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ORIGINAL ARTICLE

Response regarding the importance of vitamin D and calcium among undergraduate health sciences students in Al Kharj, Saudi Arabia

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Abstract

Background Vitamin D and calcium are essential dietary components for human body, and their deficiency is linked to poor bone health and osteoporosis. Adequate knowledge of health staff regarding vitamin D and calcium is critical for general population awareness. The current work was to evaluate the awareness regarding the importance of vitamin D and calcium among undergraduate health science students in Al Kharj.

Methods A self-distributed validated questionnaire-based cross-sectional study was conducted. Undergraduate health science students in Prince Sattam bin Abdulaziz University from the College of Medicine, College of Pharmacy, College of Dentistry, and College of Applied Medical Science were included in the study. Students between the age of 18 and 25 years have participated in the study.

Results Four hundred fifty-seven undergraduate health science students participated in the study. The vast majority of students knew about the importance of calcium (96.7%) and vitamin D (95.4%), whereas only 89.4% knew about osteoporosis. The participant students reported in their answers that the sources of knowledge were the Internet (42.8%), physicians (41.5%), textbooks (21.2%), teachers (19.1%), family and relatives (18.3%), and/or other sources (6.1%). The overall attitude was poor in about (54%) of the participants showing gender differences regarding sun-exposure duration and supplementation of calcium and vitamin D.

Conclusion The study revealed that both male and female undergraduate health science students in Al Kharj were familiar with the importance of vitamin D and calcium; however they reported improper attitude that warrants further health guidance and educational programs.

Keywords Knowledge · Attitude · Health science students · Sun exposure · Vitamin D · Calcium · Osteoporosis · Saudi Arabia

Introduction

Vitamin D (Calciferol), a lipid soluble vitamin, can be synthesized after sunlight exposure. Vitamin D metabolism starts when the ultraviolet (UV) light becomes in contact with the skin forming 7-dehydrocholesterol that will be converted to 25 hydroxyvitamin D in the liver before being activated to 1,25-dihydroxyvitamin D in the kidney. Deficiency of vitamin D has been reported to associate with a range of medical conditions, including osteoporosis, metabolic, and immune disorders [1, 2]. Vitamin D regulates calcium absorption. Calcium accounts for 1–2% of adult human body weight with almost all are found in teeth and bones. The mechanisms involved may be via modification of calcium through urine extraction, the intestines carry out for the calcium process and bone homeostasis. An adequate calcium intake and vitamin D supplementation is recommended in guidelines on osteoporosis and fracture prevention [3–5].

Despite plenty of sun in Gulf countries, vitamin D deficiency remains a health concern among population [6]. It has been

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reported that a significant part of Saudi Arabia populations have low level of vitamin D after meta-analysis of data from 2008 to 2016 showing that overall Vitamin D deficiency was 63.5% of the examined individuals [7]. In addition, reported studies showed that a portion of Saudi young adults have vitamin D deficiency and are prone to develop osteoporosis due to poor diet and low sun exposure and require preventive interventions including public health measures [8–11]. Al Kharj, a city in the central area to the south of Riyadh, is known for the agricultural significance and is one of the biggest producers of dairy products in Saudi Arabia and the Gulf countries [12]. The status and use of vitamin D and calcium are improper even among health science students [13, 14]. Data regarding the awareness calcium and vitamin D in Al Kharj is limited. The purpose of this study was to assess the awareness regarding the importance of Vitamin D and calcium among undergraduate health science students in Al Kharj.

Methods

The ethical committee in the College of Medicine, Prince Sattam Bin Abdulaziz University, with IRB (PSAU/COM/RC/IRB/A/19), approved the current study. An informed consent was taken from the study participants, after explaining the aim of the study to each of them.

Study design, site, and population

A self-distributed validated questionnaire-based cross-sectional study was conducted. The current study targeted the health science students in Al Kharj which included students from the College of Medicine, College of Pharmacy, College of Dentistry, and College of Applied Medical Science.

Sample size

The total recorded undergraduate health science students in Al Kharj for the academic year 2017–2018 were 2275 students. The sample size was calculated using Raosoft website. The estimated sample size was 329, with margin of error of 5% and confidence level of 95%. At the time of distribution of the questionnaire, we are not sure about the actual number of responders. So we distributed a total 500 questionnaires in order to avoid shortage than the target sample size or incomplete responses in the future. After revision and data entry, a total of 457 completed questionnaires were used for analysis.

Questionnaire description

The study was conducted at Prince Sattam bin Abdulaziz University, Al Kharj, Saudi Arabia, by students in the academic year 2017–2018. A questionnaire which included 20 questions was used as data collection tool. Eighteen questions were close-ended questions and two were open-ended questions. The questionnaire was made with the assistance of previous studies [11, 15]. The questionnaire was revised and validated by two independent experts. The consent has been taken from respondents before their participation in the study. The questionnaire responses were anonymous. The questionnaire included data on age, gender, residency, and major specialty for the student, whether or not they have any chronic diseases, the importance of the vitamin D and calcium for the body, the knowledge of the student for the osteoporosis, and the source of these knowledge; whether or not they have been fractured and how long they exposed to sun every day; whether or not they have been used sunscreen and tanned before; whether or not the milk is part of their diet and how often servings of milk they get weekly; whether or not the fish is part of their regular diet and how often serving of fish they get monthly; whether or not they have been taken vitamin D and calcium supplements; and whether or not they used omega-3 fatty acids (fish oil) supplements.

Data entry and analysis

Data was collected, entered, and recoded into Statistical Package for Social Sciences version 25 (SPSS 25) software for analysis. Data was computed and expressed as frequency and/or percentage that were examined using chi-square test. All p values of less than 0.05 were considered statistically significant.

Results

Among 457 undergraduate health science students who participated in the study, the students between 20 and 25 years old constituted the majority of 91.5%, whereas students under 20 years and over 25 years constituted 2.8 and 5.7% of the study population, respectively. Of the participants 321(70.2%) were males and 136 (29.8%) were females Residency for students was Al Kharj in 57.9%, Riyadh in 35.4%, and others 6.6%. Of the participants, 54 (11.8%) were from College of Dentistry, 84 (18.4%) were from the College of Pharmacy, 93 (20.4%) were from the College of Medicine, and 226 (49.5%) were from the College of Applied Medical Sciences (Table 1).

The study participants who have known chronic disease were 51 (11.15%). Some of them reported name of the disease (e.g., bronchial asthma (2.1%), anemia (1.1%), and diabetes mellitus (1.1%)). In addition, participants reported other diseases (including eczema, hypertension, hypotension, migraine, or cancer) were less than 1% for each disease, whereas those participants who reported that they have been fractured ever were 158 (34.57%). Results of the current study showed that the vast majority of students knew about the importance

Table 1 Personal and educational data of the participants

		N.	%
Age	< 20y	13	2.8%
	20–25y	418	91.8%
	> 25y	26	5.7%
Gender	Male	321	70.2%
	Female	136	29.8%
Residency	Riyadh	162	35.4%
	Al Kharj	265	58%
	Others	30	6.6%
Specialty	Medicine	93	20.4%
	Dentistry	54	11.8%
	Pharmacy	84	18.4%
	Applied medicine	226	49.5%

of calcium (96.7%) and vitamin D (95.4%). The majority (89.4%) of students in the current study knew about osteoporosis. The participant students mentioned in their answer(s) that the source(s) of knowledge was/were the Internet (42.8%), physicians (41.5%), textbooks (21.2%), teachers (19.1%), family and relatives (18.3%), and/or other sources (6.1%) (Table 2).

The majority of male students were not taking the vitamin D tablets, and they represented 215(67.0%) of male participants. Most of the female students were taking vitamin D as 87(64.0%) of female participants but only 49 (36.0%) of females were not taking vitamin D supplement. The majority of the participants who are not using sunscreen were males 277(69.6%). On the other hand, the majority of the participants using sunscreen were females 56 (71.8%). The results show that average sun exposure duration in male participants for more than 20 min per day was 112 (94.9%), from 10 to 20 min per day was 120(74.5%), and for less than 10 min per day was 89 (50.0). On the other hand, the female participants with average sun exposure less than 10 min per day were 89 (50.0%), sun exposure from 10 to 20 min per day were 41(25.5%), and sun exposure more than 20 min per day were 6 (5.1%). (Fig. 1 and Table 3).

Results show that the majority of the students of both male and female were not taking any calcium supplementation (79.6%), and only 20.4% of them took calcium tablet. However, the proportion taking calcium supplement within females was higher compared with males. The average of milk consumption shows none of them consumed any milk (34.79%), and 24.28% drink milk only once per week, and 23.19% drink more than three times per week (Table 4). The results show that average sun exposure duration in fractured participants for more than 20 min per day was 48 (40.7%), from 10–20 min per day was 61(37.9%), and for less than 10 min per day was 49 (27.5). On the other hand, the non-fractured participants with average sun exposure less than 10 min per day were 129 (72.5%), from 10 to 20 min per day were100 (62.1%), and more than 20 min per day were 70 (59.3%) (Fig. 2).

The overall knowledge of the participants appears high as of all the participants, 389 (85.1%) showed good, 54 (11.8%) showed fair, and only 12 (2.6%) showed poor knowledge. On the other hand, the overall attitude of the participants appears improper as of the all participants, 245 (53.6%) showed poor, 165 (36.1%) showed fair, and only 47 (10.3%) showed good practice towards calcium and vitamin D (Fig. 3).

Discussion

Vitamin D or sunshine vitamin is important for the regulation of calcium, bone, and immune homeostasis. Hypovitaminosis D is a risk factor for osteoporosis and may be exacerbated by

Table 2 Response of participants according to gender

		Gender		Total	*p* value
		Male	Female		
Known chronic disease	Yes	38 (74.5%)	13(25.5%)	51(11.15%)	0.479
	No	283(69.7%)	123(30.3%)	406(88.85)	
Knowledge about osteoporosis	Yes	284(69.4%)	125(30.6%)	409(89.50%)	0.273
	No	37(77.1%)	11(22.9%)	48(10.50%)	
Source of knowledge	Multiple sources	115(83.9%)	22(16.1%)	137(29.97%)	< 0.001
	Family	19(44.2%)	24(55.8%)	43(9.40%)	
	Teachers	25(71.4%)	10(28.6%)	35(7.65%)	
	Physicians	63(71.6%)	25(28.4%)	88(19.25)	
	Internet	57(57.0%)	43(43.0%)	100(21.88%)	
	Books	11(57.9%)	8(42.1%)	19(4.15%)	
	Other sources	31(88.6%)	4(11.4%)	35(7.65%)	
Fractured ever	Yes	132(83.5%)	26(16.5%)	158(34.57%)	< 0.001
	No	189(63.2%)	110(36.8%)	299(65.43%)	

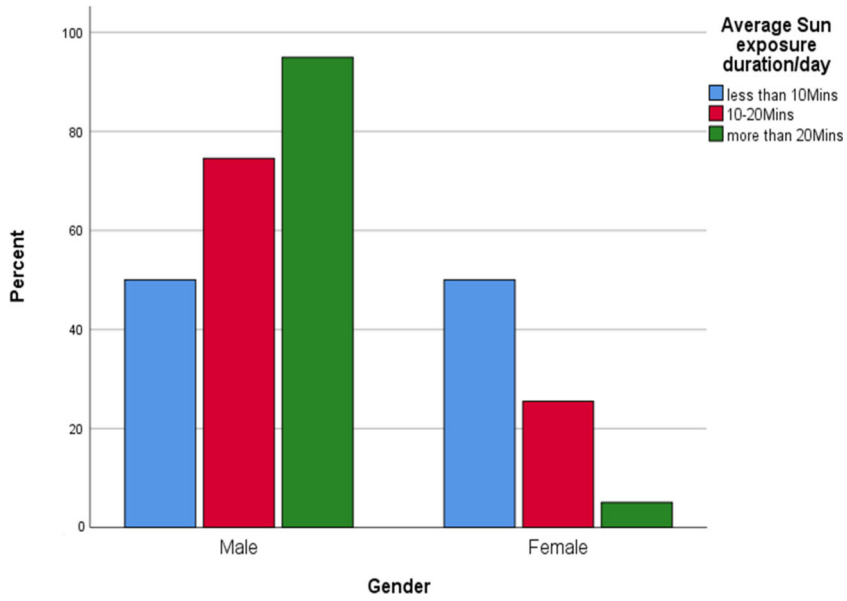

Fig. 1 Response of participants regarding sun exposure duration according to gender

the COVID-19 crisis. The adequate health care for the prevention of vitamin D deficiency remains challenging [16–18]. The current study reports the knowledge and attitude towards the importance of vitamin D and calcium among undergraduate health science students. The findings show that the students have overall high knowledge in approximately 85% of the participants. Whereas, the overall attitude was poor in about 54% of the participants showing gender differences as male participants showed higher sun exposure duration, a higher proportion of females received supplementation of calcium and vitamin D. The inadequate awareness and improper attitude are among the reasons behind vitamin D deficiency. Studies continue to report a significant lack of knowledge and poor attitude towards vitamin D deficiency [19, 20]. Undergraduate health science students have great impact on the progression of public health; health policies; and developing social norms, beliefs, and attitude towards health and wellness among population [21]. The current study revealed that the majority of the participants reported the importance regarding vitamin D and calcium undergraduate health science students; however a lack of knowledge was also reported in small part of participants. Similar studies were conducted in undergraduate medical students which also reported lack of knowledge and poor practice towards vitamin D deficiency

Table 3 Response of participants regarding vitamin D knowledge and practice according to gender

		Gender		Total	*p* value
		Male	Female		
Known importance of vitamin D	Yes	307 (70.4%)	129 (29.6%)	436 (95.4%)	0.7140
	No	14 (66.7%)	7 (33.3%)	21 (4.59%)	
Taking of Omega-3 capsules	Yes	51 (65.38%)	27 (34.61%)	78 (17.06%)	0.303
	No	270 (71.24%)	109 (28.75%)	379 (82.93%)	
Taking of vitamin D tablets	Yes	106 (54.92%)	87 (45.07%)	193 (42.23%)	< 0.001
	No	215 (81.43%)	49 (18.56%)	264 (57.76%)	
Average sun exposure duration	< 10 min	89 (50.0%)	89 (50.0%)	178 (38.9%)	< 0.001
	10–20 min	120 (74.5%)	41 (25.5%)	161 (35.22%)	
	> 20mins	112 (94.9%)	6 (5.1%)	118 (25.8%)	
Using sunscreen	Yes	22 (28.2%)	56 (71.8%)	78 (17.01%)	< 0.001
	No	299 (78.9%)	80 (21.1%)	379 (82.93%)	
Average meals of fish/month	None	163 (70.25%)	69 (29.7%)	232 (50.7%)	0.562
	Once	100 (67.11%)	49 (32.88%)	149 (32.60%)	
	Three times	28 (75.67%)	9 (24.32%)	37 (8.09%)	
	> Three times	30 (76.9%)	9 (23.07%)	39 (8.53%)	

Table 4 Response of participants regarding calcium knowledge and practice according to gender

		Gender		Total	*p* value
		Male	Female		
Known importance of calcium	Yes	310 (70.1%)	132 (29.9%)	442 (97.72%)	0.790
	No	11 (73.3%)	4 (26.7%)	15 (3.28%)	
Taking of calcium tablets	Yes	41 (44.08%)	52 (55.91%)	93 (20.4%)	< 0.001
	No	280 (76.92%)	84 (23.08%)	364 (79.6%)	
Taking milk in diet	Yes	209 (71.1%)	85 (28.9%)	294 (64.33%)	0.594
	No	112 (68.7%)	51 (31.3%)	163 (35.66%)	
Average cups of milk/week	None	109 (68.6%)	50 (31.4%)	159 (34.79%)	0.567
	Once	78 (70.3%)	33 (29.7%)	111 (24.28%)	
	Three times	62 (76.5%)	19 (23.5%)	81 (17.72%)	
	> Three times	72 (67.9%)	34 (32.1%)	106 (23.19%)	

[22, 23]. Also, the current study revealed that 89% of the health science knew about osteoporosis, whereas only just over half of all students had knowledge about osteoporosis nonmedical university students [24]. Any dearth of knowledge is intolerable among health providers. Health science students should play as role models for population. Improving the awareness regarding the importance of calcium and vitamin D at early phase of health profession may extend benefits beyond student own health to their community.

The current study shows that the participants gain the knowledge mainly from the Internet followed by physicians then family, books, and other sources. It has been shown that most of the participant acquired the information from their teachers followed by textbooks and small percent gained information from their family [15]. The role for nontraditional sources like the Internet in gaining medical information was also reported in the knowledge regarding osteoporosis [24]. Emphasizing the online sources for knowledge may increase the awareness in students and young adults.

The current work examined the participant behavior towards sources of calcium and vitamin D including diet, sun exposure, and supplementation. The participants showed poor attitude regarding dietary intake of calcium and vitamin D in more than half of the participants. Also, only less than half of the student participants reported supplementation of calcium and vitamin D. Exposure to sunlight represents the main source for vitamin D compared with dietary sources. The climate of Saudi Arabia is sunny; however real individual sun exposure duration may be limited probably due to hotness. In nonmedical students at Prince Sattam bin AbdulAziz University, Othman-Bahakim et al. reported in a previous work that proper sun exposure practices need further guidance and encouragements from health-promoting programs [11]. In the current study, the majority of male students were with

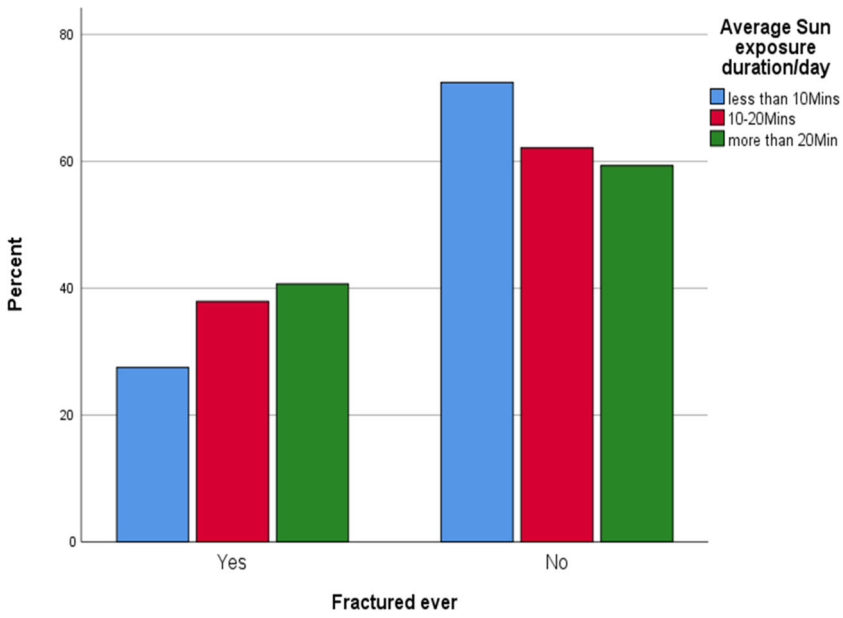

Fig. 2 Response of participants regarding sun exposure duration according to fracture history

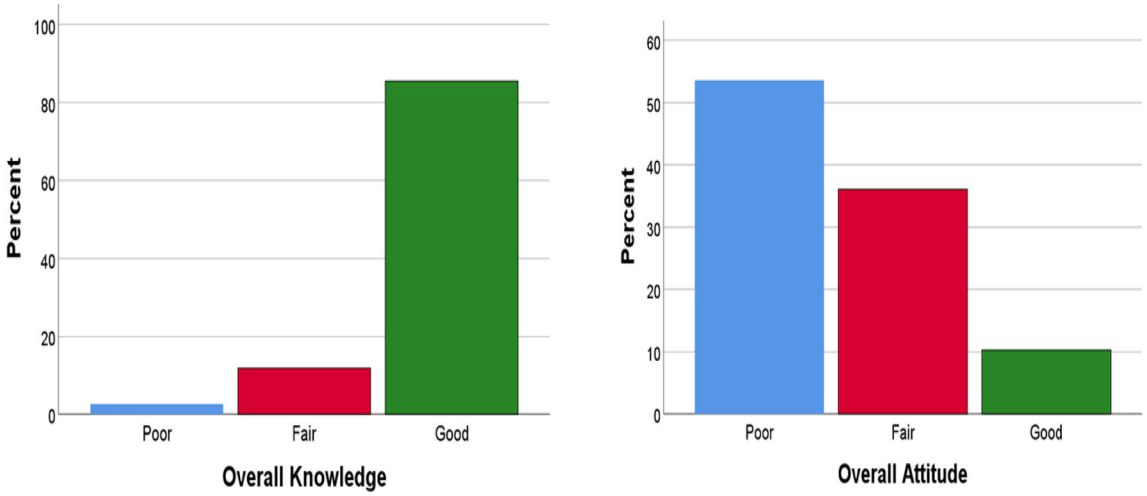

Fig. 3 Response of participants regarding the overall knowledge and overall attitude

average sun exposure duration more than 20 min/day in contrast to the majority of female students with average sun-exposure duration less than 10 min/day. Furthermore, the majority of the participants using sunscreen were females, probably for cosmetic reasons.

Taken together, our study reported that female participants have less sun-exposure than males. Similar results regarding female avoidance of sun exposure were reported from students, and it has been shown that sun awareness is generally inadequate in the Saudi population especially female students [11, 25–27]. Rare exposure to sun was identified as independent predictor of hypovitaminosis D among female university students [28]. A portion of our study populations reported that they have been fractured and most of them were males. The response of study participants show that less supplementation of vitamin D and calcium were reported in male participants. On the other hand, male participants showed higher sun exposure duration. The reason underlying the gender difference may be related to distinct outdoor, driving, and/or other daily life activities and remains to be exactly determined. Undergraduate health students are expected to be part of the solution against unawareness of vitamin D and calcium for proper health. The participants in current study, despite being health science students, still showed poor attitude and behavior towards the sources of calcium and vitamin D. Inadequate awareness and attitude regarding vitamin D were reported from studies conducted in healthcare participants both in Saudi Arabia [13, 29, 30] and worldwide [22, 23, 31]. Despite the good theoretical background in health science students, it was reported that vitamin D deficiency is highly prevalent in medical students [32]. The current study highlights the need for further efforts to change lifestyle and behaviors into healthier attitude towards calcium and vitamin D. Our study showed some limitations; being a cross-sectional survey relaying on self-reported data from the health science students makes it difficult to be generalized. Also, the relatively large sample size with lesser female participation compared to males.

In conclusion, the current study shows undergraduate health science students have high knowledge, but the overall attitude was poor in the participants showing gender differences regarding sun exposure duration and supplementation of calcium and vitamin D. Further work is required to bridge the gap between knowledge and attitude in health science students including more public health programs and/or workshops. Future studies are to be conducted on targeted healthcare provider groups to evaluate and improve their practice towards vitamin D and calcium.

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Authors' contributions This work was performed in collaboration between all authors. They designed the study, collected and processed questionnaires, created the manuscript, and approved the final version of the manuscript.

Data availability Data are available upon request from the author.

Compliance with ethical standards

Ethics approval and consent to participate The ethical committee in College of Medicine, Prince Sattam Bin Abdulaziz University with IRB, (PSAU/COM/RC/IRB/A/19), approved the current study. An informed consent was taken from the study participants, after explanations about the aim of the study to each of them.

Competing interests The author does not have any competing interests to declare.

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