

Covid-19 and the Level of Awareness of Vitamin D Among Saudi Population – A Cross-Sectional Study of Dental Public Health Perspective

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ABSTRACT

Introduction

Vitamin D is a fat-soluble vitamin of importance necessary for calcium homeostasis, healthy bones, and prevention of fractures. It has also been linked to many metabolic, infectious and autoimmune diseases. Vitamin D levels are also being studied with respect to oral health issues such as dental caries, and periodontitis. Vitamin D deficiencies have been found to be relatively common among Covid-19 patients and who received supplements experienced less severe symptoms. The credible proposals for vitamin D supplementation to avoid infection and mortality due to Covid-19 validate the chance of raising public awareness on significance of its health benefits. Thus, we carried out this research to study the influence of Covid-19 on Saudi Arabian population's awareness of vitamin D with a dental public health perspective.

Materials and methods

A cross-sectional study of the Saudi Arabian general population was undertaken with 240 subjects, including men and women chosen at random varying a range of age groups from 18 to 74 years after consent and institutional approval. Sample size was computed using G-power software. Pretested, validated questionnaire, translated to Arabic was disseminated through e-mails and all prominent social medias. Statistical analysis was done using statistical package for the social sciences (SPSS) version 26.0. Bivariate analysis was performed using chi-square test at 5% significance level.

Results

Out of 240 people participated; 57% were men, and 43% were women. Majority were between the ages of 18 and 30 years. 65% of the participants were aware that vitamin D is important for bone health, supports oral health, reducing tooth decay, and lowering the risk of heart disease. Half of the study population believe that the sunlight is the prime source of vitamin D and 80% assumed that the ideal time of sunshine exposure is in the morning. 88.3% of them projected the need to increase their knowledge about vitamin D.

Conclusion

There was a lack of awareness and knowledge about vitamin D and its significance for the body and teeth, as well as its relationship to Covid-19. The pandemic had no significant impact on society's awareness about vitamin D. This study emphasises the importance of raising awareness among the public about vitamin D and ways to prevent its deficiencies.

Keywords

Awareness, COVID-19, Saudi Arabia, Vitamin D

Introduction

Vitamin D is a fat-soluble vitamin of importance necessary for calcium homeostasis, healthy bones, and prevention of fractures. It has also been linked to many metabolic, infectious and autoimmune diseases.¹ It maintains calcium-phosphorus balance and regulating bone metabolism.² Previous researches has identified a strong correlation between vitamin D insufficiency and a number of prevalent chronic illnesses like diabetes, asthma, and rheumatoid arthritis that are characterised by elevated inflammatory response and immune system dysfunction.^{3,4} Aside from the aforementioned benefits, vitamin D levels are being studied in relation to oral health issues such as dental caries, periodontitis.⁵

Vitamin D, sometimes called as the “sunshine” vitamin, is a critical subject that has drawn the interest of many researchers and the general public in recent decades, as a sizable part of the

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worldwide population is lacking in this key element. It affects people of all ages worldwide, especially those living in lower-latitude nations. It was previously believed that UV light was sufficient to avert these deficiencies.^{1,6} A meta-analysis done by Al- Alyani *et al.*, revealed that the total prevalence of Vitamin D insufficiency rate in the healthy Saudi Arabian population is 60%.⁷ The main contributing factors to Vitamin D insufficiencies in the Saudi Arabia include a dearth of vitamin awareness and practice, unhealthy lifestyle choices, indoor pursuits, excessive clothing use, and irregular exposure to the sunshine.⁸

Patients with COVID-19 have been noticed to have a fair amount of vitamin D insufficiency (9). COVID positive individuals who took vitamin D supplementation experienced lesser symptoms.⁹ It was proposed that increasing vitamin D levels could lower the probability of SARS-CoV-2 and COVID-19 development.¹⁰ Immunological reactions have been demonstrated to be modulated by vitamin D. Because of the enormous toll of COVID-19 takes on the immune response, extensive attention has been paid in vitamin D's ability to improve or prevent unfavourable immunological responses.¹¹ People who are susceptible to the flu and/or COVID-19 need to receive 10,000 IU/day of cholecalciferol for several weeks to elevate 25(OH)D levels, then following with 5000 IU/day, to lower the likelihood of infection.¹²

According to several observational studies, low serum vitamin D levels are positively linked with both the frequency and death rate of COVID-19 in hospitalised patients.¹³⁻¹⁵ Very few studies have been conducted to appraise the knowledge, attitudes, and practices about vitamin D, direct sunlight exposure, and vitamin D supplementation.¹⁶⁻¹⁸ Since the commencement of the COVID-19 pandemic, there have been credible proposals that vitamin D intake should be supplemented to avoid infection and mortality.¹⁹

This may demonstrate the necessity of raising public awareness of vitamin D's significance in order to reduce the health problems brought on by its insufficiency. Additionally, it will call for advocating education to increase their exposure to the sun, consumption of foods high in vitamin D, and usage of vitamin D supplementation. As a result, the general public should be aware of the increased understanding, awareness, and pivotal role of appropriate vitamin D practices. The favourable health consequences include the prevention of illnesses caused by deficiency and inadequacy.

prevention is important, and some studies suggest that alternative medicines, such as vitamin D supplements, can help prevent COVID-19, but more research is needed.¹² Numerous immune-modulating characteristics of vitamin D protect against viral infection.¹³ Henceforth, the study was aimed to study the influence of COVID-19 on Saudi Arabian population's awareness of vitamin D, as well as their attitudes and practices about sunlight exposure and vitamin D supplementation with a dental public health perspective.

Materials and Methods:

Study Design and Ethical Consideration_

A cross-sectional study of the Saudi Arabian general population was undertaken with 240 subjects, including men and women chosen at random from a range of age groups from 18 to 74 years. The research was done in compliance with the Helsinki Declaration. Apart from Institutional Ethics Committee's permission, and informed consent was obtained prior to the study.

Study Sample and Eligibility Criteria_

Keeping in mind the expected power of our study (80%) and 95% confidence interval, the sample size was computed by utilizing G-power software and the total sample was 240. Participants who are consented and can read and understand were included in the study. Participants with any disability that might interfere with their understanding of the questions were excluded.

Data Collection_

Participants were recruited to the study using simple random sampling method. Participants email addresses or WhatsApp numbers were collected, and then a pretested, validated questionnaire which was translated to Arabic was emailed or sent by Whatsapp in Google form to the participants. Google forms links were also send through all prominent social medias in Saudi Arabia. There were 29 items in the questionnaire which was categorized in two four parts, first section was to collect the demographic data of the participants, followed by knowledge and awareness of vitamin D supplementation, sunlight exposure, and vitamin D practices.

Statistical Analysis

Frequency calculations were made using a Microsoft Form, data was extracted to MS Excel, and analyzed with Statistical Package for the Social Sciences (SPSS)

version 26.0. MS Excel was utilised to compute the results and number of responses. Bivariate analysis was done by applying the Chi-square test at 5% significance level. Comparisons based on gender were made for several knowledge, attitude, and practice areas.

Results

240 people from Saudi Arabia's general population participated in this study as a whole; 57% of the participants were men, and 43% were women. There was only one participant who declined to take part in the study. Most of the participants were between the ages of 18 and 30. 97% of the attendees belonged to the religion of Islam. 33% of them were students, 18% worked for the government, 17% were unemployed, and 16% were stay-at-home moms. 41.8% of the individuals were married (**Table 1** illustrates the demographic traits of the sample).

The influence of vitamin D for healthy bones, good oral health, reducing tooth decay, and lowering the risk of heart disease was known to 65% of the study population. Only half of the people believe that the most effective means of receiving vitamin D is by exposure to sunshine. Half of the people think the best source of vitamin D are Dairy products, fatty fish, Red meat and yolk (Table -1). The vast majority 80% knows that the best time of sunlight exposure for vitamin D is early in the morning. 114 people (48%) were unaware about the normal amount of vitamin D in the mankind. Even the most of the people are not aware about the daily vitamin D requirement for adult and children. 94 (39%) of individuals believed that the sole cause of vitamin D deficiency was limited exposure to sunshine.

Table 1: Sociodemographic traits of the study participants

Sl. No.	Variables		N = 239 (%)
1	Gender	Males	137 (57.3)
		Females	102 (42.7)
2	Age (Years)	<18	4 (1.7)
		18-30	166 (69.5)
		31-40	44 (18.4)
		>40	25(10.5)
3	Education	Postgraduate	23 (9.6)
		Bachelor's degree	135 (56.5)

Sl. No.	Variables		N = 239 (%)
		Diploma	32 (13.4)
		High school	45 (18.8)
		Primary school	4 (1.7)
4	Religion	Christianity	4 (1.7)
		Islam	234 (97.9)
		Other religions	1(0.4)
5	Employment	Government employee	44(18.4)
		House wife	38 (15.9)
		Private business	15(6.3)
		Private employee	22(9.2)
		Student	79(33.1)
		Unemployed	41(17.2)
6	Marital status	Married	100 (41.8)
		Separated	1(0.4)
		Single	138 (57.7)

The data represented is frequency with percentage in parenthesis.

Most of the individuals had either vitamin D deficiency 105(44%) and some 93 (38.9%) did not know if they had vitamin D deficiency or not (Table-2). Around 130 (54.4%) people were convicted that their knowledge of vitamin D had not changed Post-Covid-19 epidemic (Table -2). Most of the individuals (88.3%) expected that they need to increase their knowledge of vitamin D and a large portion of people (54%) do not have any idea of link between vitamin D and COVID-

19.

DISCUSSION

Vitamin D is crucial for the health of our body and teeth, however many people are deficient in it. The study revealed a dearth of awareness regarding vitamin D, including its significance, the right amount of duration and length to spend outside, and the signs of a vitamin D shortage. Henceforth, the majority of participants wish to increase their understanding of vitamin D.

Education on the value of vitamin D and the dangers of its deficiencies may raise worries, and this understanding may prompt actions that can raise vitamin D levels. Just over half of the participants in our study were aware that vitamin D serves a primary role in maintaining

Table 2: Association between age and increase in awareness of Vitamin D

			I have not heard of vitamin D before or after Covid -19	A little change of knowledge of vitamin D	A significant change of knowledge of vitamin D	No change of knowledge of vitamin D after Covid -19	Total
Age	From 18-30 years	Count	21	38	18	89	166
		% within Age	12.7%	22.9%	10.8%	53.6%	100.0%
		% of Total	8.8%	15.9%	7.5%	37.2%	69.5%
	From 31-40 years old	Count	1	8	10	25	44
		% within Age	2.3%	18.2%	22.7%	56.8%	100.0%
		% of Total	0.4%	3.3%	4.2%	10.5%	18.4%
	More than 40 years old	Count	0	9	2	14	25
		% within Age	0.0%	36.0%	8.0%	56.0%	100.0%
		% of Total	0.0%	3.8%	0.8%	5.9%	10.5%
	under 18 years old	Count	0	1	1	2	4
		% within Age	0.0%	25.0%	25.0%	50.0%	100.0%
		% of Total	0.0%	0.4%	0.4%	0.8%	1.7%
Total	Count	22	56	31	130	239	
	% of Total	9.2%	23.4%	13.0%	54.4%	100.0%	
Pearson Chi-Square Value = 14.158				p value = 0.117			

Statistical test used: Chi-square (χ^2); * $p < 0.05$ - statistically significant.

healthy bones, good oral and cardiac health. Similar findings were found in previous studies.^{20,21} People who regularly do vitamin D investigations and have access to more knowledge about vitamin D sources and typical concentrations tend to eat foods and supplements that are high in vitamin D. In our research, most of the participants believed that foods enriched with vitamin D are seafood, the yolk of eggs, dairy products and beef liver, similar results are seen in research conducted by Jalal et al.,²² whereas in the study conducted by Alhmaid et al., majority of the individuals think that foods enriched with vitamin D are milk and dairy products.⁸ In the study by Zmitek et al.,²³ fish and eggs are believed as of the primary reservoir of vitamin D. The present study findings reveal that the many individuals

were unaware of the normal body concentration of vitamin D. the findings were congruent with that of Day et.al.,²⁴ whereas, in the study by Zmitek et al.,²³ results reflects good knowledge about recommended dosage of vitamin D.

37% of participants in our research checked their vitamin D level irregularly which also attribute to the increased testing and free health facilities in Saudi Arabia. Alkalash et al.¹⁸ reported 45.1% of individuals explore their vitamin D serum level test and 72% of participants in a study by Tariq A, et al.,²⁵ claimed that they hardly underwent the evaluation of vitamin D.

Many individuals in this study (80%) reported that appropriate time for sunlight exposure to the sun to

obtain vitamin D indicated that early morning was the best option. These results were comparable to those of another study by Al-Agha et al.,²⁶ in which 82% of respondents indicated that early morning were the ideal time for exposure to the sunshine to acquire vitamin D. In this study, 73% of participants said that exposure to the sun for between 10 and 15 minutes is necessary, while in the study,²⁶ the most popular response, chosen by 47% of all participants, was fewer than 30 minutes.

People who are well-informed about the signs and danger signs of vitamin D deficiency can alter their daily habits for the better. In contrast to the research by Agens et al.²⁷ where only 28.5% of the cases complained of bone pain and 26.5% were diagnosed with bone fracture, nearly 72% of participants in our study correctly identified all of the vitamin D deficiency symptoms such as fatigue, depression, weak bones, chronic and continuous pain in different parts of the body. Meanwhile, around one-third of individuals in the present study (32%) were unaware of the dangers of vitamin D insufficiency. 27% of respondents believe obesity and underweight are the main causes of deficiency, while 23% believe older people are more inclined to have it. Comparable findings were observed in the study done by Alamoudi et al.,²⁸ but in the research conducted by Kung et al.,²⁹ a significant majority of the participants (46.9%) are aware that the main cause of vitamin D deficiencies occurs owing to inadequate sunlight exposure.

The majority of our survey respondents (88%) felt that they needed to learn more about vitamin D. Similar to this, Abu Hassan et al., reported that the vast majority of respondents said they would appreciate additional knowledge on the influence of vitamin D.³⁰ This shows the necessity for vitamin D health education.

Nowadays, everyone tends to choose social media for learning, which may be the reason why the majority of study participants (54%) believe that after COVID-19, awareness of vitamin D remained the same, while about 35% thought that awareness of vitamin D had increased. In contrast, most of the participants in a study by Alhomaïd, et al.⁸ thought that understanding of vitamin D has increased since the study's completion.

In this study, more than half of individuals (54%) were unaware of the connection between vitamin D supplementation and COVID-19, and 30% believed that a vitamin D deficit made covid-19 infections more likely. Whereas, a significant portion of participants

(67.7%) in the study⁸ believed that vitamin D enhanced resistance to COVID-19 and improved immunity against viral infection.

The drive against vitamin D insufficiency should be prioritized by medical experts and public health organizations. For the general public, food fortification is one possible strategy, as is vitamin D administration for older people, pregnant women, and children who are particularly at risk. An additional approach is to promote changes in behavior like outdoor exercise for the prevention of obesity along with moderate and appropriate exposure to sunlight and a wholesome diet.

The goal of this study is to raise awareness of a significant health problem, such as vitamin D insufficiency, establish the underlying causes of it, and suggest remedies. Despite of the limitation of the design of observational study and the potential biases due to self-reported data, this study has contributed to the body of literature because there is a paucity of data in the Middle East about knowledge of vitamin D and COVID-19. The causal findings are constrained by the study design. The sample size was limited, and respondents were primarily from Saudi Arabia's central region, making extrapolation to other cities challenging. Due to the survey-style structure of this study, it should be emphasised that the results depend on the respondents' subjective judgements, which may affect how reliability of the results. However, to dispel myths and remove barriers to the existing knowledge concerning the significance of vitamin D as adjuvant therapy in COVID-19, prospective clinical studies are warranted.

CONCLUSION

The participants acknowledged having a basic understanding of vitamin D. Yet, they admitted having little comprehension of vitamin D's importance for the body, teeth, and relationship to Covid-19. Additionally, the pandemic had little effect on society's understanding of vitamin D. Even if there are many basic methods of comprehending matters, the mankind still lacks an immense amount of understanding on vitamin D. The majority of people had a resoundingly favourable view on vitamin D deficiency, which might persuade them to exhibit behavioral changes addressing vitamin D. This study emphasises the importance of raising awareness among the public about vitamin D and ways to prevent

its deficiencies. Understanding the attitudes, knowledge, and awareness of vitamin D could help direct initiatives targeted at ensuring that the Saudi population has an optimum level of vitamin D.

Conflict of Interest

The author reviewed and approved the final version and has agreed to be accountable for all aspects of the work, including any accuracy or integrity issues.

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Data Availability

The data is exclusively available from the principal author for research purposes only.

Author's Contribution

All authors contributed significantly to the work, whether in the conception, design, utilization, collection, analysis, and interpretation of data or all these areas. They also participated in the paper's drafting, revision, or critical review, gave their final approval for the version that would be published, decided on the journal to which the article would be submitted, and made the responsible decision to be held accountable for all aspects of the work.

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