Assessment of Vitamin D Level in Sera of Primary School Students in Babylon Province

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Abstract

The spread of insufficiency of vitamin D may expose primary students at hazard for bone development, innate and adaptive immune responses, and increases risk of certain chronic diseases. The study provides an examination of the pervasiveness of 3 levels of sera 25(OH)D (≥30, 29-20, and <20 ng/ml) in students at the age 6 to 13 years. The data highlights that several of children in the Babylon city have levels of 25(OH)D some consider low and that urban girls have a lower record 25(OH)D. The serum is used to estimate the circulating level of vit.D by using microplate technique. Serum level 25(OH)D for children age 6 to 13 years is 28.77 ± 11.51ng/ml. Girls have suboptimal levels of 25(OH)D (25.96±9.95 ng/ml (95% CI:10.39-2.74) in comparison with the boys (32.53±12.44 [95% CI:5.75-2.29). The prevalence of levels at <10 ng/ml is 15%, less 20 ng/ml is 56%, and less 30 ng/ml is 29%. The predominance of sera '25(OH)D levels of <30 ng/ml is higher among boys (43%) in comparison with the girls (32%); urban (45%) in comparison with rural (30%). Based on a delegate test of Babylon kids of primary students, many children have inadequate levels of 25(OH)D.

1- Introduction

Vitamin D is fat- soluble prohormone, which is derived mostly from the synthesis of 7-dehydro-cholesterol (7-DHC) in the skin caused by the effect of UVB , which is the internal structure of the chief source of vitamin D supply the body and represents approximately 80% of vitamin D, can also be taken vitamin D2 or D3 through feeding in small quantities [1]. After production in the skin or nourishment uptake, vitamin D is then conveyed to the liver by a specific vitamin D binding protein (VDBP), there is hydroxylated to 25-hydroxyvitamin D (25(OH)D). This inactive form is considered the main metabolite circulates in blood and is also used for the classification of vitamin D status[2].

Vitamin D lack was identified during 19th century as a cause of rickets in kids living in industrial cities[3].Systematic reviews revealed that vitamin D deficiency and insufficiency are prevalent in all ethnicities and age groups where data are available around the globe[4].

There are two sources of cholecalciferol (vit D3): Ultraviolet rays exposure and dietary intake. Exposition to sun is the primary determinant of vitamin D state in humans[5]. The use of sunscreen in childhood, which protects against future melanoma and reduces vitamin D make in the skin, these elements add to the diminishment of vitamin in the various population according to recent reports[6].

One of the basic concepts in grasp for vitamin D' metabolism and vitamin D inadequacy is recognition that this compound has been named - it is not a vitamin, it is a fat-soluble steroids created in the skin from the effect of UV- light on 7- Dihydrocholesterol[7]. Vitamin D also regulates the genetic expression in different organs, including the brain through its dynamic shape, 1,25-dihydroxyvitamin D3 [8], [9]. The activities of the vitamin D hormone 1,25-(OH)2D3 are interceded via the vitamin D receptor (VDR), which forms heterodimers with RXRs then ties to vitamin D reaction components found in promoter locales of responsive genes [10]. VDRs are found in neurons and glial cells and can activate nerve growth factors [11],[12].

Deficiency and insufficiency of vitamin D are connected with a significant number of pathologic conditions in people everything being equal. Also insidious or non-specific the signs and side effects of vitamin D inadequacy goes unrecognized and untreated[13]. We should know about the harmful impacts of vit. D insufficiency on growth and bone advancement, including potential impacts on bone thickness and improvement of pinnacle bone mass [14].

Predominantly occurs more hydroxylated of 25 (OH) D in the kidneys to the most effective form 1,25-dihydroxyvitamin D (1,25 (OH) 2D), by 1α-hydroxylase enzyme. Assumption that Vitamin D is playing a widespread role for overall health, including, beyond the muscloskelelal system. Other tissues, such as the heart and the vessels come from the fact that 1-α-hydroxylase is also found to be active in extra-renal tissues everywhere body[15]. Circulating 25(OH)D levels half-life is approximately two to four weeks and Vitamin D status is classified according to it[16].

25(OH)D is the main rolling format and a better vitamin D indicator with a circulating halflife of (2-3 weeks). Whilst the half-life of 1,25(OH)2D is only four hours [17]. It is distributed 1,000 times at a low concentration of 25 (OH) D, and regulates blood level tightly with levels of serum parathyroidism hormone (PTH), calcium and phosphate [18]. Sera 1,25- dihydroxyvitamin D does not reflect vitamin D reserves, and is often either normal or even elevated in people with secondary hypothyroidism (SHPT) [19], and preferably only to monitor specific cases, such as diseases inherited from the phosphate and vitamin D metabolism [20].

Vitamin D is a powerful neurotransmitter that tells a lot about its health benefits. Therefore, it is not astonishing that vitamin D shortage is linked with hundreds of prevalent health problems. Therefore, reversing vit.D deficiency may reduce the hazard of death significantly[21].

On the bases on several studies, it was suggeested vit. D deficiency be known as a 25(OH)D below 20 ng/ml, inadequacy as a 25(OH)D of 21–29 ng/ml, and adequacy as a 25(OH)D of 30–100 ng/ml [15], these values are suggested to identify deficiencies and deficiencies and inform treatment decisions indirectly [22].

2-Materials and Methods

Between 23th November 2017 and 20th March 2018,134 subjects were recruited in this study, sample size of girls and boys 77, 57 consecutive**.** All children are taking values of body mass index [23]. Some healthy children were selected from the Merjan Teaching Hospital in Hill, others from the neighborhood's and relatives children.

Five ml of blood are obtained from each subject then pushed into tubes containing separating gel, The blood sample is left to coagulate at room temperature and then separated to obtain the serum by centrifugal device for approximately 15 min. then the supernatant were obtained and stored at -20˚C till analytical examination [24].

Blood levels of "25-hydroxyvitamin D" are measured in non-fasting specimens of 134 subjects by Elabscience (China) ELISA kit. "Vitamin D" Status is evaluated according to Clinicl Practice Giudelines Endocrine community [25]. Serum calcium and inorganic phosphate levels are determined by using standard methods and kits from Biomerix.

3- Statistical analysis:

The data are calculated and analyze using Statistical Package for Social Sciences (SPSS) for the 20th edition of Windows. The data is expressed as (mean ± SD).The independent t- sample test is used to compare means between two groups. The Chi-square test (X2) and Fisher's exact test are used to find the importance of class variables. P values less than (0.05) are significant.

4- Results

Blood samples are available from 134 children primary students which are categorized according to vitamin D status., The overall mean age of children were (10.01±1.96) years old, body mass index (BMI =19.3±2.0), serum calcium levels (8.6 ± 1.8), inorganic phosphate (3.8 ± 1.1) and serum 25(OH)D level (28.77 ± 11.51). The characteristics of the population under study are presented in the table (1).

Table (1): Demographic Features of the study group

Children primary students	Sample size	Age (year)	BMI kg/m^2	Ca^{+2} g/dl	P mg/dl	25(OH)D ng/ml
	134	**10.01±1.96**	**19.3±2.0**	**8.6±1.8**	**3.8±1.1**	**28.77 ± 11.51**

Participants from the population eligible for analysis are urban children 81 more than from rural population 53. There is no significant difference ($p > 0.05$) in value of serum vitamin D between the countryside and the city, but there is significant difference ($p< 0.05$) where The boys kept concentrations of serum 25(OH)D more than 30 ng/ml (32.53± 12.44) ng/ml but the girls are below 30 ng/ml (25.96 ± 9.95) ng/ml.

Table (2): Mean variation by serum vitamin D levels for both children's homes and sex

Study group		N=134	25(OH)D		P-values	95% C.I.
			Mean	S.D		
Sex	Girls	77	25.96	9.95	0.001	10.397-2.742
	Boys	57	32.53	12.44		
Residence	Urban	81	28.08	10.77	0.396	5.755-2.295
	Ural	53	29.81	12.58		

Table (3) shows that the data of 25-hydroxyvitamin D available are divided in groups of deficient vitamin D levels (n = 20), insufficient levels (n = 75) and sufficient levels (n = 39). The prevalence of children who had a level of 25 (OH) D" serum < 20 & ≥ 30 ng/ml was not high (15%), (29%) respectively, in these two categories are higher among girls (9%, 32%) in comparison with boys (11.5%, 43%). While at threshold of (29-20) ng/ml of vit.D obviously it has the highest proportion (56%). This category is higher among boys (17%) in comparison with girls. Adjustment for residence dwelling does not materially change these results.

Table (3) : Distribution of different vitamin D level between children

Vitamin D	Girls	Boys	X^2	P-value	Urban	Rural	X^2	P-value
Deficiency N=20(14.9%)	6(8.51) x^2 =[0.74]	14(11.49) X^2 =[0.55]	13.175	0.014	12(12.09) X^2=[0.00]	8(35.91) X^2=[0.00]	1.108	0.574
Insufficiency N=75(56%)	25(31.90) x^2 =[1.49]	50 (43.10) X^2= [1.11]			48(45.34) X^2=0.16	27(29.66) X^2=0.24)		
Sufficiency N=39(29.1%)	26 (16.59) x^2 =[5.34)	13 (22.41) X^2 =[3.95]			21(23.57) X^2=[0.28]	18(15.43) X^2=[0.43]		
Total	57	77			53	81		

5- Discussion

The results agree with Mansbach et. al [8] who report the significant Insufficient of vitamin D level in healthy children. Another examination demonstrates that the commonness of vitamin D paucity described as 25(OH)D<20 ng/mL is very common, Spring and Winter are the most essential hazard factors for vitamin D inadequacy [26].

We ought to know about the information emerging from the different wellbeing impacts of vitamin D and comprehend that this gathering of kids may require more vitamin D, which is right now delivered from daylight or expended in their eating regimen (counting dietary supplements)[27]. Preliminary definitions and discussion on a healthy level of vitamin D is related to preventing of rickets. However, information demonstrates that vitamin D is a prohormone with receptors throughout the body [6]. Accordingly, healthy results beyond rickets are being considered when specialists endeavor to characterize a health standard of 25 (OH) D" for kids [28].

In the past, children are used to play more outdoors, get most vitamin D from presentation to daylight and drinking vitamin D-strengthened milk, and in this way, they don't have to take a vitamin D supplement [29]. Now Children are at expanded danger of developing vitamin D deficiency because of constrained exposure to sunlight. Skin cannot efficiently synthesize "vitamin D" [30]. However, children are spend much longer inside, especially girls who wear long robes and set out covers toward religious reasons and when they leave house, they frequently they wear sun insurance that contains their capacity to make vitamin D in their skin. Vitamin D levels of vit. D in nourishments / or supplements for these individuals will give sufficient measure of these nutrients. [25].

Despite the fact that people living in this area enjoy a constantly sunny atmosphere throughout the year[31], environmental pollution is a critical factor influencing the synthesis of cutaneous synthesis of vitamin D. At wavelengths between (290 - 315) nm, occur conversion 7-DHC to previtamin D3 but due to thick air pollution and ozone cover, these wavelengths are less likely to reach the Earth's surface and prevent skin synthesis by interfering with UV-B. [32], [33].

According to reports that the age of childhood is at rise hazard for vitamin D inadequacy and lack and its dangerous health outcomes, however with the cutoff of 20 ng/ml set by the IOM [30], the pervasiveness of vitamin

D lack ought to be reconsidered. There are no information about the amount of "vitamin D" desired for counteract vitamin D lack in children aged 1– 9 yr. A couple of studies have demonstrated that amid the pubertal years, children kept up a serum "25(OH)D" over 11 ng/ml from "vitamin D" ingestion admissions of "2.5– 10 g/d" (100–400 IU/d) [25].

There is a study by Maalouf et al. [34] recommends this age amass needs 2000 IU/d to keep up vitamin D concentration in blood over 30 ng/ml. Another examination, by El-Hajj Fuleihan [35], gives a knowledge into the vitamin D prerequisite for kids matured 10– 17 yr (who were most probably exposed to suitable quantities of sun-interceded vit.D as residents of Lebanon) who ingested week after week dosages of either 1,400 or 14,000 IU vitamin D3 for 1 year .

Children amid these period have a quick development described by a checked increment in their calcium and phosphate necessities to amplify skeletal mineralization. Thus the metabolism of 25 (OH) D to 1,25 (OH) 2D increments. In contrast, an increase in blood levels by 1,25 (OH) 2D upgrades intestinal proficiency in the retention of nutritional calcium and phosphate to meet the developing skeletal prerequisites of these minerals amid their quick development stage [36].

Therefore, at least 1 to 18 years of age need of vitamin D at minimum 600 IU / D for furnish all potential medical advantages related with vit.D to amplify bone health. On the other hand, elevation of blood 25 (OH) D may require always upper than 30 ng / ml (75 nmol / L) of no fewer than 1000 IU / D of vitamin D. While obese children need a higher vitamin D to stimulate the inflow of calcium inside the adipocyte bringing about the expansion of lipogenesis and restraint of lipolysis [25],[36].

Healthy children in Iraqi country suffer from insufficiency of vitamin D because an individual's lifestyle and behavioural factors may play a role in determining the vitamin D status. avoidance of exposure to the sun because of their Cultural factors (covered clothing), working patterns (indoor or outdoor) and behavioural factors (time spent outdoors, use of sunscreen, sun avoidance) it affects greatly the synthesis of vitamin D[32],[37], [38].

6- Conclusions

Vitamin D lack is a pestilence in children living in areas of cultural expansion despite the sun's rays. The absence of school feeding, which is very important in this age group and includes vitamin D-fortified milk in addition to other nutrients, represents a comprehensive and almost complete meal, regardless of their standard of living, in addition to the absence of sports school activities and students to sunny areas and practicing simple exercise, all this and other led to insufficient vit. D.

7- **Recommendation**

We need more data in children to understand the health wares of certain range of serum 25 (OH) D, and decide the prerequisites of suitable vitamins supplement for kids to make up the shortfall and then change the lifestyle.

CONFLICT OF INTERESTS

There are no conflicts of interest.

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الخلاصة

قد يؤدي انتشار قصور فيتامين (د) إلى تعرض الأطفال لخطر نمو العظام، والاستجابات المناعية الفطرية والتكيفية, وزيادة خطر الإصابة بالأمراض المزمنة. توفر الدراسة فحص 25(OH)D لثلاث مستويات مصلية(≥30, 29-20, < 20 ng/ml) في الأطفال الذين تتراوح أعمارهم بين ٦ إلى ١٣ سنة. تشير البيانات إلى أن العديد من الأطفال في مدينة بابل لديهم مستويات منخفضة وأن الفتيات في المناطق الحضرية لديهم أدنى المستويات من 25(OH)D. وذلك باستخدام تقنية قارئ الصفائح المايكروية تم تقدير مستوى فيتامين د في مصل الدم. معدل مستوى المصل25(OH)D للأطفال في عمر ٦ إلى ١٣ سنة هو11.51ng/ml ± 28.77. لدى الفتيات كانت المستويات قليلة ng/ml (25.96±9.95) [95% CI:10.39-2.74] بالمقارنة مع الأولاد[95%CI:5.75-2.29] ng/ml(32.53±12.44). نسبة انتشار المستويات عند 10> ng/ml كان 15%, ومستوى 20> ng/ml هو 56% إما مستوى 30> ng/ml هو 29%. لقد كان انتشار مستويات مصل ٢٥ هيدروكسي فيتامين (د) 30> ng/ml أعلى بين الأولاد (٤٣٪) مقارنة بالفتيات (٣٢٪) ؛ الحضرية (٤٥ ٪) بالمقارنة مع المناطق الريفية (٣٠ ٪). وعلى أساس العينة المتمثلة بأطفال الحلة من طلاب المرحلة الابتدائية، فإن العديد من الأطفال لديهم مستويات غير كافية من٢٥ هيدروكسي فيتامين د.

الكلمات الدالة: فيتامين د ، ٢٥ هيدروكسي فيتامين د ، صحة الطفل.