ORIGINAL ARTICLE

Knowledge and Awareness Level of Vitamin D Deficiency and its Effect on the Lower Jaw in Saudi Arabia

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Abstract

Background: Vitamin D deficiency (VDD) is a prevalent public health issue in Saudi Arabia and is increasingly recognized for its role in skeletal and oral health, including effects on the lower jaw. This study aimed to assess the level of knowledge and awareness regarding VDD and its impact on the lower jaw among adults in Saudi Arabia. **Methods:** A descriptive cross-sectional study was conducted among 380 participants. A structured questionnaire was used to assess demographic characteristics and knowledge related to vitamin D benefits, deficiency, and its oral health implications. Data were analyzed using descriptive statistics, chi-square tests, and logistic regression. **Results:** The mean age of participants was 30.39 ± 10.96 years, with females representing 82.4% of the sample. Overall, 46.1% demonstrated good knowledge, 29.2% moderate knowledge, and 24.7% poor knowledge, indicating that 75.3% had adequate awareness. High awareness was observed for general aspects of Vitamin D, such as its role in bone health (88.2%), calcium absorption (79.5%), and sunlight as a source (96.6%). However, knowledge regarding its specific effects on oral and lower jaw health was lower, with <50% correctly identifying associations with gum health and jawbone changes. Chi-square analysis showed a significant association between gender and knowledge level ($P = 0.036$), with females demonstrating better knowledge than males. No significant associations were found with age, education, or income. Logistic regression confirmed that these variables were not significant predictors of knowledge level. **Conclusion:** Participants showed adequate knowledge of Vitamin D, particularly its general health benefits, but exhibited moderate awareness regarding its specific effects on the lower jaw and oral health. Gender was the only significant factor associated with knowledge level. Targeted educational interventions are recommended to improve awareness of Vitamin D's oral health implications in Saudi Arabia.

Key words: Vitamin D, deficiency, awareness, Saudi Arabi

INTRODUCTION

Vitamin D is a fat-soluble vitamin that is produced naturally in the skin. It can be gained by diet or by being exposed to ultraviolet B from sunshine, which has a wavelength of 290–315 nm.[1] Vitamin D exists in two forms, cholecalciferol (Vitamin D3) and ergocalciferol (Vitamin D2). When the skin is exposed to ultraviolet radiation from sunshine, it produces Vitamin D3. In addition, it can be found in some animal-based foods such as meat, eggs, liver, butter, and oily fish. Unlike Vitamin D3, Vitamin D2 is frequently present in plant-based meals.[2]

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The liver and kidneys convert both forms into 25-hydroxyvitamin D (25(OH)D). This metabolite eventually transforms into 1,25-dihydroxyvitamin D, which is the most active form. Vitamin D is often retained in the liver and adipose tissue. Vitamin D deficiency (VDD)/insufficiency is more common in some groups, such as people with dark skin, those with little sun exposure, those with malabsorption, and smokers.[3] Furthermore, VDD is linked to VDD or Vitamin D supplement use.[4,5] If the serum 25(OH)D level is <50 nmol/L (20 ng/mL), VDD is diagnosed. Muscle weakness, poor mineralization, hypocalcemia, bone loss, or osteoporosis is among the consequences of VDD that can result in fractures.[2]

Surprisingly, Saudi Arabia's population, including both adults and children, has been found to have a significant frequency of Vitamin D insufficiency despite its sunny climate. This deficit is caused by a number of reasons, including increased indoor activity, traditional attire that restricts sun exposure, dietary practices, and probably genetic factors.[6] Inadequate Vitamin D levels, which can affect growth, immunity, and long-term health, are particularly dangerous for children and adolescents during their critical bone-forming years.[7]

Skeletal and blood mineral balance are regulated by Vitamin D, which plays a significant role in the interactions between the kidney, bone, parathyroid gland, and gut. Because of its function in controlling extracellular calcium levels, it is also necessary for the preservation of skeletal integrity. Because it increases the absorption of calcium and phosphate in the small intestine, Vitamin D helps generate the ideal circumstances for bone mineralization, which is crucial for the growth and maintenance of the skeletal system. When Vitamin D is present, calcium absorption rises to 30–80%, whereas it is only about 10–15% when it is not.[8]

The two most prevalent oral diseases in the world are periodontal and dental diseases.[9] The significance of food in various illnesses has become more well acknowledged. VDD has been found to impede odontogenesis, resulting in a hypomineralized dentition that is more susceptible to breakage and caries infections.[10] Moreover, VDD may play a part in the immune system's response to periodontal infection and is associated with poorer periodontal health.[11] Vitamin D actually affects the pathophysiology of periodontal diseases (PD) by immunomodulation, increasing bone mineral density, decreasing bone resorption, and combating PD-causing substances.[9]

In their systematic review of the relationship between serum Vitamin D levels and dental implants in terms of marginal bone loss, survival rates, and related complications, Bazal-Bonelli *et al*. discovered that cases with lower serum Vitamin D levels were linked to marginally worse marginal bone loss outcomes.[12]

Calcium and cholecalciferol (Vitamin D3) supplements have systemic effects that speed up bone regeneration, according to recent studies on the alveolar ridge and the healing of recently extracted tooth regions. The success rate of dental implant treatment is significantly impacted by the amount and quality of bone present at the implantation site.[13] Research indicates that the failure rate of implant treatment increases when there is insufficient bone in terms of both quantity and quality.[14]

Due to the dependence of dental procedures on healthy bone structure and the hazardous effect of VDD on bone formation, this study aimed to assess the knowledge and awareness of VDD and its impact on the lower jaw among the population in Saudi Arabia.

METHODS

Study design and setting

This cross-sectional study aimed to investigate the association between Vitamin D intake and its mandibular effects in a sample population from Saudi Arabia.

Subject: Participants, recruitment, and sampling procedure

The studied population consisted of Saudi adults over the age of 18. Participants were recruited during September 2025 from people receiving the questionnaire regarding VDD and its effect on the lower jaw.

Sample size

The data collection began from September 2025 to December 2025 calculation of sample size was done to ensure the minimum number of respondents needed to be a representative sample for the whole population. The sample size was determined using Raosoft's sample size calculator. Keeping an indicator percentage of 0.50, margin of error of 5%, and confidence interval (CI) of 95%, the calculated sample size was 380.

Inclusion and exclusion criteria

Inclusion criteria

Adults aged 18 years or older, who have been residents of Saudi Arabia for at least 12 months, are able to read and understand Arabic or English, are willing to provide informed consent, and – specifically for mandibular assessment – have a recent serum Vitamin D result (or are willing to undergo testing) along with a diagnostic-quality panoramic radiograph.

Exclusion criteria

Individuals with systemic bone or metabolic diseases (such as hyperparathyroidism, chronic kidney disease, or Paget's

disease), those taking medications that affect bone metabolism (including bisphosphonates, steroids, or anticonvulsants), individuals with a history of mandibular surgery, fracture, or radiotherapy, those who are pregnant or lactating, and cases with poor-quality radiographs or an edentulous mandible.

Data collection

Data were collected using a structured, self-administered questionnaire available in both Arabic and English. Participants were Saudi residents aged 18 and above, selected through stratified random sampling to ensure balanced representation across age, gender, and region. The questionnaire covered demographics, knowledge of Vitamin D awareness of its effects on the lower Jaw and personal history related to VDD, supplement use, and jaw issues. It included multiple-choice, yes/no, and Likert scale questions. Content validity was confirmed by experts in dentistry and public health, and a pilot study involving 20–30 participants was conducted to assess clarity and reliability, with necessary revisions made. The questionnaire was distributed online via platforms like Google Forms and, where feasible, in dental clinics and community centers. Participation was voluntary and anonymous.

Scoring system

The scoring system used to assess participants' knowledge about Vitamin D was adopted from Alamoudi's study. The questionnaire included a total of 23 questions divided into three parts: The first part collected demographic data, the second part assessed knowledge related to Vitamin D benefits, deficiency, sources, and toxicity, and the third part related to the level of awareness. Each correct answer in the knowledge section was assigned 1 point, while incorrect answers received 0 points, resulting in a total knowledge score ranging from 0 to 10. Regarding the awareness section, each correct answer in the awareness section was assigned 1 point, while incorrect answers received 0 points, resulting in a total knowledge score ranging from 0 to 8.

Pilot test

A pilot test of the questionnaire was conducted on a sample of 25 participants from the target population who met the inclusion criteria. The aim of this pilot test was to evaluate the clarity of the questions, the simplicity of the wording, and the estimated time required to complete the survey.

After collecting responses, participant feedback highlighted the following:

- Some medical terms were difficult to understand, so they were simplified
- Certain close-ended questions were rephrased for better clarity
- The completion time ranged between 7 and 10 min, which was considered appropriate.

The reliability coefficient was assessed using Cronbach's Alpha, which was found to be 0.82, indicating a good level of internal consistency. The revised version of the questionnaire was then finalized and used in the main study.

RESULTS

The collected data were entered and analyzed using the Statistical Package for the Social Sciences software version 26. Descriptive statistics were used to summarize the data, where categorical variables were presented as frequencies and percentages, while continuous variables were expressed as mean ± standard deviation. The Chi-square test was used to assess the association between categorical variables. A $P < 0.05$ was considered statistically significant. The reliability of the questionnaire items was assessed using Cronbach's alpha coefficient, which demonstrated a Cronbach's alpha value of 0.789, indicating acceptable to good internal consistency.

The study included 380 participants, with an average age of 30.39 ± 10.96 years, ranging from 18 to 69 years old. The majority of participants were between the ages of 23 and 38 years, with 50% of the group. Followed by from 18 to 22 years at 26.1%, and 39 years and above at 23.9%. Most of the individuals were female, accounting for 82.4%. The highest percentage of residents came from the central region at 44.7%, followed by the western region at 27.4% and the southern region at 24.5%. The eastern region contributed a smaller percentage of 2.1%, while the northern region had the least at 1.3%. The majority of participants held a bachelor's degree (73.2%), and the largest income category was below 1000, accounting for 35.8%, followed by the 1000–5000 range at 31.3% [Table 1].

The results indicate that participants generally have a good knowledge of Vitamin D, especially its importance for bone health and where it can be found. The majority of respondents accurately recognized that Vitamin D is important for the development of bones and jaws (88.2%), helps prevent bone weakness (87.9%), and is typically sourced from sunlight (96.6%). A significant percentage acknowledged its importance in calcium absorption (79.5%) and noted that its deficiency is prevalent in Saudi Arabia (89.2%). Knowledge about its specific effects on oral health was limited, with fewer than half of the individuals aware of its impact on the lower jaw (48.2%) and gum health (47.1%). In addition, only 53.2% acknowledged its link to jaw fractures. In general, there is a good level of knowledge, but there are still gaps in understanding the specific oral effects of VDD [Table 2].

The findings reveal that participants had a good awareness of Vitamin D, especially concerning its sources and significance for health. The majority of participants accurately recognized that insufficient sun exposure can result in VDD (93.2%). They expressed a readiness to modify their lifestyle if given information (94.2%) and acknowledged the significance

Table 1: Demographic characteristics of the studied participants (*n*=380)

Variable	Category	*N*	Percentage
Mean age±S.D=30.39±10.957 Min=18, Max=69			
Age groups	From 18 to 22 years	99	26.1
	From 23 to 38 years	190	50
	From 39 and above	91	23.9
Gender	Female	313	82.4
	Male	67	17.6
Province of residency	Central region	170	44.7
	Eastern region	8	2.1
	Northern region	5	1.3
	Sothern region	93	24.5
	Western region	104	27.4
Education level	Bachelor	278	73.2
	Intermediate	12	3.2
	Postgraduate	21	5.5
	Primary	3	0.8
	Secondary	66	17.4
Income	1000–5000	119	31.3
	10001–15000	26	6.8
	5001–10000	56	14.7
	Above 15000	43	11.3
	<1000	136	35.8

SD: Standard deviation

Table 2: Participants' knowledge of Vitamin D benefits and its deficiency (*n*=380)

No.	Question	Yes *n* (%)	No *n* (%)
1	Vitamin D is essential for bone and jaw development	335 (88.2)	45 (11.8)
2	Vitamin D deficiency can cause bone weakness	334 (87.9)	46 (12.1)
3	Lower jaw can be affected by a lack of Vitamin D	183 (48.2)	197 (51.8)
4	Vitamin D helps calcium absorption	302 (79.5)	78 (20.5)
5	Vitamin D deficiency may lead to tooth loss	224 (58.9)	156 (41.1)
6	Gum health is influenced by Vitamin D levels	179 (47.1)	201 (52.9)
7	Sunlight is a natural source of Vitamin D	367 (96.6)	13 (3.4)
8	Vitamin D deficiency is common in Saudi Arabia	339 (89.2)	41 (10.8)
9	Vitamin D deficiency increases the risk of jaw fractures	202 (53.2)	178 (46.8)
10	Vitamin D supplements help prevent oral health problems	246 (64.7)	134 (35.3)

of supplementation (81.1%). Knowledge regarding its specific effects on oral and jaw health was average, with approximately half of the respondents accurately recognizing its role in oral health (51.8%) and its connection to jawbone weakening (47.6%). Awareness of its relationship with gum disease was similarly split, with 49.5% of participants informed. The results indicate a good general awareness of oral health [Table 3].

The results showed that 184 participants (48.4%) revealed good knowledge, and 127 (33.4%) had a moderate level of knowledge; the remaining 69 (18.2%) showed a poor level of knowledge [Table 4, Figure 1].

The results showed that 198 participants (52.1%) demonstrated adequate moderate awareness, while 148 (38.9%) had a good level of awareness, and 34 participants (8.9%) had poor awareness. The findings revealed that the majority of the study population (91%) had at least moderate-to-good awareness, suggesting a generally adequate level of awareness among the participants [Table 5, Figure 2].

The results show that there were no statistically significant associations between participants' knowledge levels and any of the demographic characteristics. Age was not significantly associated with knowledge level (χ^2 = 3.258, P = 0.516), although participants aged 23–38 years represented the

Table 3: Participants' awareness of Vitamin D benefits and its deficiency (*n*=380)

No.	Question	Yes *n* (%)	No *n* (%)
1	Vitamin D plays a role in oral and jaw health	197 (51.8)	183 (48.2)
2	Vitamin D deficiency weakens the lower jawbone	181 (47.6)	199 (52.4)
3	Limited sun exposure leads to Vitamin D deficiency	354 (93.2)	26 (6.8)
4	Ever tested for Vitamin D levels	322 (84.7)	58 (15.3)
5	Vitamin D supplements are important for teeth and jaw health	308 (81.1)	72 (18.9)
6	Gum disease linked to low Vitamin D levels	188 (49.5)	192 (50.5)
7	Saudi population at a higher risk of Vitamin D deficiency	293 (77.1)	87 (22.9)
8	Would change lifestyle if aware of Vitamin D impact	358 (94.2)	22 (5.8)

Table 4: Frequency of knowledge levels

Total knowledge classification	Frequency	Percent
Poor	69	18.2
Moderate	127	33.4
Good	184	48.4

highest proportion across all knowledge categories. Similarly, gender showed no significant relationship (χ^2 = 4.638, P = 0.098), with females comprising the majority in all knowledge groups. Education level was also not significantly associated with knowledge (χ^2 = 2.112, P = 0.348), and most participants in all categories had a high level of education. Income likewise showed no significant correlation with knowledge level (χ^2 = 5.393, P = 0.294) [Table 6].

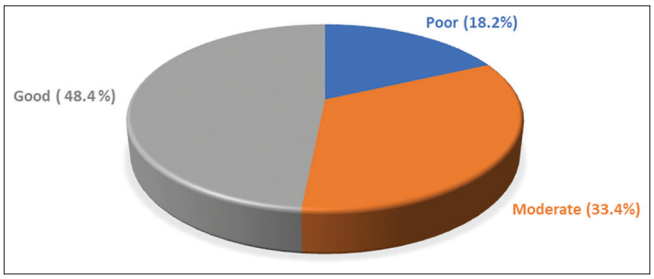

Figure 1: Knowledge classification

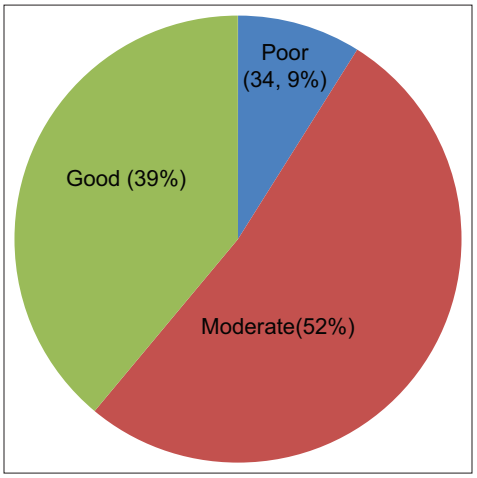

Figure 2: Awareness classification

Table 5: Frequency of awareness levels

Total knowledge classification	Frequency	Percent
Poor	34	8.9
Moderate	198	52.1
Good	148	38.9

The results demonstrate that there was no statistically significant association between awareness levels and most demographic characteristics, except for gender. Age showed no significant relationship with awareness level (χ^2 = 1.690, P = 0.793), indicating a similar distribution of poor, moderate, and good awareness across all age groups. Likewise, education level (χ^2 = 0.331, P = 0.480) and income (χ^2 = 5.167, P = 0.271) were not significantly associated with awareness. In contrast, gender showed a statistically significant association (χ^2 = 14.397, P = 0.001), with females representing a higher proportion in the moderate and good awareness compared to males [Table 7].

The multinomial logistic regression analysis showed that none of the examined demographic variables were statistically significant predictors of knowledge levels. Education level (B = −0.296, standard error [SE] = 0.385, P = 0.443), age groups (B = 0.496, SE = 0.449, P = 0.270), and gender (B = −0.400, SE = 0.349, P = 0.251) were not significantly associated with knowledge levels. Income showed a borderline association with knowledge (B = 1.286, SE = 0.682, P = 0.059), with higher income potentially increasing the odds of better knowledge (odds ratio [OR] = 3.617), although this did not reach statistical significance [Table 8].

The multinomial logistic regression analysis revealed that most demographic variables were not significant predictors of awareness levels. Education level (B = −0.067, SE = 0.499, P = 0.893), income (B = 0.633, SE = 0.876, P = 0.470), and age groups (B = 0.155, SE = 0.500, P = 0.756) showed no statistically significant association with awareness. However, gender was a significant predictor (B = −1.301, SE = 0.426, P = 0.002), indicating that females had significantly lower odds of poor awareness compared to good awareness (OR = 0.272, 95% CI: 0.118–0.628) [Table 9].

Table 6: Correlation between demographic characteristics and levels of knowledge

Variable	Category	Poor *n* (%)	Moderate *n* (%)	Good *n* (%)	χ^2	df	*P*-value
Age	From 18 to 22 years	17 (24.60)	36 (28.30)	46 (25.00)	3.258	4	0.516
	From 23 to 38 years	40 (58.00)	61 (48.00)	89 (48.40)			
	≥39 years	12 (17.4)	30 (23.6)	49 (26.6)			
Gender	Female	52 (75.40)	111 (87.40)	150 (81.50)	4.638	2	0.098
	Male	17 (24.60)	16 (12.60)	34 (18.50)			
Education level	Low (Intermediate, Primary, Secondary)	13 (18.80)	23 (18.10)	45 (24.50)	2.112	2	0.348
	High (Bachelor, Postgraduate)	56 (81.20)	104 (81.90)	139 (75.50)			
Income	Low<1000, 1000–5000	47 (68.1)	84 (66.1)	124 (67.4)	5.393	4	0.294
	Moderate 5001–10000, 10001–15000	19 (27.5)	25 (19.7)	38 (20.7)			
	High>15000	3 (4.3)	18 (14.2)	22 (12.0)			

Table 7: Correlation between demographic characteristics and levels of awareness

Variable	Category	Poor *n* (%)	Moderate *n* (%)	Good *n* (%)	χ^2	df	*P*-value
Age	18–22 years	8 (23.5)	50 (25.3)	41 (27.7)	1.690	4	0.793
	23–38 years	18 (52.9)	104 (52.5)	68 (45.9)			
	39+years	8 (23.5)	44 (22.2)	39 (26.4)			
Gender	Female	Female	20 (58.8)	169 (85.4)	14.397	2	0.001
	Male	Male	14 (41.2)	29 (14.6)			
Education level	Low (Intermediate, Primary, Secondary)	8 (23.5)	40 (20.2)	33 (22.3)	0.331	2	0.48
	High (Bachelor, Postgraduate)	26 (76.5)	158 (79.8)	115 (77.7)			
Income	Low<1000, 1000–5000	24 (70.6)	24 (70.6)	24 (70.6)	5.167	4	0.271
	Moderate 5001–10000, 10001–15000	24 (70.6)	24 (70.6)	24 (70.6)			
	High>15000	24 (70.6)	24 (70.6)	24 (70.6)			

Table 8: Multinomial logistic regression analysis of predictors of knowledge levels regarding education, income, and age groups

Predictor	B	SE	Wald	*P*-value	Odds ratio (Exp (B))	95% CI (Lower–Upper)
Education level	−0.296	0.385	0.589	0.443	0.744	0.350–1.582
Income	1.286	0.682	3.556	0.059	3.617	0.951–13.760
Age groups	0.496	0.449	1.218	0.270	1.642	0.681–3.959
Gender	−0.400	0.349	1.315	0.251	0.670	0.339–1.328

SE: Standard error, CI: Confidence interval

Table 9: Multinomial logistic regression analysis of predictors of awareness levels regarding education, income, and age groups

Predictor	B	SE	Wald	*P*-value	Odds ratio (Exp (B))	95% CI (lower–upper)
Education level	−0.067	0.499	0.018	0.893	0.935	0.352–2.487
Income	0.633	0.876	0.522	0.470	1.883	0.338–10.473
Age groups	0.155	0.500	0.096	0.756	1.168	0.438–3.111
Gender	−1.301	0.426	9.321	0.002	0.272	0.118–0.628

SE: Standard error, CI: Confidence interval

DISCUSSION

The health and biomedical fields have been quite concerned about Vitamin D status over the past 10 years, and numerous studies have been carried out looking at its advantages, applications, and deficiencies.[15] Vitamin D insufficiency is seen as an epidemic on a global scale and affects both adults and children. The prevalence of VDD in the Middle East and North Africa, which includes Saudi Arabia, is extremely high, reaching 81% across all age categories.[16]

One possible risk factor for VDD is a lack of understanding and awareness of the issue. Numerous studies reveal that several nations, including Hong Kong, Saudi Arabia, the United States, and India, lack awareness and knowledge of the importance and sources of Vitamin D.[17-20] Therefore, the purpose of our study was to evaluate the general Saudi Arabian population's knowledge and awareness of VDD and its impact on the lower jaw.

The study included 380 participants, with an average age of 30.39 ± 10.96 years, ranging from 18 to 69 years old. The majority of participants were between the ages of 23 and 38 years (50%). There was non-significant correlation between age and knowledge of participants. In agreement with us, two studies in Saudi Arabia (one in Qassim and the other in Jeddah) found also non-significant correlation between age and knowledge.[21,22]

Regarding gender, most of the individuals were female (82.4%). Gender was found to have a statistically significant association with knowledge level ($\chi^2 = 6.632$, $P = 0.036$). Females exhibited a higher percentage of moderate and good knowledge than males, indicating that gender might influence knowledge differences in this group. Similarly,

the study carried out in the Al-Baha region confirmed that result.[23] On the other hand, the Jeddah study showed that gender had non-significant effect on Vitamin D awareness.[22]

Regarding education, the majority of the participants were in the Bachelor's degree (73.2%), so they were well educated but there was non-significant correlation between education and level of knowledge and awareness. Adversely, a study done by Alkubur *et al*. in Saudi Arabia found that there was a significant correlation between education and knowledge, and the vast majority were highly educated (79.6%) with a bachelor's degree.[24] Education raises awareness of Vitamin D insufficiency and related illnesses, which is consistent with the findings of Alfaris *et al*.[25] The numerous gaps in nutritional knowledge, however, indicate that educational interventions should be customized for particular knowledge shortfalls about dietary sources and the importance of sun exposure, even in the face of high educational levels.

The results of the current study showed that the majority of the study population (81.8%) had at least moderate-to-good knowledge, suggesting a generally adequate level of knowledge among the participants similar to findings by Aljefree *et al*.,[26] who reported widely different knowledge on Vitamin D between populations in Saudi Arabia. A study in Jeddah found that almost two-thirds of the participants have an adequate level of knowledge about Vitamin D benefits.[22]

Worldwide, there is a low level of awareness and knowledge regarding Vitamin D, which may play a role in the high rates of VDD. More than two-thirds of participants in a UK survey knew very little about the most typical signs of VDD.[17] A study conducted in Saudi Arabia found that 40% of mothers attending primary health centers in Al-Ahsa had a low level of knowledge about Vitamin D supplementation for their infants,[27] while another study conducted in India found that over half of participants had a low level of knowledge about VDD in antenatal mothers.[28]

Our findings revealed a generally moderate level of awareness of Vitamin D (52.1%), especially its importance for bone health and development, but there was a lack of knowledge on the hazardous effects of VDD on gum health and lower jaw diseases. Similarly, participants in a qualitative study carried out in Saudi Arabia showed insufficient awareness of the hazards associated with Vitamin D insufficiency, specifically osteoporosis and rickets, despite having a good understanding of the vitamin's role in bone health.[26] Comparable results were seen in Vietnam and India, where 88%[29] and 88.5%[30] of participants, respectively, showed strong awareness of Vitamin D's advantages for bone health but lacked knowledge of its preventive function in certain disorders, like rickets and osteoporosis.

Furthermore, the current study demonstrated that most participants (93.2%) confirmed that limited sun exposure leads to VDD, and 81.1% of them knew that Vitamin D supplements were important for teeth and jaw health. Similarly, in the study in Taif where the majority (91.1%) of participants were aware of the role of sun exposure on Vitamin D levels, and about two-thirds of participants were aware of the role of Vitamin D on bone health.[31] Furthermore, the study conducted in the Al-Baha region revealed that over half of the participants were aware of the advantages of Vitamin D.[23] On the other hand, only 33% of participants in the Pakistani study were aware of the advantages of Vitamin D for bone health.[32]

Limitations

The limitations of the present study were its cross-sectional design, which prohibits the making of any inference of causality between knowledge, awareness around VDD, and its effect on the lower jaw. In addition, its application relied on self-reported data, which may contain bias because participants may have provided more knowledge on Vitamin D than they actually knew. Furthermore, the study's sample, which was primarily young and well-educated, might not accurately represent the Saudi people at large. To better comprehend Vitamin D knowledge across various age groups, educational levels, and socioeconomic positions, future research should strive to include a more diverse demography.

CONCLUSION

Participants showed adequate knowledge of Vitamin D, particularly its general health benefits, but exhibited moderate awareness regarding its specific effects on the lower jaw and oral health. Gender was the only significant factor associated with knowledge level. Targeted educational interventions are recommended to improve awareness of Vitamin D's oral health implications in Saudi Arabia.

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ETHICAL APPROVAL

The study was fully explained to all participants, and it was emphasized that participation was voluntary. Written informed consent was obtained from each participant before enrollment. All collected information was securely stored and used exclusively for research purposes.

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