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The Relationship between Vitamin D Level and Dental Caries among Iraqi Children.

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Abstract*: Background: Vitamin D has a vital factor in the maintenance of calcium and phosphate metabolism and their deposition in mineralized tissues including teeth. Objective: To investigate the relation of vitamin D level among 6-12 years old children and their dental caries. Patients and Methods: Two hundred children were asked to participate in this study. Their ages ranged between 6-12 years. Their variables were identified and included socioeconomic status, age, medical history, health-related behaviors, dietary intake, dental history, presence of any dental complaints and oral hygiene practice. The mouth health measures to be investigated in this study were decayed, missing, and filled teeth index. Vitamin D measurements were analyzed by I-Chroma II, Boditch Medical Inc., Republic of Korea. Three vitamin levels were considered as deficient, insufficient and sufficient. Results: Among 200 children who involved in this work, 9 (4.5%) children had dental caries. Male children, parents education, no onchophagia, no toothache and children with brushing 2 times a day were significantly had less incidence of dental caries. While, age, house hold income and residency have no relationship with presence of dental caries. Vitamin D estimations were reported as deficient, insufficient and sufficient at a rate of 14.5%, 31% and 54.5% respectively. The highest incidence of dental caries was detected among deficient children (22.2%) in comparison to either insufficient (66.7%) or sufficient (11.1%) children. Conclusions: There is high incidence of dental caries among vitamin D deficient children but its causation cannot be confirmed. Therefore, vitamin D deficiency can be considered as a predisposing factor for dental caries.*

Keywords: Children, Dental caries, Oral health, Vitamin D.

Introduction

Vitamin D has a vital factor in the maintenance of calcium and phosphate metabolism and their deposition in mineralized tissues including teeth (1,2). Vitamin D is a steroid hormone obtained mainly from exposure to sunlight, but also from diet (3-5). The effect of vitamin D in teeth development indicate that impaired teeth composition is increasing in individuals with vitamin D deficiency (6).

Vitamin D deficiency leads teeth vulnerable to dental caries due to teeth enamel defects (7). The confirmed mechanism for the effect of vitamin D on dental caries has not been understood (8).

Schroth et al. (9) recorded the relationship between vitamin D deficiency and dental caries among Canadian children. In a research done in children ages 3–5 years, Pacey *et al.* (10) recorded that the incidence of children with dental caries was much lower in those who used vitamin D and calcium supplements than in those who did not. Koreans are susceptible to severe health disorders due to insufficient vitamin D levels (11).

It has been reported that periodontitis was related among insufficient vitamin D compared to non-periodontitis (12-15), another has recorded no variation (15). In addition, vitamin D concentrations were related with higher periodontal destruction and higher tooth loss (16-18).

Interestingly, mouth neoplasm, squamous cell carcinoma of the esophagus, oral, and pharyngeal cancers are associated with vitamin D deficiency (19,20).

Therefore, the aim of the present study is to investigate the relationship between vitamin D concentration among 6-12 years old Iraqi children and their dental caries.

Patients and Methods

Subjects: This is a cross-sectional study which was carried out by a professional dentist on Iraqi children at the College of Dentistry in Basrah during the period from January to October 2021. The work has been proved by the Ethical Committee of the Dentistry College in Basrah. Two hundred children were asked to participate in this study. Their ages ranged between 6-12 years. Children with diabetes type 2 or cancer were excluded from the study.

Their variables were identified and included socioeconomic status, age, medical history, health-related behaviors, dietary intake, dental history, presence of any dental complaints and mouth hygiene. The oral health measures to be investigated in this study were decayed, missing, and filled teeth index.

Vitamin D estimation: Blood samples were collected at least 2 h after a meal. The samples were light protected, centrifuged after 30 min, and stored at −20 °C. Vitamin D concentrations were analyzed and estimated by I-Chroma II, Boditch Medical Inc., Republic of Korea.

Statistical analysis: The collected data were statistically analyzed using Statistical Package for the Social Sciences (SPSS). Chi-Square test (X2) was applied to compare variables while groups with <5%, Fisher Exact test was used. P <0.05 was significant.

Results

Among 200 children who involved in the study, 9 (4.5%) children had dental caries. The basic socio-demographic features of the participants according to the occurrence of dental caries were illustrated in Table (1). Male children, parents education, no onchophagia, no toothache and children with brushing 2 times a day were significantly associated less with the incidence of dental caries. While, age, house hold income and residency have no relationship with presence of dental caries.

Vitamin D levels were reported as deficient, insufficient and sufficient at a rate of 14.5%, 31% and 54.5% respectively. The highest incidence was detected among children with insufficient vitamin D level as 66.7% in comparison to either deficient (22.2%) or sufficient (11.1%) children as far as vitamin D level is concerned (Table 2).

Table 1. Demographic features for the studied children.

Variables	Total n=200 No. (%)	Children with dental caries. n = 9 No. (%)	Children without dental caries. n= 191 No. (%)	P value
Sex				**0.001**
Male	**85 (42.5)**	**3 (3.5)**	**82 (42.9)**	
Female	**115 (57.5)**	**6 (5.2)**	**109 (57.1)**	
Age (years)				**0.05**
6-8	**93 (46.5)**	**4 (4.3)**	**89 (46.6)**	
9-12	**107 (53.5)**	**5 (4.6)**	**102 (53.4)**	
House hold income				**0.05**
Low				
Middle	**71 (35.5)**	**3 (4.2)**	**68 (35.6)**	
High	**87 (43.5)**	**4 (4.6)**	**83 (43.5)**	
	42 (21.0)	**2 (4.8)**	**40 (20.9)**	
Parents education				**0.001**
Illiterate				
High school	**58 (29.0)**	**4 (6.9)**	**54 (28.3)**	
University	**99 (49.5)**	**3 (3.03)**	**96 (50.3)**	
	43 (21.5)	**2 (4.7)**	**41 (21.5)**	
Residency				**0.05**
Urban	**112 (56.0)**	**5 (4.5)**	**107 (56.0)**	
Rural	**88 (44.0)**	**4 (4.5)**	**84 (44.0)**	
Onchophagia				**0.001**
Yes	**19 (9.5)**	**1 (4.3)**	**18 (9.4)**	
No	**181 (90.5)**	**8 (4.6)**	**173 (90.6)**	
Toothache				**0.01**
Yes	**22 (11.0)**	**2 (9.1)**	**20 (10.5)**	
No	**178 (89.0)**	**7 (7.9)**	**171(89.5)**	
Frequency of brushing				**0.01**
2 times a day	**38 (19.0)**	**0 (0.0)**	**38 (19.9)**	
Irregular	**70 (35.0)**	2 (2.8)	**68 (35.6)**	
No.	**92 (46.0)**	7 (7.6)	**85 (44.5)**	

Table 2. The relationship between vitamin D and dental caries.

Vitamin D level	Dental caries (+ve) =9	Without dental caries (-ve) = 191	Total N = 200
Deficient ` 10 ng/ml.	2 (22.2)	27 (14.1)	29 (14.5)
Insufficient 10-30 ng/ml.	6 (66.7)	56 (29.3)	62 (31.0)
Normal 30-100 ng/ml.	1 (11.1)	108 (56.5)	109 (54.5)
P value	0.01	0.01	0.01

Discussion

Vitamin D deficiency is a predisposing factor for oral diseases including dental caries. Vitamin D has a vital factor in bone and teeth mineralization. So, if mineral metabolism is disturbed then failures will occur in bone development. The maintenance of sufficient vitamin D status has found to be associated with a healthy mouth including teeth. Nevertheless, vitamin D levels are essential in order to get a healthy oral cavity. The highest incidence detected in this work was among patients with either deficient or inadequate vitamin D level. Children and adolescents are susceptible to the clinical pictures of inadequate vitamin D because of its essential role in bone and teeth development (21).

Male children, parents education, no onchophagia, no toothache and children with brushing 2 times a day were clearly reducing the incidence of dental caries. While, age, house hold income and residency have no relationship with occurrence of dental caries. Dental caries has a complex and multifactorial etiology. Thus, the cause of such relationship is difficult to be confirmed since many other factors might contribute to oral diseases as increased acidity in the mouth cavity, reduction in saliva production, sugary diet, fast food, inadequate attention to oral health, inhabitant of *Streptococcus mutans* microorganism and delayed treatment (22-24). It is well known that children consume a lot of sweats, chocolate, biscuit, carbohydrate and soft drinks without washing their mouths. In addition, many children refuse to eat egg and fish and further less exposure to sun light especially during Corona-19 outbreak when people stayed at home for a lots of time.

Some published investigations have indicated that low vitamin D intakes are related to an increased dental caries incidence (25-27), but other has not observed such association (28). However, there is evidence for the relationship of low concentrations of vitamin D and the high incidence of dental caries in subjects of various ages, even the mechanism is obscure (29-32). Hence, I can conclude that, the maintenance of normal vitamin D levels during pregnancy might have a vital role on the baby's health and teeth development. Environmental situations are not enough to discuss the incidence of dental caries (33,34). Thus, few surveys have indicated that some individuals are either susceptible or resistant to dental caries.

In conclusion, there is high incidence of dental caries among children with either deficient or insufficient vitamin D level, but its causation cannot be confirmed. Therefore, vitamin D deficiency can be considered as a predisposing factor for dental caries.

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