MEDICAL SCIENCE

Awareness of vitamin D deficiency among the general population in Al Qunfudhah, Saudi Arabia

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ABSTRACT

Background: Vitamin D deficiency is very common globally. Previous researches revealed that both men and women suffer from high rates of vitamin D deficiency. The goal is to evaluate the level of awareness regarding vitamin D deficiency in Al-Qunfudah governorate, Saudi Arabia. *Methodology:* A six months cross-sectional study was carried out. 1228 individuals formulated an electronic questionnaire using question items from previously validated questionnaires. *Result:* The total number of participants in the questionnaire is 1228 from Al Qunfudhah, Saudi Arabia. Approximately 46% agreed fat-free diet may be a cause of vitamin D deficiency followed by 37% they don't know. About 42% they don't know that dark skin is more susceptible vitamin lack than lighter skin. A majority of participants aware that exposure to sun enhances production of vitamin D in the skin and they about 93%. 40% agreed that use of sunscreen creams may be a cause of vitamin D deficiency followed by 36% they do not know 45% aware that vegetarians are more likely to have vitamin D deficiency. Most of participants 81% aware and agree that vitamin D help to strengthen immunity and muscles. *Conclusion:* Although adults in the Al-Qunfudah Governorate had a generally acceptable knowledge about vitamin D depressed level, older participants had less. Knowledge level and educational level had a strong correlation. We advise promoting vitamin D's importance and raising people's awareness of its sources through advertisements and campaigns.

Keywords: Vitamin D deficiency, Al-Qunfudah, Awareness, Saudi Arabia.

1. INTRODUCTION

Vitamin D, which is an essential fat-soluble nutrient that is produced in the epidermis when exposed to ultraviolet (UVB) light and it is consumed by taking supplements or from foods as oily fish, egg yolks, veal, beef, liver and

sun-dried mushrooms (Zareef and Jackson, 2021). The two majors biologically are vitamin D3 (cholecalciferol) and vitamin D2 (ergocalciferol) (Al-Daghri, 2018; AbdulRahman et al., 2023), both outcomes as a result of sun exposure and the diet are converted to 25-hydroxyvitamin D (25 (OH) D) (calcidiol) when they enter the liver (Holick, 1990; Abukhelaif et al., 2021). Literature has clearly demonstrated and well-established the significance in several immunological activities and body metabolism (Holick, 2006). According to prior studies, vitamin D decrease health problem associated to a number of medical disorders, such as depression, type 1 diabetes, syndrome X and chronic widespread muscle and bone pain (Deluca, 2008; Hoogendijk et al., 2008).

Having low vitamin D is a serious public health problem in both industrialized and developing nations as the most prevalent dietary deficit (Alamoudi et al., 2019). With over a billion individuals impacted worldwide, it is has become a pandemic at a young age to old age (Holick and Chen, 2008). An extremely high percentage which is reaching to 81% among different age groups, is seen throughout the North and Middle East African region, which includes Saudi Arabia (Alshamsan and Bin-Abbas, 2016; Al-Daghri, 2018). A 60% vitamin D deficiency is estimated based on the literature that is currently accessible on Saudi Arabians (Al-Alyani et al., 2018).

A prominent cause may include sedentary behavior habits, busy lifestyles and poor outdoor activity levels in tropical areas a reduction in nutrition intake and solar exposure, among other things (because of cultural and religious practices, seasonal variation and practice of not taking the child out, increase in pigmentation) (Balasubramanian et al., 2013). Increasing understanding and awareness an effective initial step toward enhancing personal accountability for preventing of this pandemic problem is public health education that targets modifiable beliefs and behavior (Nimitphong and Holick, 2013; Holick, 1995).

To protect the general public from widespread bone and other illnesses, awareness of its role in the regulation of normal physiology and the effects of it lack is necessary (Arshad and Zaidi, 2022). Our aim is to prevent and reduce the prevalence of depression in vit D level in Al-Qunfudhah, Saudi Arabia, by evaluating family knowledge and identifying the most valuable information sources in our community.

2. MATERIAL AND METHODS

Study design and setting

A descriptive cross-sectional study among general people in Alqunfudah was done for five months, started from August 2022 to December 2022. We included Saudi patients, 18 of age and living in Alqunfudah governorate. On the other hand, individuals less than 18 years and people living outside Alqunfudah were excluded from this study. A self-administrated questionnaire in Arabic language is done to gather information regarding participants' perception about the disease and prevention.

An ethical approval (HAPO-02-K-012-2022-11-1287) was provided by the Medical Research and Ethical Committee of University of Umm Al-Qura, Makkah. The respondents approved to cooperate before responding and the purpose was explained before including them in the survey. The replies were anonymous therefore the privacy was protected all the time.

Study sample and procedure for data collection

The total population in Alqunfudah governorate estimated to be 300516. By using raosoft to calculate the size of the sample which was 384 at a 95% CI and an error in margin 5%. An online questionnaire has been distributed via various communication applications such as, WhatsApp, Telegram, twitter and Snapchat by 13 data collectors to achieve the proper sample size 384 of general people.

The questionnaire consisted of two sections. The first is about participants' socio-demographic (age, Nationality, educational level, marital status and having any children) participants were divided into five groups of age. The education status was divided into 4 groups (elementary, secondary, high school or bachelor's degree). The other section is to assess their knowledge about vitamin D function, sources, importance, helps in medical treatment in some diseases and risk factors that can decrease its normal value in the human body. Our work data were collected from August 2022 to December 2022. The total responses collected in the duration was 1220 thus, the study sample was accomplished. The link was designed in requiring answers manner, so no questions were left unanswered.

Statistical analysis

Our data were analyses by using the statistical Program IBM for social science (SPSS) for windows, version 20.0 (SPSS Inc., Chicago, IL). Parametric data were expressed as means, standard deviations and minimums and maximums, while nonparametric data were expressed as numbers and percentages. We compared participants' awareness about vitamin D deficiency and prevention among demographic groups using t-test and a one-way analysis of variance test. A p value is important if it is of less than 0.05.

3. RESULTS

Socio-demographic data

The entire sum of participants in the questionnaire is 1228 from Al Qunfudhah, Saudi Arabia. Major age group in the survey form fall between (18–28) years (46.66 %), then (29-39) were (28.26%), almost who response (98.21%) their nationality are Saudi, utmost of these people have a university degree (68.65%), those have high school education are second most common (25.65%), most of their marital status are married (49.92%) followed by (41.78) are single, most of responds don't have a children (50.41%) and (49.59%) have a children (Table 1).

Table 1 Socio-demographic data (n=1228)

			n	%
1	Age	18-28	573	46.66%
		29-39	347	28.26%
		40-50	229	18.65%
		51-60	59	4.80%
		60 and more	20	1.63%
2	Nationality	Non-Saudi	22	1.79%
		Saudi	1206	98.21%
3	Education	Elementary	30	2.44%
		Intermediate school	40	3.26%
		High school	315	25.65%
		University	843	68.65%
4	Marital status	Divorced	62	5.05%
		Married	613	49.92%
		Single	513	41.78%
		Widowed	40	3.26%
5	Do you Have children	No	619	50.41%
		Yes	609	49.59%

Participants' knowledge of preventive methods to vitamin D deficiency frequency based on the 10 questions

Knowledge of members to preventive methods of vitamin D scarcity show (83.88%) agreed that treat rickets alongside the vitamin D, beside (83.31%) accepted it is important in conserving of phosphates and calcium, also (86.81%) go along with it is importance for teeth and bones, (92.51%) go with agreement of production of vitamin D by sun exposure, as (81.51%) say yes for it is help to strengthen immunity, at the same time (71.66%) decide it is support muscle's strengthen, for fat-free diet in association with this deficiency (47.48%) select yes but (38.60%) they don't know, according to dearth of vitamin D with vegetarians more than non-vegetarians (45.44%) say yes and (40.80%) they don't know, (40.23%) consent the appliance of sunscreen cream may be a cause of this condition however (36.48%) be devoid of information finally in the last question exhibits (42.35%) be without idea about dark skin is related to this problem more than fairer skin, (33.14%) choose yes and (24.51%) select no. (Table 2) (Figure 1).

Table 2 Participants' knowledge of preventive methods to reduce vitamin D lack based on the 10 questions: (n=1228)

			n	%
1	Is Vitamin D is used in treatment of rickets	No	55	4.48%
		Yes	1030	83.88%
		Don't know	143	11.64%
2	Vitamin D is important in calcium and phosphates maintenance	No	36	2.93%
		Yes	1023	83.31%
		Don't know	169	13.76%
3	Is Vitamin D being mandatory for bone and teeth maintenance	No	40	3.26%
		Yes	1066	86.81%
		Don't know	122	9.93%

4	Sun exposure increases production of dermal vitamin D	No	39	3.18%
		Yes	1136	92.51%
		Don't know	53	4.32%
5	Vitamin D useful for immunity	No	43	3.50%
		Yes	1001	81.51%
		Don't know	184	14.98%
6	Vitamin D involved in muscles strength	No	79	6.43%
		Yes	880	71.66%
		Don't know	269	21.91%
7	A fat-free diet may be a cause of vitamin D insufficiency	No	171	13.93%
		Yes	583	47.48%
		Don't know	474	38.60%
8	Vegetarians largely exposed to have vitamin D defect than non-vegetarians	No	169	13.76%
		Yes	558	45.44%
		Don't know	501	40.80%
9	Use of creams of sunscreen may be a cause of vitamin D insult	No	286	23.29%
		Yes	494	40.23%
		Don't know	448	36.48%
10	Dark skin is more prone to vitamin D decreasment than fairer skin	No	301	24.51%
		Yes	407	33.14%
		Don't know	520	42.35%

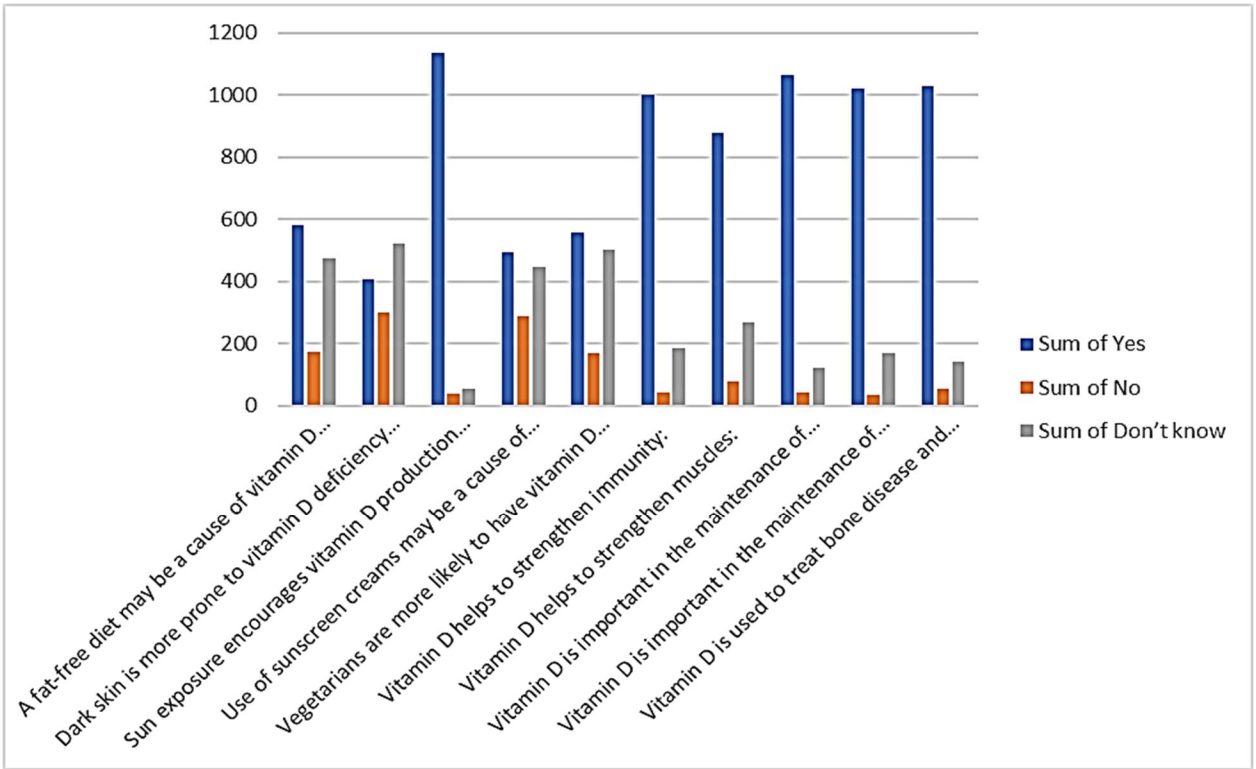

Figure 1 Bar Chart for all the 10 questions

Association between general knowledge formed on the 10 questions and Socio-demographic

Overall, the table 3 show the largest number answers are "yes" 8178 (66.95%), then "don't know" 2883 (23.48%) and in the last is "no" 1219 (9.57%). The statistical analysis described the correlation between general knowledge and socio-demographic data discovered that: Regarding age with "yes" the dominant age group (18-28) 3765 (46.03%) thereafter 2274 (27.81%) which is represent (29-39) years (p-value=<0.00001), a significant relation with nationality appears the Saudis are the greatest with 8048 (98.41%) say

yes (p-value=<0.003797), in an education level university degree get the highest 5624 (68.77%) (P-value=<0.012536), after that in a marital status the most category who agree with questions are married 4093 (50.05%) followed by single 3381 (41.34%) (P-value=<0.000029) and in the last however the participants who have a children 4156 (50.82%) accept these information are greater than who don't have a children 4022 (49.18%) (P-value=<0.000329) (Table 3) (Figure 2, 3).

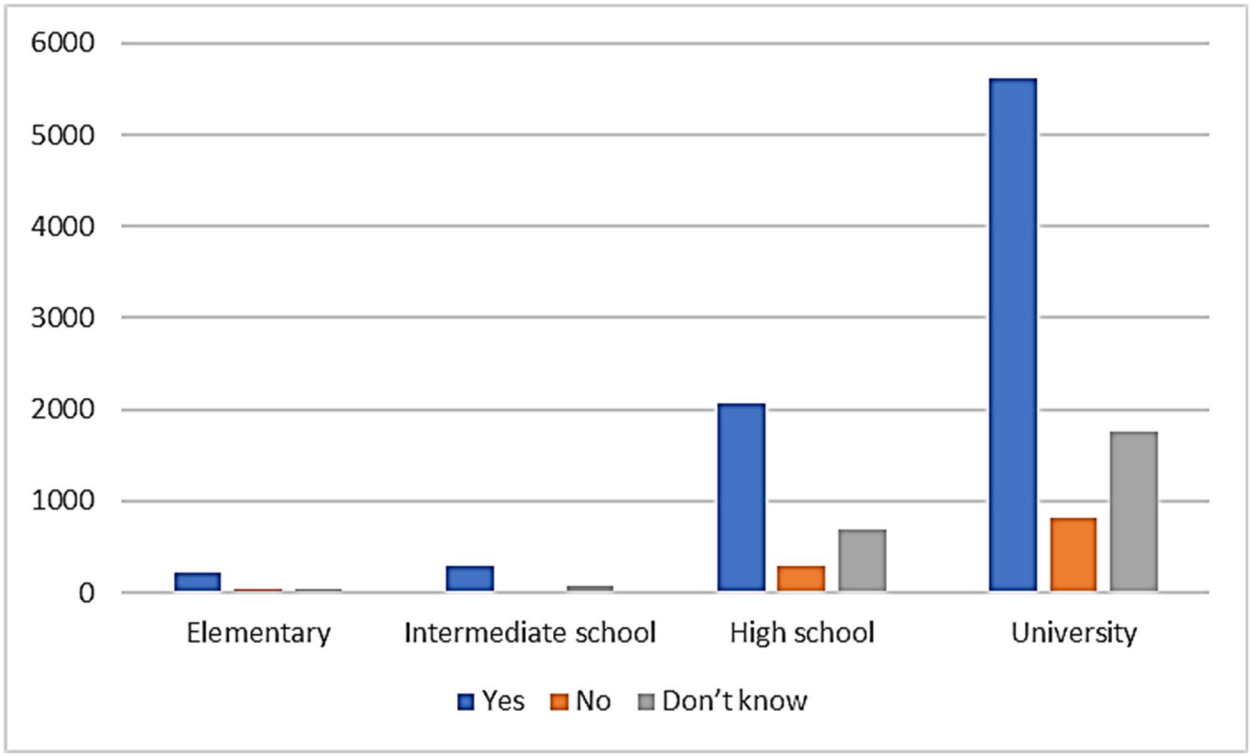

Figure 2 The relationship between education and the general knowledge of Al-Qunfudhah population with preventive methods to reduce vitamin D poorness based on the 10 questions

Table 3 Association between general knowledge based on the 10 questions and socio-demographic data

		General Knowledge based on the 10 questions			
		No (1219)	Yes (8178)	Don't know (2883)	
Age	18-28	635	3765	1330	$p < 0.05$ The chi-square statistic is 81.0581. The p-value is < 0.00001. The result is significant at $\alpha = 0.05$.
	29-39	312	2274	884	
	40-50	197	1537	556	
	51-60	49	435	106	
	60 and more	26	167	7	
Nationality	Non-Saudi	29	130	61	$p < 0.05$ The chi-square statistic is 6.0094. The p-value is 0.003797. The result is significant at $\alpha = 0.05$.
	Saudi	1190	8048	2822	
Education	Elementary	35	211	54	$p < 0.05$ The chi-square statistic is 16.2371. The p-value is 0.012536. The result is significant at $\alpha = 0.05$.
	Intermediate school	24	283	93	
	High school	309	2060	781	
	University	851	5624	1955	
Marital status	Divorced	87	401	132	$p < 0.05$ The chi-square statistic is 30.7289. The p-value is 0.000029.
	Married	575	4093	1462	
	Single	527	3381	1222	

	Widowed	30	303	67	The result is significant at $\alpha = 0.05$.
Do you Have children	No	661	4022	1507	$p < 0.05$ The chi-square statistic is 16.0379. The p-value is 0.000329. The result is significant at $\alpha = 0.05$.
	Yes	558	4156	1376	

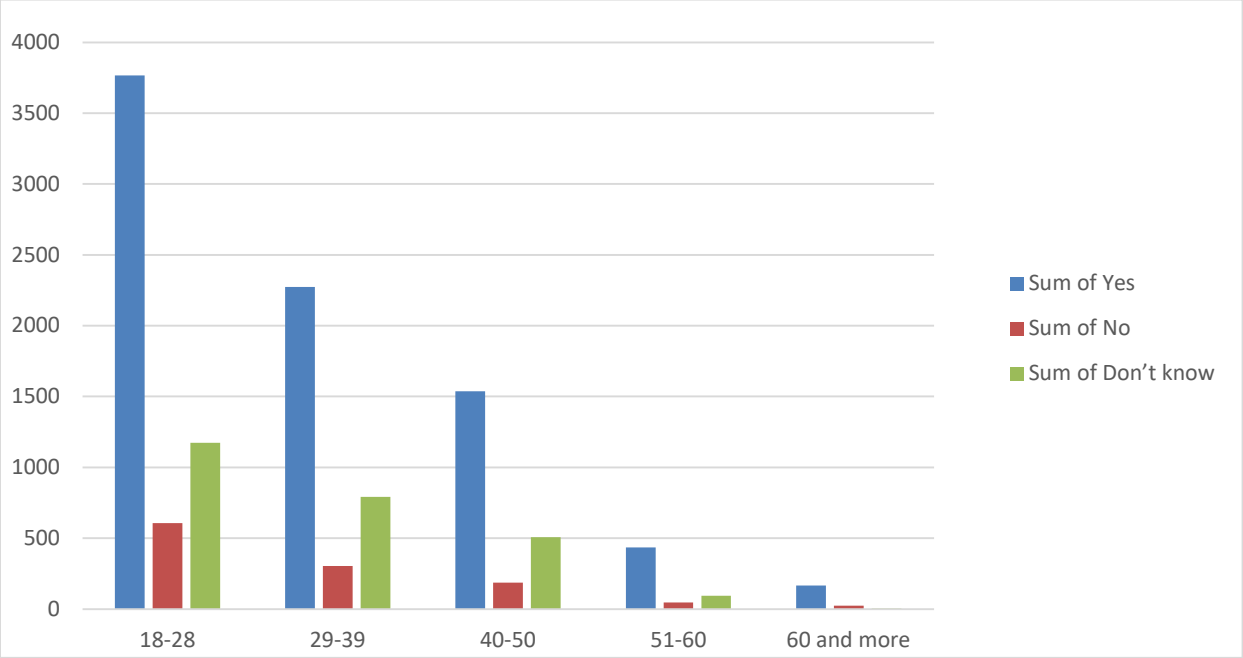

Figure 3 The relationship between Age and the general knowledge of Al-Qunfudhah population with preventive methods to reduce vitamin d lack based on the 10 questions

4. DISCUSSION

Worldwide, this medical condition is a big burden in health society affecting all age groups (Mithal et al., 2009; Wahl, et al., 2012). It helps in minerals homeostasis and bone metabolism has been well recognized (Wahl et al., 2012; Al-Daghri et al., 2018). In children, it can cause nutritional rickets, impaired growth, developmental delays, lethargy and hypocalcemic seizures (Alshahrani and Aljohani, 2013). Lack of knowledge and the significance of these organic molecules can increase the risk deficiency conducted in several previous epidemiological studies including UK, USA, India and Saudi Arabia (Alemu and Varnam, 2012; Alamoudi et al., 2019; Kung and Lee, 2006). The current data revealed a lot of participants have valuable information about the function of this vitamin in the human body as helping in maintaining minerals, bone and teeth and strengthening immunity and muscle.

Our result in consistent with previous study in Jeddah (Alamoudi et al., 2019), in contrast finding in Pakistani's study among university students with a lack of awareness of the function in the body (Tariq et al., 2020), sunlight is the main source (Christie and Mason, 2011). However, several factors could affect it such using sun protection, black skin and old age (Holick, 2007; Clemens et al., 1982). In our result, the majority agree that sunlight could be useful. Despite that a lot of people have no idea about its restriction like sunscreen and dark skin. Also, they are unable to know either free-fat diet is considered to be an etiological factor as bonus being vegetarian which parallel to previous study in Jeddah (Alamoudi et al., 2019) urgent need for more attitudes toward sun exposure can help and dietary resources.

Our findings revealed that high-level education people have excellent information, anyhow no difference between males and females, married or not. This finding cooperative with Jeddah study (Alamoudi et al., 2019). While Al-Agha et al., (2016) conducted that there's no difference to be in collage or still in school to know the proper information.

Limitation

Our research assesses health attitudes and prevention of vitamin D depressed level which is quite valuable but needs further awareness, particularly resources because of gap of knowledge noted. Besides, the cross-section study through online self-link may potentially risk for no response biases.

5. CONCLUSION

The study reflected good knowledge of important vitamin D being exposed to the Sun is good, but there's poor awareness about restricted factors and dietary resources. We recommend educating the community through campaigns, schools visits and seminars, about sunlight and barriers also, lifestyle modification like vitamins rich diet.

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Author's contributions

Dr Medhat Taha: Concept and design of the study, clinical studies and supervision of the study.

Dr Hassan Alsuhabi: Manuscript preparation and literature search and critical and final revision as well as final editing of the manuscript.

Ebrahem R Alsohabi, Fatimah M Alhassany: Concept and design of the study, manuscript preparation and literature search, data acquisition and carried out the initial and statistical analyses.

Abdullah A Alrashdi, Nawaf H AlRufaydi: Manuscript preparation and literature search, data acquisition.

Alhassan H Alfaqeh, Ali H Alfaqih, Khalid H Almahmudi: Data collection, clinical studies and revised the manuscript.

Ethical Approval

The study was approved by the Medical Ethics Committee of the Medical Research of Umm Al-Qura University, Makkah (Ethical Approval code HAPO-02-K-012-2022-11-1287).

Informed consent

Not applicable.

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Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

REFERENCES AND NOTES

1. AbdulRahman KAB, Aljasser KA, Al-Kabi AA, Alramadhan ZT, Alhussaini JT, Almutairi AM, Alshibely AY, Alharthi AM, Oraif MF, Alotaibi RM. Assessment of knowledge and awareness of vitamin D deficiency among medical students in Saudi Arabia: A cross-sectional study. Medical Science 2023; 27: e23ms2735. doi: 10.54905/disssi/v27i131/e23ms2735
2. Abukhelaif AE, Alzahrani SA, Al-Thobaiti LY, Alharbi AA, Al-Shumrani KM, Alghamdi YS. Assessment level of awareness of Vitamin D deficiency among the public residents of Al-Baha region; Saudi Arabia. Medical Science 2021; 25(116):2728-2736
3. Al-Agha AE, Alorabi SH, Noor-Saeed SM, Shalabi NM. Awareness of vitamin D and its deficiency in Jeddah population, Saudi Arabia. J Community Public Health Nurs 2016; 2(120):2
4. Al-Alyani H, Al-Turki HA, Al-Essa ON, Alani FM, Sadat-Ali M. Vitamin D deficiency in Saudi Arabians: A reality or simply hype: A meta-analysis (2008-2015). J Fam Community Med 2018; 25(1):1-4. doi: 10.4103/jfcm.JFCM_73_17
5. Alamoudi LH, Almuteeri RZ, Al-Otaibi ME, Alshaer DA, Fatani SK, Alghamdi MM, Safdar OY. Awareness of Vitamin D deficiency among the general population in Jeddah, Saudi Arabia. J Nutr Metab 2019; 2019:4138187. doi: 10.1155/2019/4138187
6. Al-Daghri NM. Vitamin D in Saudi Arabia: Prevalence, distribution and disease associations. J Steroid Biochem Mol Biol 2018; 175:102-107. doi: 10.1016/j.jsbmb.2016.12.017
7. Alemu E, Varnam R. Awareness of vitamin D deficiency among at-risk patients. BMC Res Notes 2012; 5:17. doi: 10.1186/1756-0500-5-17

8. Alshahrani F, Aljohani N. Vitamin D: Deficiency, sufficiency and toxicity. Nutrients 2013; 5(9):3605-16. doi: 10.3390/nu5093605
9. Alshamsan FM, Bin-Abbas BS. Knowledge, awareness, attitudes and sources of vitamin D deficiency and sufficiency in Saudi children. Saudi Med J 2016; 37(5):579-583. doi: 10.15537/smj.2016.5.14951
10. Arshad S and Zaidi SJA. Vitamin D levels among children, adolescents, adults and elders in Pakistani population: A cross-sectional study. BMC Public Health 2022; 22(1):2040. doi: 10.1186/s12889-022-14526-6
11. Balasubramanian S, Dhanalakshmi K, Amperayani S. Vitamin D deficiency in childhood: A review of current guidelines on diagnosis and management. Indian Pediatr 2013; 50(7):669-675. doi: 10.1007/s13312-013-0200-3
12. Christie FT, Mason L. Knowledge, attitude and practice regarding vitamin D deficiency among female students in Saudi Arabia: A qualitative exploration. Int J Rheum Dis 2011; 14(3):e22-9. doi: 10.1111/j.1756-185X.2011.01624.x
13. Clemens TL, Adams JS, Henderson SL, Holick MF. Increased skin pigment reduces the capacity of skin to synthesize vitamin D3. Lancet 1982; 1(8263):74-6. doi: 10.1016/s0140-6736(82)90214-8
14. Deluca HF. Evolution of our understanding of vitamin D. Nutr Rev 2008; 66(10 Suppl 2):S73-S87. doi: 10.1111/j.1753-4887.2008. 00105.x
15. Holick MF, Chen TC. Vitamin D deficiency: A worldwide problem with health consequences. Am J Clin Nutr 2008; 87(4):1080S-6S. doi: 10.1155/2019/4138187
16. Holick MF. Environmental factors that influence the cutaneous production of vitamin D. Am J Clin Nutr 1995; 61(3 Suppl):638S-645S. doi: 10.1093/ajcn/61.3.638S
17. Holick MF. The role of vitamin D for bone health and fracture prevention. Curr Osteoporos Rep 2006; 4(3):96-102. doi: 10.1007/s11914-996-0028-z
18. Holick MF. The use and interpretation of assays for vitamin D and its metabolites. J Nutr 1990; 120 Suppl 11(Suppl 11):1464-1469. doi: 10.1093/jn/120.suppl_11.1464
19. Holick MF. Vitamin D deficiency. N Engl J Med 2007; 357(3):266-81. doi: 10.1056/NEJMra070553
20. Hoogendijk WJ, Lips P, Dik MG, Deeg DJ, Beekman AT, Penninx BW. Depression is associated with decreased 25-hydroxyvitamin D and increased parathyroid hormone levels in older adults. Arch Gen Psychiatry 2008; 65(5):508-512. doi: 10.1001/archpsyc.65.5.508
21. Kung AW, Lee KK. Knowledge of vitamin D and perceptions and attitudes toward sunlight among Chinese middle-aged and elderly women: A population survey in Hong Kong. BMC Public Health 2006; 6:226. doi: 10.1186/1471-2458-6-226
22. Mithal A, Wahl DA, Bonjour JP, Burckhardt P, Dawson-Hughes B, Eisman JA, Fuleihan GE, Josse RG, Lips P, Morales-Torres J; IOF Committee of Scientific Advisors (CSA) Nutrition Working Group. Global vitamin D status and determinants of hypovitaminosis D. Osteoporos Int 2009; 20(11):1807-20. doi: 10.1007/s00198-009-0954-6
23. Nimitphong H, Holick MF. Vitamin D status and sun exposure in Southeast Asia. Dermatoendocrinol 2013; 5(1):34-37. doi: 10.4161/derm.24054
24. Tariq A, Khan SR, Basharat A. Assessment of knowledge, attitudes and practice towards Vitamin D among university students in Pakistan. BMC Public Health 2020; 20(1):355. doi: 10.1186/s12889-020-8453-y
25. Wahl DA, Cooper C, Ebeling PR, Eggersdorfer M, Hilger J, Hoffmann K, Josse R, Kanis JA, Mithal A, Pierroz DD, Stenmark J, Stöcklin E, Dawson-Hughes B. A global representation of vitamin D status in healthy populations. Arch Osteoporos 2012; 7:155-72. doi: 10.1007/s11657-012-0093-0
26. Zareef TA, Jackson RT. Knowledge and attitudes about vitamin D and sunlight exposure in premenopausal women living in Jeddah, and their relationship with serum vitamin D levels. J Health Popul Nutr 2021; 40(1):38. doi: 10.1186/s41043-021-00263-w