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Assessment of knowledge and awareness of vitamin D among physicians and students of healthcare in Jeddah, Saudi Arabia

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RESEARCH

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ABSTRACT

Background

Vitamin D deficiency is now considered to be a widespread epidemic. A poor level of knowledge and an inadequate level of awareness are two of the main risk factors for vitamin D deficiency.

Aims

This study aimed to assess the level of awareness and knowledge about vitamin D deficiency and identify factors associated with the level of awareness among healthcare workers and healthcare professional students.

Methods

From September 2017 to March 2018, a self-administered questionnaire was used to collect data among physicians and students of healthcare in Jeddah, Saudi Arabia.

Results

Of 529 participants, 320 (60.5 per cent) were students and 209 (39.5 per cent) were healthcare workers. The overall mean knowledge scores (maximum score=35) were 20.0±5.5 (58.8 per cent) among healthcare workers and 15.9±5.5 (46.8 per cent) among students. Most healthcare workers and healthcare professional students stated that vitamin D is used to treat bone disease and rickets (96.2 per cent and 89.4 per cent, respectively), maintain calcium and phosphate levels (95.2 per cent and 87.8 per cent, respectively), and strengthen immunity (68.3 per cent and 60.9 per cent, respectively). Most healthcare workers (94.7 per cent) and students (91.5 per cent) stated that osteoporosis is a result of vitamin D deficiency.

Less than half of healthcare workers (38.3 per cent) and less than quarter of healthcare professional stated that vitamin D reduces the risk of diabetes. Only 13.1 of healthcare professional and 11.6 per cent of healthcare professional stated that vitamin D reduces the risk of premature birth. However, less than one-third of workers and one-fifth of students were aware of the correct dose.

Conclusion

This study highlighted the lack of knowledge regarding vitamin D deficiency among healthcare professional students and healthcare workers in Jeddah, Saudi Arabia. There was a significant association between the level of knowledge and position. More continuing medical education programs and campaigns need to be implemented to raise awareness about the condition.

Key Words

Vitamin D deficiency, awareness, healthcare workers, students

What this study adds:

1. What is known about this subject?

Very few studies about awareness of vitamin D among medical students and physicians.

2. What new information is offered in this study?

More information disclosed about the awareness of vitamin D awareness among medical students and physician.

3. What are the implications for research, policy, or practice?

The study highlighted a lack of knowledge about vitamin D deficiency among healthcare professional students and healthcare workers, particularly with regard to the relationship between vitamin D deficiency and diabetes, the role of vitamin D in pregnancy complications, and the correct dose of vitamin D.

Background

Vitamin D is a group of fat-soluble prohormones with diverse forms, including D2 (ergocalciferol) and D3 (cholecalciferol). It is found in plants as well as animals, liver, fish, milk, and eggs in the form of ergocalciferol and cholecalciferol, whereas 7-dehydrocholesterol (provitamin D3) is converted to cholecalciferol in the skin when exposed to sunlight.[1] The daily required dose is 400-800IU/day. Vitamin D deficiency occurs due to a lack of exposure to sunlight and inadequate dietary intake.[1,2] Several studies have reported the relationship between vitamin D deficiency and many chronic illnesses (e.g., respiratory infections, type 1 diabetes, cardiovascular diseases, obesity, cancer).

In addition, studies have reported the relationship between vitamin D deficiency and anaemia, pre-eclampsia, premature birth, failure to thrive, seizures, asthma, and depression. In children, vitamin D deficiency is related to nutritional rickets, impaired growth, developmental delays, lethargy, and hypocalcaemia-induced seizures.[1,3-8] Vitamin D is used to treat rickets, osteomalacia, renal osteodystrophy, and hypoparathyroidism.[1] Vitamin D overdose occurs when the level of 25-hydroxycholecalciferol (produced in the liver after hydroxylation of vitamin D3) is more than 150ng/mL.[9]

This leads to hypercalcemia, hyperphosphatemia, normal or low levels of alkaline phosphatase (ALP), high levels of serum 25-hydroxycholecalciferol, low serum parathyroid hormone (PTH), and high urine calcium/creatinine.[9,10] Recommendations for the required dose of vitamin D vary widely: 400IU for infants, 600IU for ages 1–70 years, 800IU for age>70 years, 400–1000IU for infants, 600–1000IU for ages 1–18 years, and 1500–2000IU for age>19 years.[11]

In the last few years, vitamin D deficiency has been considered to be a widespread epidemic, with the consequences of its clinical deficiency among children and adults becoming one of the most interesting and important topics in the medical research field.[12,13] The Middle East and North African region, including Saudi Arabia, has a very high rate of vitamin D deficiency, with vitamin D deficiency being defined as a level of a level of <50nmol/L (20ng/mL).[12,13]

The prevalence of vitamin D deficiency is high in Saudi Arabia despite the country's year-round sunny weather.[12,14] In a 2012 study, Al-Daghri et al. reported higher levels of vitamin D in the winter than summer, which was explained by the fact that people tend to avoid summer sun to prevent sunburn and other detrimental health effects.[12,14] The authors also reported a higher rate of deficiency among women of all age groups.[12,14]

A poor level of knowledge and an inadequate level of awareness are two of the main risk factors for vitamin D deficiency. Several studies have been conducted around the world to detect the level of awareness and knowledge about this topic among healthcare providers and healthcare professional students.[15-18]

In Saudi Arabia, several studies were conducted to assess the level of awareness among healthcare providers and healthcare professional students.[19-21]

This study aimed to assess the level of awareness and knowledge about vitamin D deficiency and to explore the factors associated with the level of awareness among healthcare workers and healthcare professional students in Jeddah, Saudi Arabia.

Method

This cross-sectional study was conducted from September 2017 to March. A self-administered questionnaire was used to collect the data. The questionnaire was designed by the authors after reviewing previous studies and was validated by three consultants. The questionnaire sent electronically through social media sites including Twitter, Facebook and LinkedIn. Ethical approval was obtained from the ethical committee of King Abdulaziz University. Each participant received an explanation of the aim of the study and then provided verbal informed consent. An initial sample was identified using the Cronbach test. A total 529 physicians and healthcare students in Jeddah, Saudi Arabia answered

the questionnaire and included in analysis. The questionnaire had two parts with 36 questions. The first part collected demographic data (academic year and specialty for students, position and specialty for doctors). The second part examined the participant's knowledge about vitamin D (benefits of use, deficiency, resources, doses, and overdose) (Figures 1–5). The scores were calculated as follows: Each correct answer was given a score of 1, whereas each wrong answer was given a score of 0; the maximum overall score was 34. The collected data were statistically analysed using descriptive statistics by the Statistical Package for the Social Sciences version 20 (IBM, Armonk, NY, USA). Numeric data are presented as means and standard deviations (minimums and maximums), whereas categorical data are presented as numbers (percentages). Comparisons between participants' knowledge based on position and specialty for healthcare providers and academic year and specialty for students were performed using a one-way analysis of variance test. P-values.

Results

Out of 529 participants, 320 (60.5 per cent) were students and 209 (39.5 per cent) were healthcare workers (Table 1).

The results in Table 2 reveal that the overall mean knowledge score among healthcare workers was 20.0±5.5 (58.8 per cent). The overall mean score among healthcare professional students was 15.9±5.5 (46.8 per cent) (Table 2).

When the results were examined by specialty among healthcare workers, significant differences in scores on the usage questions were found. Dental professionals had the highest scores, followed by physiotherapy and pharmacy professionals (p<0.001). A significant difference was also found for scores on the vitamin D source questions, with pharmacy professionals having the highest scores, followed by medical and dental professionals (p=0.03). No significant differences were found for scores in the other domains of deficiency, dose, overdose, and overall scores. For students, a significant difference was found for scores on the resources questions, with medical and applied science students having the highest scores, followed by dental, medical, and nursing students with equal scores (p=0.04).

A significant difference was also found for the overdose knowledge score, with medical and applied science students having the highest scores, followed by nursing, dental, and physiotherapy students with equal scores (p=0.03). No significant differences were found in the other domains of use, deficiency, dose, and overall score (Table 3). When results were compared according to the position of healthcare workers, a significant difference in scores on the usage questions was found. Residents and consultants had the highest scores, followed by interns (p<0.001).

In addition, a significant difference was found for overall knowledge scores, with interns having the highest scores, followed by consultants and residents (p=0.03). No significant differences were found for the other domains of deficiency, sources, dose, and overdose (Table 4). When results were compared by students' academic years, significant differences were found for usage, sources, and overall knowledge scores. Sixth-year students had the highest scores, followed by fourth-year students and fifth-year students (p<0.0001 for all). A significant difference was also found for deficiency knowledge scores; sixth-year students had the highest scores, followed by fifth-year students and fourth-year students (p<0.0001). Furthermore, a significant difference was found for overdose knowledge scores, with fourth-year students having the highest scores, followed by fifth-year students and sixth-year students (p<0.0001). No significant difference was found regarding dose knowledge (Table 5).

Discussion

This study evaluated the level of awareness and knowledge about vitamin D deficiency and investigated the factors associated with the level of awareness among healthcare students and workers. Lower levels of awareness among healthcare professionals were evidenced in the studies by Al-Elq[22] and Munter et al.,[15] which reported low levels of vitamin D among medical students and physicians, respectively. The prevalence of vitamin D deficiency is increasing around the world, affecting both healthy and ill individuals.[22]

To solve this global epidemic and decrease the associated morbidity, experts have recommended vitamin D screenings, particularly for those who are in danger of developing this deficiency.[15] However, our results indicate a low level of awareness among healthcare professional students and workers. The results of the current study showed that almost two-fifths of healthcare workers and less than half of the students had an adequate level of knowledge about vitamin D. These findings are consistent with a Riyadh study, in which more than half of the physicians had an adequate level of knowledge.[21] In the Al-Elq's study, low levels of vitamin D were reported among medical students;[22] Munter et al. also reported low levels of vitamin D among physicians.[15] In a study from Pakistan, the majority of students had good levels of knowledge about

vitamin D.[23]

However, in India, less than half of the students had the appropriate knowledge.[16] These results indicate a poor level of awareness, which contributes to the prevalence of vitamin D deficiency. The results of the current study revealed an average level of knowledge about vitamin D and its sources from sunlight and specific kinds of foods. The majority of the participants from both groups provided correct information about the benefits of sun exposure; however, less than half of the participants stated that people with dark skin and vegetarians are at high risk of developing vitamin D deficiency. In a study from the United Kingdom, the majority of physicians (82 per cent) stated the importance of sun exposure and identified dark skin as a risk factor for vitamin D deficiency.[6]

In a study from Riyadh, the majority of participants stated the importance of sun exposure; however, they were not aware of the optimal time for daily sun exposure.[21] In a study from India, 30.9 per cent of medical students identified one correct source of vitamin D, 42.4 per cent reported the appropriate time for sun exposure, but only 32 per cent reported the proper duration of sun exposure.[12]

The current study revealed an average level of awareness about the benefits of vitamin D. The majority of participants in the two groups reported the benefits of bone health, dental health, strength of immunity, and muscle strength. However, only one-third of healthcare workers and less than one-third of students reported the benefits of vitamin D for insulin secretion and diabetes prevention. These results are consistent with studies from India (94.4 per cent), Pakistan (93 per cent), and Riyadh,[16,21,23] but are higher than what has been reported in studies from the United Kingdom (78 per cent) and Australia.[24,25]

The findings of the current studies revealed very poor knowledge of the right doses, where less than third of healthcare workers and less than fifth of healthcare professional student stated the right doses for both pregnant women and children. Similar result was found in India study, where the majority could not state the right dose.[16] In contrast, in a UK study, 70 per cent of physicians were able to identify the right dose.[6] The current study indicates average knowledge of the effects of vitamin D deficiency.

The majority of participants in both groups correctly stated the association between vitamin D deficiency and osteoporosis, seizures, growth failure, depression, hair loss, and difficulty concentrating. However, less than half of healthcare workers and one-third of students reported its association with obesity, anaemia, and depression. Less than one-fifth of both groups stated the relationship between vitamin D deficiency and pregnancy problems (pre-eclampsia, premature birth). In a UK study, 63 per cent of participants were aware of the effects of vitamin D on prematurity.[6] The current study revealed a good level of knowledge about vitamin D overdose among healthcare workers, with more than two-thirds reporting the correct symptoms.

However, an average level of overdose knowledge was found among students, with less than half reporting the correct symptoms for vitamin D overdose. A significant difference in scores was found among healthcare workers by specialty. Dentists, physicians, and pharmacists showed a higher level of knowledge than other specialties regarding the use and sources of vitamin D. There was also a significant difference among students by their field of study.

Participants who studied dentistry, nursing, and medical and applied science showed a higher level of knowledge than others regarding the overdose and sources of vitamin D. Score comparisons also revealed a significant difference among healthcare workers: interns showed a higher level of knowledge than others regarding the use of vitamin D and overall scores. A score comparison by students' academic years also revealed significant differences: sixth-year students showed a higher level of knowledge than others regarding the use, sources, deficiency, and overdose of vitamin D and higher overall scores. Similar results were reported in a study from Pakistan.[23]

Conclusion

The study highlighted a lack of knowledge about vitamin D deficiency among healthcare professional students and healthcare workers, particularly with regard to the relationship between vitamin D deficiency and diabetes, the role of vitamin D in pregnancy complications, and the correct dose of vitamin D. A significant relationship was found between the level of knowledge and the different strata of healthcare workers and students. To the best of our knowledge, this is the first study of its kind to highlight these aspects of awareness about vitamin D deficiency among providers and students. It is imperative that advanced medical educational courses and awareness campaigns be conducted to raise the level of awareness among our study's population groups. Future interventional and qualitative studies can be performed to ascertain the reasons for this lack of knowledge and to determine suitable

approaches to increase awareness about health issues related to vitamin D deficiency.

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PEER REVIEW

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CONFLICTS OF INTEREST

The authors declare that they have no competing interests.

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ETHICS COMMITTEE APPROVAL

The study was approved by Research Ethics Committee at King Abdulaziz University. Each participant was required to sign an informed electronic consent before starting filling the questionnaire.

Table 1: Demographic data

Variables		N	%
	Specialty		
Healthcare workers	Physiotherapy	11	5.3
	Medicine	119	56.9
	Pharmacy	9	4.3
	Medical and applied science	15	7.2
	Nursing	43	20.6
	Dental	11	5.3
	Others	1	.5
	Position		
	Intern	63	30.1
	Resident	46	22.0
	General	26	12.4
	Consultant	29	13.9
	Specialist	45	21.5
Healthcare professional students	**Specialty**		
	Physiotherapy	4	1.3
	Medicine	221	69.1
	Pharmacy	9	2.8
	Medical and applied science	15	4.7
	Nursing	31	9.7
	Dental	37	11.6
	Others	3	.9
	Academic Years		
	First year	25	7.8
	Second year	40	12.5
	Third year	128	40.0
	Fourth year	88	27.5
	Fifth year	22	6.9
	Sixth year	17	5.3

Table 2: Knowledge scores

Variables		Mean± SD	Range (min-max)	Total	%
Healthcare workers	Use	3.3±1.2	(0-5)	5	66%
	Deficiency	6.6±2.1	(1-12)	12	55%
	Sources	4.6±1.9	(1-9)	8	57.50%
	Dose	0.9±0.6	(0-2)	2	45%
	Overdose	4.9±2.2	(0-7)	7	70%
	Overall	20.0±5.5	(6-34)	34	58.80%
Healthcare professional students	Use	2.9±1.2	(0-5)	5	58%
	Deficiency	6.1±1.8	(0-12)	12	50.80%
	Sources	3.2±1.9	(0-8)	8	40%
	Dose	0.5±0.2	(0-2)	2	25%
	Overdose	3.5±2.2	(0-7)	7	50%
	Overall	15.9±5.5	(2-34)	34	46.80%

Table 3: Comparison by specialty

Variables		Healthcare workers				Healthcare students			
		Mean	±	SD	p value	Mean	±	SD	pvalue
Use	Physiotherapy	3.8182	±	1.07872	**0.001***	3	±	0.8165	**0.98**
	Medicine	3.3898	±	1.09415		2.8894	±	1.22729	
	Pharmacy	3.6667	±	1.22474		2.8889	±	1.05409	
	Medical and applied science	3.3571	±	1.08182		3.0667	±	1.38701	
	Nursing	2.7442	±	1.32904		2.9355	±	1.12355	
	Dental	4.2727	±	1.10371		3.0811	±	0.98258	
Deficiency	Physiotherapy	6.4545	±	2.20743	**0.79**	6.5	±	1.73205	**0.76**
	Medicine	6.6723	±	2.1672		5.986	±	1.84996	
	Pharmacy	6.1111	±	1.76383		6.3333	±	1.5	
	Medical and applied science	5.8667	±	2.32584		6.6667	±	1.29099	
	Nursing	6.814	±	2.06162		6.1613	±	1.89907	
	Dental	6.9091	±	2.21154		6.0541	±	1.74716	
Sources	Physiotherapy	4.0909	±	1.57826	**0.03***	3	±	1.41421	**0.04***
	Medicine	4.9496	±	1.95218		3.0691	±	1.96021	
	Pharmacy	5	±	1.58114		2.4444	±	1.81046	
	Medical and applied science	3.9286	±	2.01778		4.4	±	2.1974	
	Nursing	3.814	±	1.77624		3.129	±	1.35995	
	Dental	4.5455	±	2.0181		3.4571	±	1.63316	
Dose	Physiotherapy	0.0909	±	0.30151	**0.13**	0	±	0	**0.75**
	Medicine	0.6723	±	0.76034		0.21	±	0.53475	
	Pharmacy	0.4444	±	0.72648		0.2222	±	0.44096	
	Medical and applied science	0.3333	±	0.61721		0.4286	±	0.75593	
	Nursing	0.6047	±	0.84908		0.2	±	0.48423	
	Dental	0.3636	±	0.50452		0.2432	±	0.548	

Overdose	Physiotherapy	4.6364	±	3.00908	**0.16**	4	±	1.41421	**0.04***
	Medicine	5.1513	±	2.24605		3.2477	±	2.18389	
	Pharmacy	4.6667	±	1.41421		3.7778	±	1.7873	
	Medical and applied science	4.4667	±	2.26358		4.4286	±	2.34404	
	Nursing	4.186	±	2.02668		4.3333	±	2.10637	
	Dental	5.5455	±	2.06706		4	±	2	
Overall	Physiotherapy	19.0909	±	6.48775	**0.84**	16.5	±	4.65475	**0.19**
	Medicine	20.8644	±	5.29298		15.38	±	5.75161	
	Pharmacy	19.8889	±	3.40751		15.666	±	4.92443	
	Medical and applied science	18.4615	±	5.89654		19.0714	±	6.05696	
	Nursing	18.1628	±	5.77321		16.7241	±	4.47929	
	Dental	21.6364	±	5.73189		16.9118	±	3.91088	

Table 4: Comparison by position of healthcare workers

Variables		Mean	±	SD	p value
Use	Intern	3.5246	±	1.14901	**0.001***
	Resident	3.6087	±	1.12503	
	General	3.2308	±	1.50486	
	Consultant	3.5517	±	0.98511	
	Specialist	2.6889	±	1.06221	
Deficiency	Intern	6.7619	±	2.10003	**0.47**
	Resident	7	±	2	
	General	6.4231	±	2.45231	
	Consultant	6.4483	±	2.16442	
	Specialist	6.2444	±	2.10147	
Resources	Intern	4.9048	±	1.93202	**0.06**
	Resident	4.6304	±	1.91321	
	General	4.52	±	2.0232	
	Consultant	4.931	±	2.0862	
	Specialist	3.8667	±	1.67332	
Dose	Intern	0.7143	±	0.85059	**0.35**
	Resident	0.6087	±	0.61385	
	General	0.4231	±	0.70274	
	Consultant	0.5172	±	0.78471	
	Specialist	0.4667	±	0.72614	
Overdose	Intern	5.1429	±	2.30607	**0.05**
	Resident	4.9783	±	2.1857	
	General	4.3462	±	2.57592	
	Consultant	5.5517	±	1.86291	
	Specialist	4.2	±	2.02933	
Overall	Intern	21.1475	±	5.31926	**0.005***
	Resident	20.8261	±	4.97239	
	General	19.24	±	6.72235	
	Consultant	21	±	5.33854	
	Specialist	17.4667	±	5.08831	

Table 5: Comparison by academic year

Variables		Mean	±	SD	p value
Use	First year	2.6522	±	1.22877	**0.0001***
	Second year	2.65	±	1.27199	
	Third year	2.68	±	1.24175	
	Fourth year	3.3409	±	1.01581	
	Fifth year	3.1364	±	0.94089	
	Sixth year	3.3529		0.86177	
Deficiency	First year	6.08	±	1.73013	**0.0001***
	Second year	5.5641	±	1.56936	
	Third year	5.7165	±	1.92683	
	Fourth year	6.4588	±	1.64428	
	Fifth year	6.75	±	1.80278	
	Sixth year	7.1176		1.16632	
Sources	First year	2.4	±	1.41421	**0.0001***
	Second year	2.375	±	1.46213	
	Third year	2.75	±	1.79676	
	Fourth year	4.0732	±	1.9295	
	Fifth year	3.5455	±	1.65406	
	Sixth year	4.7647		1.85504	
Dose	First year	0.1667	±	0.38069	**0.05**
	Second year	0.25	±	0.58835	
	Third year	0.1349	±	0.44458	
	Fourth year	0.2414	±	0.58995	
	fifth year	0.3636	±	0.58109	
	Sixth year	0.5294		0.71743	
Overdose	First year	3	±	2.14679	**0.0001***
	Second year	2.4359	±	2.13732	
	Third year	3.432	±	2.01741	
	Fourth year	4.2857	±	2.13728	
	Fifth year	3.7619	±	2.40634	
	Sixth year	3.5294		2.32157	
Overall	First year	14.0909	±	3.96303	**0.0001***
	Second year	13.2105	±	5.26671	
	Third year	14.7395	±	5.37329	
	Fourth year	18.4416	±	5.08996	
	Fifth year	17.4737	±	5.02625	
	Sixth year	19.2941		4.20958	

Figure 1: Use knowledge

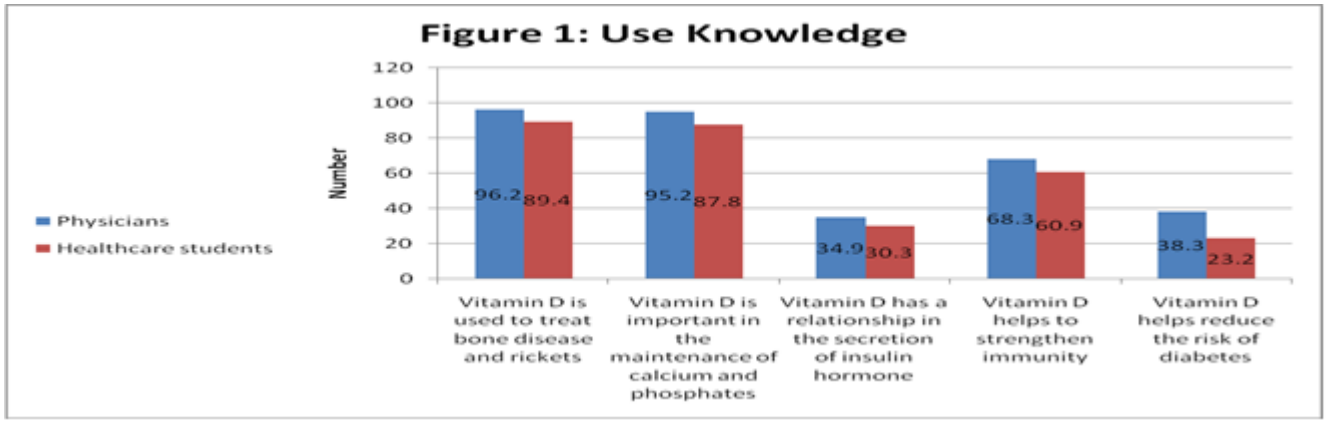

Figure 2: Deficiency knowledge

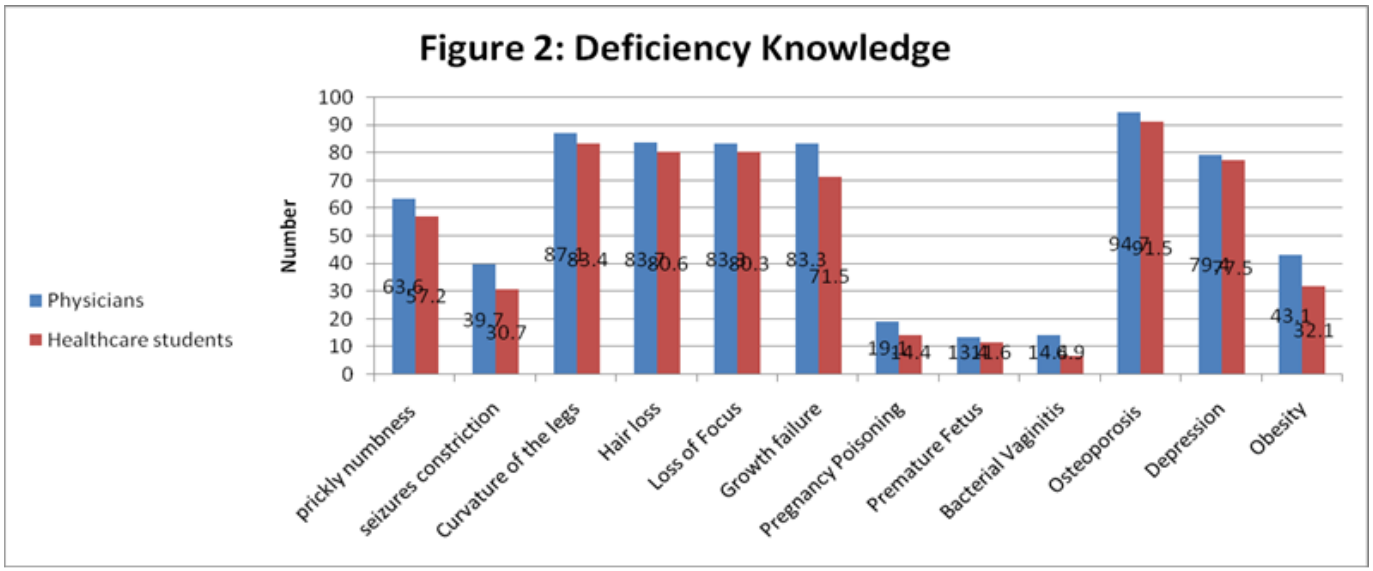

Figure 3: Resources knowledge

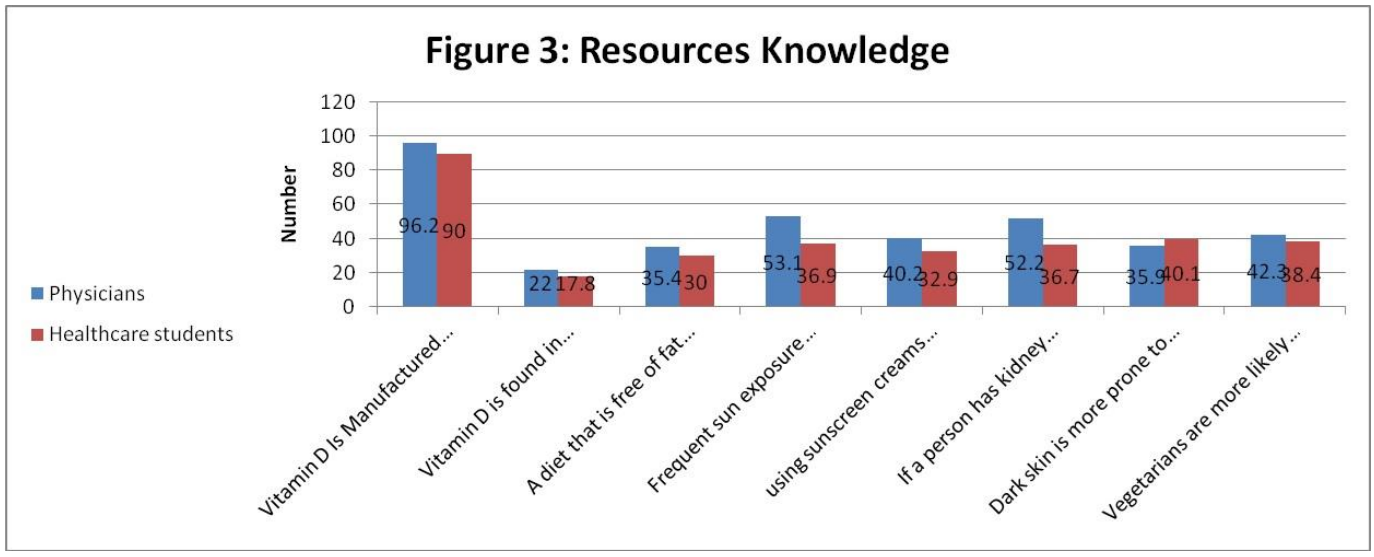

Figure 4: Dose knowledge

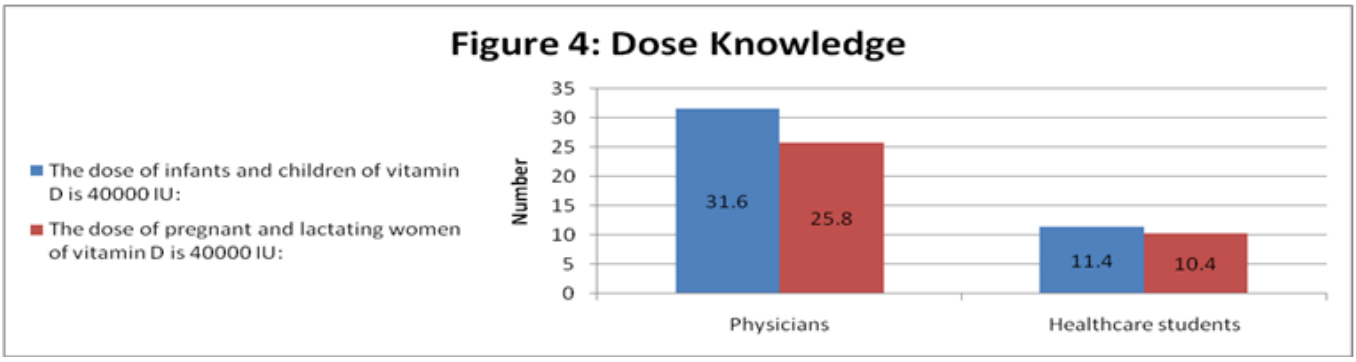

Figure 5: Overdose knowledge