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Association of vitamin D and dental caries in children in Basra

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ABSTRACT:

Severe Early Childhood Caries (S-ECC) distresses well-being in childhood. The research aimed to define the relationship of vitamin D deficiency and SECC in pre-school age pediatric patients. This cross-sectional study was accomplished in Department of Pedodontics and Preventive / Basra University, college of dentistry. Two groups of 47 children aged from 2 and 6 years, each were involved in the study, and were categorized into two groups: cases and control. Intake of vitamin D was measured by analyzing 25-hydroxy vitamin D [25(OH)D] levels. The involvement of primary teeth caries was evaluated by index of decay-missing-filled teeth (dmft) and decayed-missing-filled rate (dmf). Statistical package for social science (SPSS-21) with descriptive statistics, Simple linear regression and coefficient of determination (R²), the level of significance indicates in 0.05. The results demonstrate that there is moderate negative strong highly significant correlation between caries experience of primary teeth surfaces and teeth with vitamin D except between filling surfaces and vitamin D, the result is weak negative not significant correlation. In conclusion, improving child's levels of vitamin D may be supplementary preventive concern to a lower risk of dental caries.

Keywords: vitamin Dental, Early childhood caries, Preschool children

INTRODUCTION

Oral health is important for the growth and well-being of a child. One of the most public diseases, mainly in the developed countries and in earlier years, which relics a serious multifactorial common international issue [1]. Reduced oral health is not life-threatening, but it affects other diseases harmfully and can be a source for dental pain, sleep disruption, weight and height progress, affect speech and life quality, and increase the incidence of permanent teeth carries [2].

Early childhood caries (ECC) is defined as "the presence of decayed, missing, and filled tooth surfaces in any deciduous dentition occurring in a child 71 months or younger" [3,4].

Quality of natural life is decreased among children with Sever ECC [5-7]. They might suffer from distressed sleep, pain and behavior variations [8,9] Factors which involved in ECC are lifespan of teeth [10]. Oral healthiness (e.g., tooth brushing) [11], feeding performs (e.g., breast feeding, night bottle--)[11,12], dietary behaviors (obesity, sugar ingestion, nutritional practices) [13], socio-economic grade (e.g., domestic annual salary, mother's level of education) and environmental location [2,14]. When calcium and phosphorus are absorbed,

vitamin D plays a critical role. The interface between 1,25-dihydroxyvitamin D and the vitamin D receptor enhances the intestinal absorption of calcium to 40% and phosphorus to 80% [15,16]. Vitamin D deficiency occurs when level of 25-hydroxyvitamin D (25[OH] D) less than 20 ng/mL [17,18].

Many factors can lead to vitamin D deficiency, as hereditary disorders and obesity [19], dark skin, acquired syndromes, absence of sunlight, medications and mal absorption [20]. Levels of 25-hydroxy vitamin D [25(OH)D] in the serum greater than 30 nm/mL result in better outcomes of the oral health [21]. Vitamin D furthermore play an immunological part, as it prompt synthesis of antimicrobial peptides, as cathelicidin and defensins.

Saliva plays important role in preserving the teeth integrity of teeth and oral soft tissues [22]. Although vitamin D deficiency and SECC are common globally, the studies that handle the relationship of vitamin D insufficiency and SECC are limited [23-26]. In Iraq, there was no previous studies to conclude the relationship of vitamin D insufficiency and SECC. Thus, it is necessary to carry out similar researches in Iraq. In this context, this study has been developed to

estimate the association of vitamin D deficiency and SECC in preschool children.

METHODOLOGY

This cross-sectional study was accomplished in the Branch of Pedodontics and Preventive / Basra University, college of dentistry. 47 children were divided in to both control and case groups .The case group consist of 47 children aged 2 - 6 years developed numerous carious teeth who were chosen from the Outpatient Branch of Pedodontics and Preventive Dentistry, Dental College, Basra University, Iraq. The control group consist of 47 children aged 2 - 6 years free from carious teeth who were also chosen from the Outpatient Branch of Pedodontics and Preventive Dentistry, Dental College, Basra University, Iraq. Inclusion standards for the 1st(case) group: 1. Healthy infants aged 2 to 6 years without chronic medical condition. 2. ECC Involvement. Inclusion standards for the 2nd (control) group: 1. Healthy infants aged 2 to 6 years of age without any underlying health problems. 2. Patients with no cavity on teeth by visual inspection (deft 0). As all children were chosen at Basra University, they all had the similar socio-economic status. For all children of case and control classes, the following records has been obtained. State of dental caries: oral inspection for every infant was conducted to document cumulative amount of deft caries. The evaluation of children in both classes was carried out by same investigator consuming appropriate illumination and with aid of a dental probe and mirror after accurate teeth dryness. Children's caries status was reported using deft index. A questionnaire intended to assess child's personal history, food patterns, oral health and socio-economic status was prepared and filled out to family of children for both groups. Intravenous blood sample (approximately 2.5 mL) was collected with the agreement of the parents by a laboratory specialist for calculation.

Dental inspection was restricted to the primary teeth and data was collected concerning dental caries, absent or extracted teeth and previous restorations according to "World Health Organization standards".

Data investigation used Statistical package for social science (SPSS-21) (Chicago, In Press) with descriptive statistics as frequency, percentage, minimum, maximum, mean, standard deviation (SD) and Scatter plot graph, while the inferential statistics are Independent sample T test, Pearson correlation ,Simple linear regression and coefficient of determination (R2) , the level of significance indicates in 0.05.

RESULTS:

The sample comprises of two groups as case or study group and caries free as control group with defs as 0, each group consists of 47 subjects with age 2-6 years old both of them, In this table results demonstrated that there is no significant difference between groups regarding age and gender (Table 1). Table (2) that mean of Vitamin D3 in control group more than that of the study group with highly significant difference.

This result indicates that subjects with less than 10 ng/mL and subjects with range from 10-20 ng/mL found in study group more than that of control while the opposite finding in range greater than 20ng/mL found in control subjects more than those of studied group (Table 3 and Figure 1).

These results demonstrate that there is moderate negative strong highly significant correlation between caries experience of primary teeth surfaces and teeth with vitamin D except between filling surfaces and vitamin D , the result is weak negative not significant correlation (Table 4).

Figures () indicate the simple linear regression between ds,ms dmfs and dmft with Vit D as there is inverse linear relationship between those variables with highly significant (p<0.000)

Table (1):Descriptive and statistical test of studied variables among groups.

Variable	Groups						P value
	Study (2-6 y)			Control (2-6 y)			
Age	47	4.57	±1.175	47	4.70	±1.140	0.594 [NS] [T-test]
Gender (M/F)	25/22	53.19% / 46.81%		22/25	46.81% / 53.19%		0.536[NS] [Chi-square]

Table (2):Descriptive and statistical test of Vitamin D3 among groups

Vitamin D3 serum level								T test	P value
Study				Control					
Min.	Max.	Mean	SD	Min.	Max.	Mean	SD		
5.40	28.10	13.785	5.711	8.90	25.60	20.507	3.500	6.880	0.000 [HS]

Table (3): Description of studied variables among groups according to level of vitamin D.

Groups	Vitamin D3 serum level					
	<10		10-20		>20	
	N.	%	N.	%	N.	%
Study	18	38.3	21	44.68	8	17.02
Control	1	2.13	19	40.43	27	57.45

Table (4): Correlations between caries experience by surfaces and tooth with Vit D3

		ds	ms	fs	dmfs	dmft
Study group	r	-0.625	-0.512	-0.215	-0.707	-0.658
	P	.000 [HS]	.000 [HS]	0.147 [NS]	.000 [HS]	.000[HS]

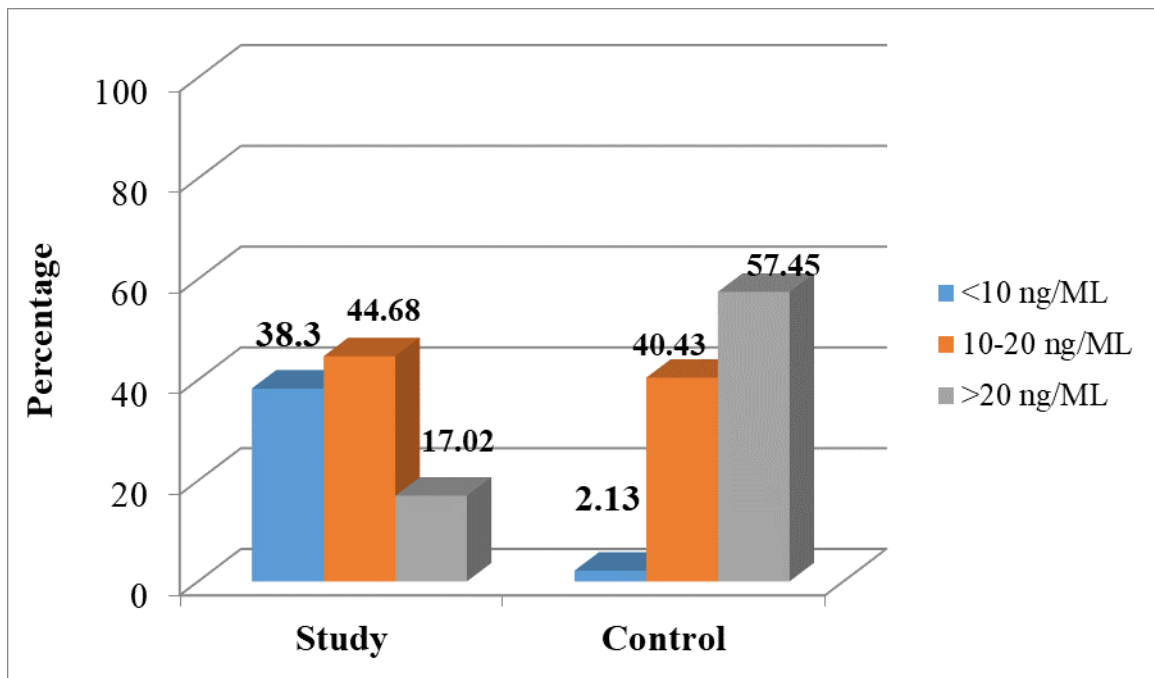


Fig.1: Correlation between percentage of vitamin D level in study and control groups

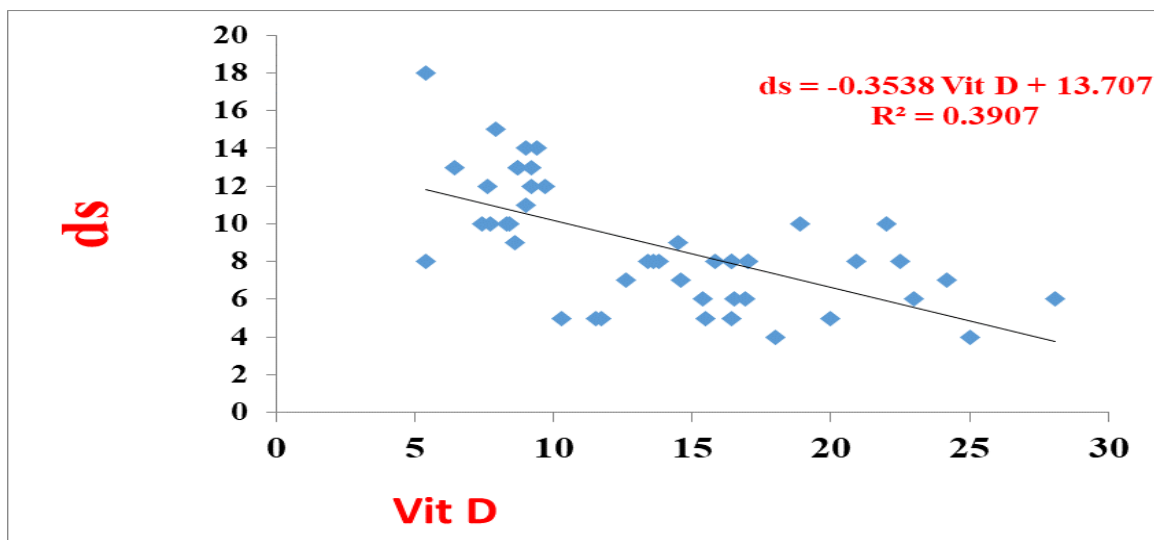


Fig.2:simple linear regression of ds and Vit D.

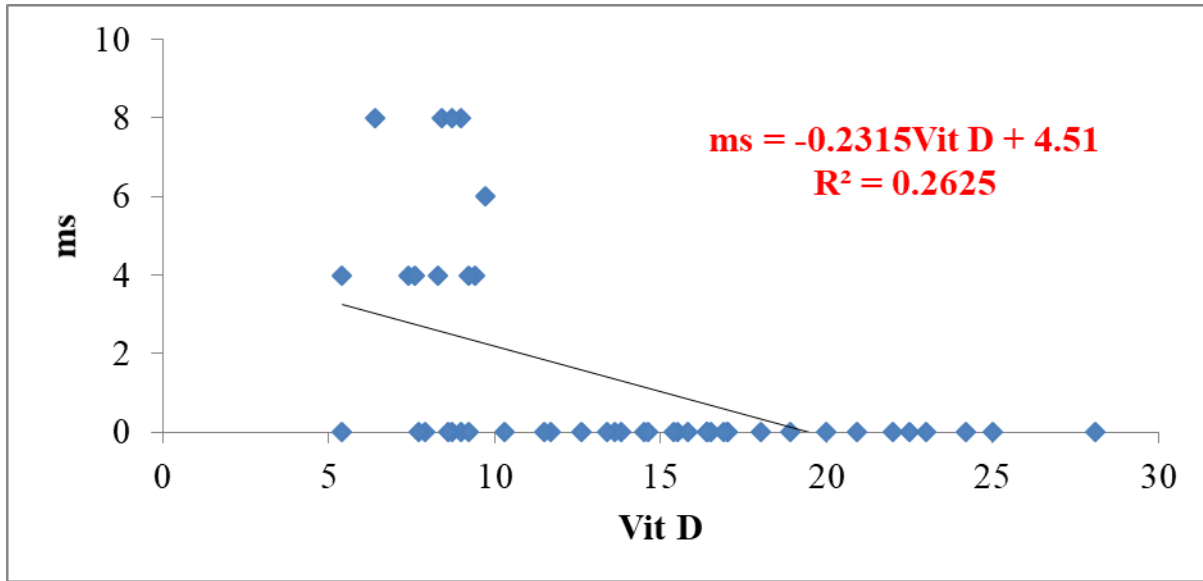


Fig.3: simple linear regression between ms and Vit D.

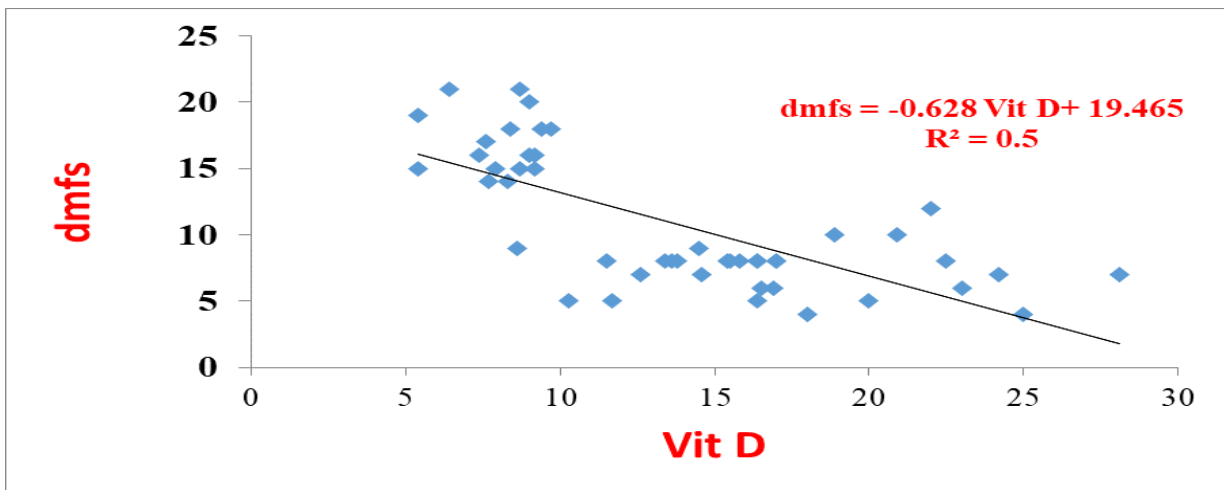


Fig.4:simple linear regression of dmfs and Vit D.

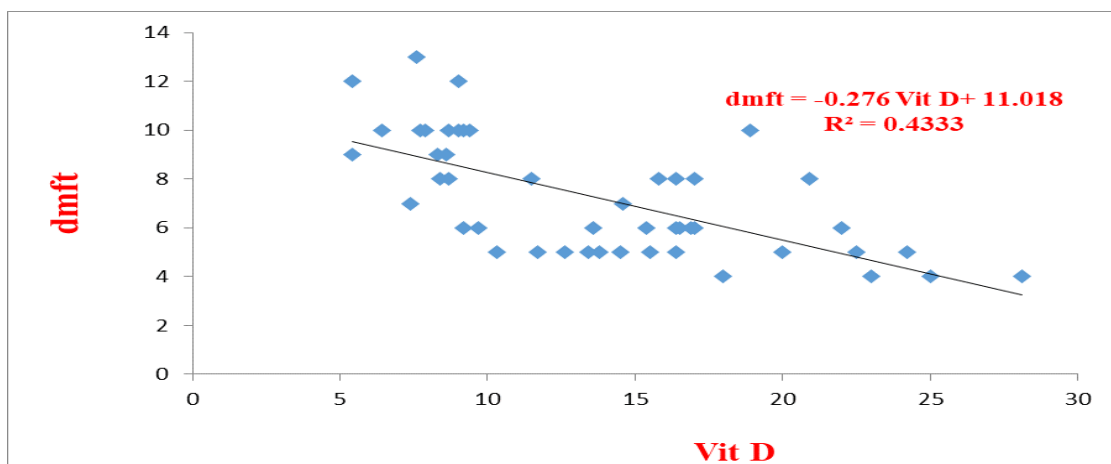


Fig.5:simple linear regression of dmft and Vit D.

Data analysis used Statistical package for social science (SPSS-21) (Chicago, In Press) with descriptive statistics as frequency, percentage, minimum, maximum, mean, standard deviation

(SD) and Scatter plot graph, while the inferential statistics are Independent sample T test, Pearson correlation ,Simple linear regression and

coefficient of determination (R^2), the level of significance indicates in 0.05.

DISCUSSION:

Although most of people in Middle east resides in regions that expose to sufficient sunlight during the whole year, however, vitamin D deficiency is common in all age groups and in both sexes; this can be clarified by restricted sun exposure because of cultural practices. These are dictated by the region's tight association to conservative living styles. Extended breast-feeding, with no vitamin D supplementation, due partially to the absence of obligatory medical coverage or awareness, during and after gestation [27]. Besides, the socioeconomic status is recognized to affect vitamin D levels in the school children of low SES [28]. This study showed statistically significant difference among mean levels of vitamin D between groups. Winter term and lower intake of milk were related significantly with lower 25(OH)D concentrations [25]. In the current study, there was a significant association between vitamin D levels and SECC ($p < 0.000$) is as well established. This earnings that lower levels of serum vitamin D in children rendering them more venerable for advanced dental caries as estimated with deft score.

A cross-sectional study accomplished in 2015 in Canadian schools by Schroth et al [29], revealed that hypovitaminosis D was strongly correlated with widespread dental caries. This study showed results that coincides with the findings of the current research. Some studies displaying strong relationship between decreased level of vitamin D and severity of dental caries, while others does not presenting any association. Raised serum vitamin D level were connected with improved dental health constraints [30].

Zhan et al [31], 2014 reported inverse relationship of serum levels of vitamin D and tooth loss. Dudding et al [32], 2015 establish that there was no confirmation of inverse influence of vitamin D on dental caries, however they institute relationship between lower levels of vitamin D and early caries. Herzog [33] et al in 2016 establish non-significant relationship between vitamin D ranks and caries involvement. In the current study, there is statistically significant variation between mean level of vitamin D in children with SECC and children with out caries. Significant association between vitamin D levels and SECC was also established. But, this study had definite restrictions. This study was a solitary-centre but the sample size small. Thus, there is a necessity for extended multi-centre studies. However this study considered to be the first of its kind in Iraq, and it can be recorded for further

studies. Additional restriction is that our study was a cross-sectional study and thus, prospective studies would be required to appreciate the favourable consequence of vitamin D supplements in reducing severity and prevalence of dental caries in pediatric patients.

CONCLUSION :

The level of vitamin D in the blood "with which correct bone mineralization occur" is a significant defensive component against caries. Certifying a correct serum level of vitamin D is one portion of the competition against dental caries. We cannot consider it as a cause of caries alone ignoring education in the extent of proper oral hygiene among children or fluoride prophylaxis. Records from this case-control study revealed that there was a close correlation between dental caries and lower serum vitamin D. Additional preventive concern to reduce the risk of caries may be to improve the vitamin D status of the child. The completed survey suggests that there is a negative correlation between the association of vitamin D with the prevalence of caries and the incidence of childhood caries and vitamin D inadequacy can be a hazard dynamic for dental caries.

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