conversely, there was no significant correlation between experience and levels of practices ($F = 0.242$, $p = 0.785$). Taking together, these findings indicate that demographic and educational variables are crucial in defining nursing practices rather than experience (Table 9).

Table 9. Differences in Nurses' Practices and Demographic Data (n= 236)

Practice with			**Nurses**				
			Good	**Fair**	**Poor**	**F**	**P-value**
Age	Mean=27.4	SD=5.29	33.9	23.3	42.8	4.086	0.018
		%	Good	Fair	Poor	F	P-value
Gender	Male	51.3	10.6	16.9	23.7	12.990	0.0001
	Female	48.7	23.3	6.3	19.1		
Education	Secondary	4.2	2.1	0	2.1	11.494	0.0001
	Institute	51.3	23.3	8.4	19.4		
	Bachelor	44.5	8.4	14.8	19.4		
Experiences	< 1 year	4.2	0	2.1	2.1	0.242	0.785
	1-5 years	76.7	27.5	16.9	32.2		
	6-10 years	12.7	4.2	2.1	6.3		
	> 10 years	6.4	2.1	2.1	2.1		

Discussion

It is the need of the day to define the gaps between the knowledge and attitude of nurses and patients concerning the practices of vitamin D, and thus the importance of health education for improving outcomes can be identified. Therefore, the aim of the current research is to explore and compare the KAP of patients and nurses concerning vitamin D at the tertiary care hospitals. The findings of the research revealed that the nurses' level of knowledge and attitude towards vitamin D is better than patients', but there is a significant gap in the practices of patients.

The results show that the level of knowledge of nurses is greater than that of patients concerning vitamin D, especially with respect to its involvement in the absorption of

calcium, the health of the bones, and its presence in food. This is consistent with previous studies, which have already shown that the level of knowledge of health professionals is greater than that of others concerning vitamin D due to their educational background and working experience [15]. This has also been the case with the Middle Eastern population, where the scores of health professionals were significantly higher than those of patients [16].

However, there existed a gap in the level of knowledge in both categories in relation to the non-skeletal effects of vitamin D, particularly its association with cardiovascular health. It has also been observed in previous research that there exists a lack of awareness in relation to the non-skeletal uses of vitamin D even among medical practitioners [17, 18].

In various regions of the Middle East countries such as Iraq, Oman, and Saudi Arabia, there was found to be a satisfactory level of knowledge among the general public regarding vitamin D. More than half of the healthcare practitioners had been found to have good knowledge and practice in the study conducted in Ethiopia [19]. This has been supported by other studies [20, 21]. A similar gap was found in nursing students in North India by Khanna et al. [22], who, despite being aware of the importance of Vitamin D and its main source being sunlight, lacked adequate practical skills in relation to Vitamin D supplements and its levels in the blood.

The nurses and patients showed positive attitudes towards Vitamin D, with most appreciating its role in health. This study consists of knowledge, attitudes, and practices (KAP) surveys, which show positive attitudes despite moderate or low knowledge levels [23, 24]. Positive attitudes may be due to increased knowledge among people through various sources, such as health care and health education.

The nurses had stronger levels of agreement compared to patients in regard to educating patients on vitamin D. This reinforces the literature that has long acknowledged the pivotal role that nurses play in health promotion, prevention of diseases, as well as educating patients [25, 26]. On the other hand, the patients had lower levels of confidence in discussing issues pertaining to vitamin D. This has also been reinforced by literature that has shown that patients tend to look towards healthcare providers in order to start nutritional conversations [27, 28].

A positive attitude of most healthcare practitioners towards the evaluation and management of vitamin D deficiency is greatly related to improved practice [19]. Contrasting trends were found in students in health-related faculties at universities, in which most students showed moderate attitudes towards the use of vitamin D, reflecting a gap in attitudes towards actual practices like exposure to the sun and the intake of vitamin D supplements [20, 21].

About half of the nurses portrayed a satisfactory level of practice regarding vitamin D, while unsatisfactory practices did not reach a quarter of the nurses. The results are in line with the existing studies on healthcare practitioners, including nurses, suggesting that practices regarding vitamin D were of average adequacy in about fifty percent of the samples, while unsatisfactory practices occurred in twenty-five percent [21, 20].

The practices among patients in the use of vitamin D were also explored in this research, and the findings indicated that less than half the patients showed good practices, while over a quarter showed moderate practices. Further, the practices among patients in the use of vitamin D were observed to be suboptimal, with less than half the patients showing good practices and over a quarter showing merely moderate practices [29-31]. Though various studies have indicated a relatively higher utilization of vitamin D among patients, the findings in this research seem to reflect a relatively lower transfer of awareness to

practices. Interestingly, it has been observed in this research, and in various similar studies, that while patients are largely aware of the importance of vitamin D, this is not necessarily reflected in proper preventive practices, such as regular supplementation and adequate sun exposure. This is a significant reflection of the knowledge-practice gap and seems to imply the presence of factors not directly linked to the level of patients' awareness, such as perhaps unavailability for supplementation, a lack of proper professional advice, and certain lifestyle and cultural constraints, among patients in the use of vitamin D. Cultural, lifestyle, and environmental factors may significantly impact patients' practices in vitamin D, especially in areas where sun exposure is relatively limited.

While nurses practiced better than patients, there were no regular measurements of vitamin D intake or status among patients. This gap between knowledge and practice has been widely reported in literature, implying that knowledge alone is not enough to change practice [15, 26]. In the case of patients, the practices related to vitamin D supplement, sun exposure, and dietary intake were mostly moderate.

Similar results have also been found in Middle Eastern and Asian communities, which have been associated with poor vitamin D practices despite having good attitudes toward vitamin D [23, 24]. These findings stress the significance of planned interventions conducted by nurses that help promote changes and encourage long-term adherence to vitamin D recommendations.

Level of education was found to be a major predictor for the knowledge, attitudes, and practices of patients regarding vitamin D, as is the case worldwide, where greater levels of health literacy and preventive practices result from greater levels of health education [32,28]. Age was also a predictor for greater positive practices, possibly because they possess greater awareness about health and greater exposure to health care. For the nurses, the impact of education was greater than the impact of the number of years they had been in practice.

These statistically significant relationships have been found in various studies, including studies involving nurses and patients [19, 21, 30, 31]. On the other hand, there are studies that found that there were no statistically significant relationships between practices, knowledge, attitudes and age and education [19, 22, 27]. The results emphasize the importance of nurses in filling the gap between knowledge and practice with regard to vitamin D. Although nurses have a higher level of KAP compared to patients, the presence of suboptimal practices among nurses indicates a need for education. Vitamin D assessment, counseling, and documentation by nurses can be integrated with patient care to increase patient involvement. Evidence has been generated by systematic reviews that education programs led by nurses have been effective in increasing patient knowledge, adherence, and health behaviors [25, 26].

The cross-sectional study design limits the possibility of establishing causation. Moreover, the reliance upon self-reported practices might affect the study by introducing the possibility of recalling bias or social desirability bias. Despite these limitations, the study provides significant information concerning the KAP of nurses and patients with regard to vitamin D.

Conclusion

In summary, nurses scored higher in terms of both knowledge and attitudes toward vitamin D compared to patients, but there were some deficits in both. These results emphasize the need for specific education interventions by nurses aimed at improving both vitamin D knowledge and practices among both health care personnel and patients.

Conflicts of Interest

The authors declare no conflict of interest.

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Ethical Approval

The study was registered and approved by College of Nursing at the University of Mosul.

Data Availability

Data available on request.

Author Contributions

All required work and written done by Tameem Thamir.

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