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Knowledge and practices towards vitamin D sources and insufficiency among healthcare workers in Erbil, Iraq, 2025

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Abstract

Background and objective: Vitamin D is an essential fat-soluble vitamin that is produced in the skin depending on sunlight and found in different foods. Its deficiency is a widespread health issue, affecting approximately one billion people and leading to significant health consequences. This study aimed to assess knowledge and practices regarding vitamin D sources and insufficiency amongst healthcare workers (HCWs) in Erbil hospitals.

Methods: A cross-sectional study was carried out at five public hospitals in Erbil city in 2025. A total of 400 HCWs were recruited from the selected hospitals. A structured questionnaire was developed, which included three sections: sociodemographic characteristics, knowledge questions, and practice questions related to sources and insufficiency of vitamin D.

Results: This study revealed that 33 HCWs (8.3%) had poor knowledge, 319 (79.7%) had fair knowledge, and 48 (12%) had good knowledge about vitamin D. Good knowledge levels were significantly higher in older HCWs (55.2%), highly educated HCWs (23.3%), technicians (20%), and HCWs who had 1–13 years of experience (13.3%). Only 28 (7%) exhibited good practice, and the poor practice level was significantly higher among females (56.3%) and technicians (60%).

Conclusion: Most HCWs had fair knowledge and less than half had poor practices regarding vitamin D. Better knowledge was associated with older age, higher education, longer service, and being a technician, while poor practices were more common among females and technicians. Targeted interventions are recommended to improve HCWs' knowledge and practices for better public health outcomes.

Keywords: Vitamin D, Healthcare workers, Knowledge, Practice.

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Introduction

Vitamin D is an essential fat-soluble vitamin that is produced in the skin depending on sunlight and found in different food elements, including oily fish, egg yolks, veal, beef, liver, sundried mushrooms, offal, milk, and dairy products, as well as nutritional supplements (1). Epidemiological studies have shown a substantial correlation between vitamin D deficiency and common chronic diseases like diabetes, cancer, heart disease, and bone metabolism issues. It is also a risk factor for mental and immunological diseases. The prevalence of vitamin D insufficiency is very high worldwide. It is vital to understand the detrimental health implications of vitamin D deficiency to create interventions and early therapies for those who are likely to have low levels of vitamin D (2).

Almost half of the world's population suffers from vitamin D deficiency. Over one billion people worldwide are thought to be deficient in vitamin D. Therefore, hypovitaminosis D can be considered a pandemic-level disorder and is a risk factor for death. The entire world is currently dealing with a pandemic of hypovitaminosis D, which has far-reaching effects on people of all ages' general health and wellness. As evidenced by the growing number of prescription and self-medication cases and a large number of studies on the subject, the disease has become more serious in recent years (3). Vitamin D has received a lot of attention and has been called the medication of the decade (4). According to a recent study, inadequate consumption of vitamin supplements, low knowledge of vitamin D, and vitamin D deficiency are all related. Similarly, earlier studies conducted in the Arab world have found that the general public is unaware of vitamin D insufficiency, emphasizing the necessity of educational initiatives to raise awareness (5). Sunlight is the primary source of vitamin D, giving the body up to 90% of its vitamin D requirements, whereas other sources, such as diet, only supply 10%. For general health, having appropriate vitamin D levels is quite advantageous (6). The general symptoms of vitamin D deficiency are exhaustion, chronic fatigue, bone pain, back pain, and low mood. Furthermore, vitamin D deficiency is associated with a higher risk of generalized anxiety disorder. It is linked to a wide range of illnesses and is a significant global public health concern (6). The climate of the Kurdistan area in northern Iraq is somewhat dry. The residents in this area receive enough sunlight from the frequently bright days. Therefore, it was anticipated that the vitamin D status of the current population would be primarily within the normal range. The results, however, showed that this expectation was not at all met, with

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most people having either inadequate or deficient vitamin D levels, 74.3 and 21.1%, respectively (7). Vitamin D deficiency is unusual in tropical places where the sun is overhead for most or all of the year, such as India, Africa, and the Middle East (particularly Iraq) (8). Vitamin D insufficiency is very common in Erbil, Iraq's Kurdistan Region. Furthermore, a lack of serum vitamin D has been linked to numerous additional illnesses. Consequently, doctors have to think about educating patients more about the significance of vitamin D levels in the body (9). Illustrating this local clinical burden, vitamin D3 deficiency has been documented among rheumatoid arthritis patients in Erbil (14), and a comparable correlation between vitamin D status and disease activity has also been examined in rheumatoid arthritis patients in Sulaymaniyah (15). The public's message about vitamin D is conflicting and imprecise, especially when it comes to sun exposure and dietary sources and the link between vitamin deficiency and other health problems (10). Increasing public knowledge concerning the value of vitamin D can help reduce health problems brought on by its insufficiency. Therefore, this study aimed to assess knowledge and practices regarding vitamin D sources and insufficiency amongst HCWs in Erbil hospitals.

Methods

Study design, setting, and time

A cross-sectional study with an analytic component was used. The current study was conducted at five public hospitals in Erbil city (Erbil Teaching, Rizgari Teaching, Raparin Teaching, Maternity Teaching, Rozhawa Emergency) for 9 months, from October 2024 to May 2025.

Study population, sample size, and sampling method

The HCWs at the selected hospitals were the subjects of this study. They were informed about the study's purpose, and those who agreed to participate were recruited for this study. The total number of HCWs in the selected hospitals was 3000, and they were distributed as follows: 700 in Erbil teaching hospital, 1200 in Rizgari hospital, 470 in the Rozhawa emergency hospital, 250 in Raparin hospital, and 380 in the maternity hospital. The sample size was calculated using Epi-Info software. It was initially estimated that the prevalence of knowledge is similar to the 74.3% reported in a previous study conducted in Baghdad/ Al-Rusafa (11), we found that for a population of 3000 healthcare workers, a sample size of 400 was sufficient to achieve a 95% confidence interval for the prevalence (±2%) in this population. To achieve this target, 463 HCWs were approached. Of these, 63 either refused to participate or did not

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complete the questionnaire. The final sample size was 400 participants, resulting in a response rate of 86.4%.

The required sample was proportionally distributed among the selected hospitals based on the number of HCWs at each hospital. A convenience sampling method was applied to collect the required sample size from the enrolled hospitals. Data was collected through daily visits until the required number of participants was reached. All HCWs (Nurses, medical assistants, laboratory staff, and technicians) at the five selected hospitals who agreed to participate were enrolled in the study. HCWs who refused to participate or had any of the following conditions were excluded from the study: doctors, pharmacists, dentists, HCWs who were seriously ill or unable to speak, and administrative staff.

Data Collection Tools:

A self-administered questionnaire was designed to collect the needed information. A pilot study was implemented in one of the selected hospitals involving 10 HCWs before starting data collection, to test the clarity and applicability of the study tool, the time needed for filling the questionnaire, and to determine the reliability of the questionnaire. After piloting on 10 healthcare workers, the final version of the questionnaire included the following data:

1. Basic sociodemographic variables: Age, gender, residency, marital status, educational level, job title, years of experience, and monthly income.
2. Knowledge questionnaire: It consisted of 22 multiple-choice questions designed to evaluate healthcare knowledge about vitamin D. Question 3 was worth 10 points for the correct answer, and Question 4 was worth 8 points. For the remaining questions, 1 point was given for each correct answer, and 0 for incorrect answers. The total score ranged from 0 to 38, with higher scores indicating better knowledge levels.
3. Practice questionnaire: It consisted of 9 multiple-choice questions to assess physicians' practices regarding vitamin D. Each correct answer was awarded 1 point, and the incorrect answers received 0 points for questions 1, 2, 8, and 9. Questions 3, 4, 6, and 7: 2 points for a correct answer and 0 points for an incorrect answer. The correct answer for question 5 provided 3 points. Hence, the total score of this section ranged from 0 to 15, and a high score indicates a good practice level.

For each knowledge and practice, the scores of the items were summed, and the total was divided by the number of items, resulting in a mean score for that part. These scores were then converted into percentage scores. The Knowledge and practice were considered

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satisfactory if the percentage score was 50% or more and unsatisfactory if less than 50%, as follows: poor Knowledge and practice (< 50%), fair (50% to 75%), and good (> 75%) (12).

Data was analyzed using the available statistical package of SPSS-26. Data were presented in simple measures of frequency, percentage, mean, standard deviation, and range (minimum-maximum values). The significance of the difference in different percentages (qualitative data) was tested using the Pearson Chi-square test. A level of P-value <0.05 was considered significant.

Ethics approval:

The research ethics committee of the College of Medicine, Hawler Medical University approved the study, Official facilities were obtained from the selected hospitals. Informed consent was obtained verbally from participants and were informed that participation is voluntary, and they can withdraw at any time. The collection of data was kept confidential, private, and not used except for study purposes.

Results

This study included a total of 400 HCWs in the primary healthcare centers of Erbil city. The ages of the recruited participants ranged from 39 to 60 years, with a mean age of 41.27 ± 9.92 years. The highest proportion of participants belonged to the age group of 36 – 45 years, 161 (40.2%). Among the 400 participants, 123 (30.8%) were males and 277 (69.2%) were females, 394 (98.5%) resided in urban areas, 321 (80.2%) were married, 187 (46.8%) had completed institutional education, 168 (42%) were nurses, and 205 (51.3%) had 14 – 25 years of experience. Finally, the middle monthly income was reported by 329 participants (82.3%), as illustrated in Table 1.

Overall knowledge score:

According to the participants' responses to knowledge-related questions, the overall knowledge score toward vitamin D was as follow: 33 participants (8.3%) had poor knowledge (scores ≤ 19), 319 (79.7%) had a fair knowledge (scores 20 – 28), and 48 (12%) had good knowledge (scores 29 or more). In the present study, insufficient sun exposure was the most identified cause of vitamin deficiency, reported by 391 HCWs (97.8%). Further, 329 (82.3%) and 275 (68.8%) of respondents reported nutritional insufficiency and pregnancy as the causes of vitamin deficiency, respectively. Other frequently recognized factors were illustrated in Table 2.

This study found that the higher rates of good knowledge level were found in participants aged > 45 years old (55.2%), participants who had postgraduate education (23.3%), technicians (20%), and those who had 1 – 13 years of experience (13.3%), with a statistically

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significant association (P ≤0.05) between the knowledge level of participants and their age, education, job title, and years of experience, as shown in Table 3.

Table 1. Socio-demographic characteristics of the study participants

Variable	No. (n= 400)	Percentage (%)
Age groups (Years)		
≤ 35	111	27.8
36 – 45	161	40.2
> 45	128	32.0
Gender		
Male	123	30.8
Female	277	69.2
Residency		
Urban	394	98.5
Rural/suburban	6	1.5
Marital Status		
Married	321	80.2
Single	79	19.8
Education		
Intermediate/secondary	42	10.4
Institution	187	46.8
College	128	32.0
Postgraduate/specialty	43	10.8
Job title		
Nurse	168	42.0
Medical assistant	51	12.8
Laboratory staff	151	37.8
Technician	30	7.5
Years of experience		
1 – 13	120	30.0
14 – 25	205	51.3
26 – 37	75	18.7
Monthly income		
Low income	69	17.2
Middle income	329	82.3
High income	2	0.5

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Table 2. Participants' knowledge regarding the causes of vitamin D deficiency

Variable	No. (n= 400)	Percentage (%)
Age groups (Years)		
Insufficient sun exposure	391	97.8
Nutritional insufficiency	329	82.3
Pregnancy	275	68.8
Aging	256	64.0
Low water intake	230	57.5
Physical inactivity	211	52.8
Dressing style	146	36.5
Soft drinks	321	30.8
Smoking	79	15

Table 3. Distribution of the participants by knowledge level and general characteristics

Variable	Knowledge level				
	Poor No. (%)	Fair No. (%)	Good No. (%)	Total (n= 400) No. (%)	P -value
Age groups (Years)					
≤ 35	3 (2.7)	93 (83.8)	15 (13.5)	111 (100.0)	< 0.001
36 – 45	7 (4.3)	133 (82.6)	21 (13.1)	161 (100.0)	
> 45	23 (18.0)	22 (32.8)	37 (55.2)	128 (100.0)	
Gender					
Male	7 (5.7)	100 (81.3)	16 (13.0)	123 (100.0)	0.446
Female	26 (9.4)	219 (79.1)	32 (11.6)	277 (100.0)	
Education					
Intermediate	8 (19.0)	30 (71.4)	4 (9.5)	42 (100.0)	0.009
Institution	17 (9.1)	153 (81.3)	17 (9.1)	187 (100.0)	
College	8 (6.3)	103 (80.5)	17 (13.2)	128 (100.0)	
Specialty	0 (0)	33 (76.7)	10 (23.3)	43 (100.0)	
Job title					
Nurse	10 (6.0)	146 (86.9)	12 (7.1)	168 (100.0)	< 0.001
Medical assistant	12 (23.5)	32 (62.7)	7 (13.7)	51 (100.0)	
Laboratory staff	9 (6.0)	119 (78.8)	23 (15.2)	151 (100.0)	
Technician	2 (6.7)	22 (73.3)	6 (20.0)	30 (100.0)	
Years of experience					
1 – 13	3 (2.5)	101 (84.2)	16 (13.3)	120 (100.0)	< 0.001
14 – 25	14 (6.8)	164 (80.0)	27 (13.2)	205 (100.0)	
26 – 37	16 (21.3)	54 (72.0)	5 (6.7)	75 (100.0)	

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Overall practice score:

The analysis of participants' responses to practice-related questions showed that 179 participants (44.7%) demonstrated poor practice (scores ≤ 7), 193 participants (48.3%) had fair practice (scores between 8 and 11), and only 28 participants (7%) exhibited good practice (scores 12 to 15).

In the present study, female participants and laboratory staff had higher rates of poor practices, 56.3% and 62.3%, respectively, and a statistically significant association (P ≤0.05) was found between the practice level of participants and their gender and job title, as shown in Table 4.

Table 4. Distribution of the participants by practice level and general characteristics

Variable	Practice level			Total (n= 400) No. (%)	P-value
	Poor No. (%)	Fair No. (%)	Good No. (%)		
Age groups (Years)					
≤ 35	47 (42.3)	59 (53.2)	5 (4.5)	111 (100.0)	
36 – 45	75 (46.6)	73 (45.3)	13 (8.1)	161 (100.0)	0.647
> 45	57 (44.5)	61 (47.7)	10 (7.8)	128 (100.0)	
Gender					
Male	23 (18.7)	84 (68.3)	16 (13.0)	123 (100.0)	0.001
Female	156 (56.3)	109 (39.4)	12 (4.3)	277 (100.0)	
Education					
Intermediate	16 (38.1)	21 (50.0)	5 (11.9)	42 (100.0)	
Institution	75 (40.1)	98 (52.4)	14 (7.5)	187 (100.0)	
College	62 (48.4)	58 (45.3)	8 (6.3)	128 (100.0)	0.171
Specialty	26 (60.5)	16 (37.2)	1 (2.3)	43 (100.0)	
Job title					
Nurse	50 (29.8)	99 (58.9)	19 (11.3)	168 (100.0)	
Medical assistant	17 (33.3)	29 (56.9)	5 (9.8)	51 (100.0)	
Laboratory staff	94 (62.3)	54 (35.8)	3 (2.0)	151 (100.0)	< 0.001
Technician	18 (60.0)	11 (36.7)	1 (3.3)	30 (100.0)	
Years of experience					
1 – 13	59 (49.2)	58 (48.3)	3 (2.5)	120 (100.0)	
14 – 25	86 (42.0)	99 (48.3)	20 (9.8)	205 (100.0)	0.159
26 – 37	34 (45.3)	36 (48.0)	5 (6.7)	75 (100.0)	

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Discussion

In the current study, 400 healthcare workers in public hospitals of Erbil city were enrolled. The overall knowledge score regarding vitamin D was poor for 8.3%, fair for 79.7%, and good for the remaining 12% of the participants. Better rate of good knowledge reported among HCW enrolled in the Mekonnen et al study, as good knowledge was observed among half of them (51.8%) and poor among the remaining 49.2% of the HCW enrolled (13).

This study found that the highest proportion of the participants believed that vitamin D prevents muscle pain (93.3%) and bone diseases such as osteoporosis (91.5%). Conversely, 99% of them missed the concept that early morning and late in the day were ideal times for sun exposure, and 90.5% did not recognize that dark-skinned individuals were more prone to vitamin D deficiency. In comparison to other studies, Al-Fady and colleagues reported that most participants (88.1%) knew that vitamin D is necessary for healthy bones. About 75.3% of them indicated that vitamin D deficiency is associated with muscle pain. However, 45.5% of the respondents thought that vitamin D deficiency and other illnesses, such as cancer, diabetes, heart disease, and depression. About 73% reported that they like to go into the sun, and only 13.1% of them used an umbrella to shade from the sun, and the majority (86.9%) of them did not use an umbrella (14).

Regarding the participants' knowledge about the causes of vitamin D deficiency in this study, 97.8% of respondents believed that insufficient sun exposure was the most identified cause of vitamin D deficiency. Further, 82.3% and 68.8% of respondents reported nutritional insufficiency and pregnancy as the causes of deficiency, respectively. Other frequently recognized factors included aging in 64% and low water intake in 57.5%. In comparison to other studies, Mekonnen and colleagues reported a different findings, in that inadequate sunlight exposure, the inadequacy of nutritional intake on food items rich in vitamin-D, diseases limiting vitamin-D absorption, diseases impairing vitamin D conversion and impaired bone mineralization was reported as a cause of vitamin D deficiency by 90.1%, 93.8%, 58.8%, 36.5% and 41.2% of the health workers included in this study, respectively (13).

Regarding the responses of participants in this study about the source of vitamin D, 97% of the respondents enrolled believed that sun exposure is a source of vitamin D. Additionally, dairy products and fruits and vegetables were missing by 92% and 90.5% of participants, respectively, as sources of vitamin D. In the same concern, Alfady et al., study reported that only 4.16% of participants did not know the

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sources of vitamin D. The most reported vitamin D source was the sun (83.9%), followed by vitamin D supplements (80%), milk dairy (26.78%), fatty fish (14.88%), and then eggs (30.95%) (14). Our results revealed that the higher rates of good knowledge level were significantly found in participants aged > 45 years old, participants who had postgraduate education, technicians, and those who had 1-13 years of experience (P <0.05). Different results obtained from Alfady et al., study showed a significant association between the age variables and knowledge benefit, whereas there were no significant associations with knowledge sources (P <0.05) (14). These variations in findings between studies may be attributed to differences in sample characteristics, study methodologies, or cultural factors.

In this study, 44.7% of participants demonstrated poor practice, 48.3% had fair practice, and only 7% of participants exhibited good practice, this was close to the results published in Mekonnen et al., study, in which good practice was reported among 47.4% of the HCWs and poor practice among the remaining 52.6% (13). The current study observed a significant association between the practice level of participants and each gender and job title; female participants and laboratory staff had higher rates of poor practices. These results aligned with Meknnon et al., study, as they discovered that male providers had a significantly better practice, and as the age of the provider increases, the practice level improves. Clinicians have better practice compared with those assigned in leadership and health promotion positions, though the difference is not statistically significant. The practice level was significantly better among physicians and health officers, whose training has more emphasis on clinical orientation. Moreover, those workers who had worked for several years had a significantly better practice level (13).

Limitations

Limitations of this study included: inability to determine temporality, recall or social desirability bias due to self-reported data, possible selection bias due to voluntary participation, limited generalizability to other regions or healthcare settings, and no biochemical assessment (e.g., serum vitamin D levels) was included.

Conclusion

The study revealed that most HCWs lack adequate knowledge regarding vitamin D. Good knowledge levels were significantly higher among older HCWs, those with higher educational levels, technicians, and those with longer service duration. Most HCWs had inappropriate practices, and higher poor practice levels were among females and technicians. These findings highlight the importance of implementing ongoing education programs to raise awareness

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and information among HCWs about vitamin D sources and insufficiency to improve patient care and public health outcomes related to vitamin D deficiency.

Competing interest

The authors declare that they have no competing interests.

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