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ORIGINAL ARTICLE

Vitamin D Deficiency in asymptomatic children one month to 2 years attending a Tertiary Care Hospital's Well Baby Clinic for Immunization.

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ABSTRACT… Objective: To determine the frequency of vitamin D deficiency among asymptomatic children aged 1 month to 2 years visiting the well-baby clinic at a tertiary care hospital for immunization. **Study Design:** Cross-sectional study. **Setting:** The Well-baby Clinic of the National Institute of Child Health (NICH) in Karachi, Pakistan. **Period:** March 13, 2020, to September 12, 2020. **Methods:** The study included all asymptomatic children between 1 month and 2 years of age, with height and weight within 2 SD above and below the mean, attending the well-baby clinic for immunization. A blood sample was collected to assess serum 25 OH vitamin D levels. Frequencies and percentages were calculated for qualitative variables, including sex, feeding patterns, maternal and paternal education, sunlight exposure, socioeconomic status, and vitamin D deficiency. The mean and standard deviation (SD) were calculated for continuous variables such as age, height, and weight. **Results:** The mean age of the children in the study was 8.22 ± 4.77 months. A higher proportion of females (57%) were included in the study. Most mothers (72.5%) had an illiterate education status, while most fathers (47.7%) had a primary level education. A majority of children (53.7%) had over 30 minutes of sunlight exposure per week. Vitamin D deficiency was found in 17 (11.4%) of the children studied. **Conclusion:** Vitamin D deficiency was found to be prevalent in 11.4% of asymptomatic children aged 1 month to 2 years attending the well-baby clinic for immunization. This highlights the need for increased awareness and screening for vitamin D deficiency in pediatric populations, even in the absence of symptoms.

Key words: Immunization, Vitamin D Deficiency, Well-baby Clinic.

INTRODUCTION

Vitamin D deficiency is a serious public health problem in both developed & developing countries, with a global incidence of 30-80% in children and adults. Vitamin D is essential for bone growth and mineralization and contributes to calcium metabolism.[1]

Vitamin D is necessary for intestinal calcium & phosphate absorption & plays a central role in maintaining calcium homeostasis & skeletal integrity.[2] The classic endocrine action of vitamin D lies in the regulation of intestinal calcium & phosphorus absorption, to maintain both normal serum calcium & phosphorus levels or eventually, to guarantee adequate skeletal mineralization. In children, vitamin D insufficiency causes rickets and skeletal under mineralization, as well as other symptoms.[3]

The mostly used and suitable biochemical marker of1vitamin D status is serum or plasma 25(OH) D3.[4] While 125(OH) 2D3 represent the active form of vitamin D, due to tight1regulation of its production and comparatively small half-life (4 – 6 hrs), it's not a good indicator of vitamin D status.[5]

It is recognized that level of serum was 25(OH) D3 under 12.5nmol / l can cause in bone diseases like Rickets. There's also evidence indicates circulating 25(OH) D3 levels under 20-25 nmol/l can cause rickets over time. Some medical problems, like cystic fibrosis, crohn's disease & celiac disease can affect the ability of intestine to absorb vitamin D from1food. Vitamin D insufficiency is linked to cardiovascular disease

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and impaired glucose homeostasis, and it's more common in obese children.[6]

A high frequency & adjusted odds of vitamin D deficiency were found among obese, overweight and severely obese US children.[7] A study published in American journal of clinical nutrition conducted in northern India & New Delhi on 5137 school children that showed 10.8% prevalence of vitamin D deficiency in apparently healthy children.[8] In 2018 study, the frequency of Vitamin D deficiency ranged from 40 to 99%, with majority of studies finding a prevalence of 80 to 90 percent.[9]

According to extensive studies, deficiency of vitamin D in children is frequent & a worldwide health problem. The frequency of vitamin D deficiency among pediatric population visiting well baby clinic has not been identified especially among those without sign & symptoms. The rationale of this study is to find out the frequency of vitamin D deficiency among asymptomatic pediatric population going to well-baby clinic for immunization so that 6 the magnitude of this problem in Pakistani children can be identified. This in future can help translate into developing effective protocols for screening and prevention of vitamin D deficiency and related skeletal growth problems in children by supplementation of vitamin D.

METHODS

This cross sectional study from March 13. 2020 to September 2020 conducted from well-baby clinic of the National Institute of Child Health Karachi after approval from ethical committee (IERB. NO:02/2019). 149 subjects Sample size was calculated with 5% level of significance & 80% power of test by taking expecting prevalence 10.8% of vitamin D deficiency in healthy children).

All asymptomatic children between the age of one month to 2 years with height & weight centile within 2 SD above and below mean, visiting well baby clinic of the National institute of child health Karachi for immunization were included. Children with any sign & symptoms of vitamin D deficiency such as bone pain, bone deformities bowing of legs ricketic rosary, history of thyroid, parathyroid, adrenal, diabetes & gonadal diseases, thalassemia & other haemoglobinopathies, Malignancy, hepatic & Renal diseases Use of medications that deplete vitamin D levels in the past. Calcium supplements were not included in the study.

Height and weight was measured and plotted on a standard growth chart for centiles according to age and sex. A blood sample for serum 25 OH vitamin D was sent. Each child was assessed for age, sex, height (in centile on growth chart), weight (in centile on growth chart), feeding pattern, parent's education, exposure to sunlight. Age was noted as less than or more than 1 year, height and weight was noted as less than or more than mean for age and sex (within ±2 SD). Data was collected on a predesigned proforma was completed by the principal investigator for all enrolled subjects. (Proforma & Growth Chart attached) All data was collected by a single investigator and all investigations were performed by the single laboratory to control for bias.

Data was analyzed by using SPSS 21. Frequencies & percentage was calculated for qualitative variables like sex, feeding pattern, mother's & father's education, exposure to sunlight, socio-economic status and vitamin D deficiency. Mean and SD was calculated for age, height and weight. To control the effect modifiers, vitamin D deficiency was stratified according to age, gender, height, weight, feeding pattern, parent's education & exposure to sunlight. Chi square was applied. $p <$ to 0.05 was taken as significant.

RESULTS

Total 149 children included, there were 64(43%) male and 85(57%) female. The mean age of children was 8.22 ±4.77months. Most of the children lie in ≤12 months of age, i.e. 128 (85.90%). Average height of most of the children 82 (55%) was ≤25 inches. Mean weight was 14.41 ±5.58lbs. Most of the children 79 (53.0%) were presented with <15lbs weight. Table-I

The majority of the mothers 108 (72.50%) had illiterate education status whereas father's

education of most of the children 71 (47.70%) was primary. Table-II There were 96(64.4%) children with ≥10,000 socioeconomic status. The majority of the children 80(53.7%) got sun exposure of >30 minutes/week. Table-III

There were 56(37.6%) children with top feed and 93(62.4%) children with weaning feeding pattern. Frequency of vitamin D was found in 17 (11.40%) patients. Table:3 Stratification was done to see the effect of age, height, weight, gender, mother's & father's education, feeding pattern, sunlight exposure on the outcome. Deficiency of vitamin D were significant difference with age, height & weight. Table-IV

Gender	Male	64(43%)
	Female	85(57%)
Age (months)	Mean + SD	8.22 ±4.77
	<12	128(85.90%)
	>12	21(14.10%)
	<25	82(55%)
	>25	67(45%)
Weight (lbs)	Mean + SD	14.41 ±5.58
	<15	79(53.0%)
	>15	70(47.0%)

Table-I. Descriptive of Gender, Age, Height, Weight

	Illiterate	Primary	Secondary
Mother Education	108(72.50%)	25(16.80%)	16(10.70%)
Father Education	39(26.20%)	71(47.70%)	39(26.20%)

Table-II. Distribution of mother & father education

		Frequency (%)
Socioeconomic Status	<10,000	53(35.6%)
	>10,000	96(64.4%)
Sunlight Exposure	<20 minutes/week	69(46.3%)
	>30 minutes/week	80(53.7%)
Feeding Pattern	Top Feed	56(37.6%)
	Weaning	93(62.4%)
Vitamin D Deficiency	Yes	17(11.40%)
	No	132(88.60%)

Table-III. Frequency of Socioeconomic Status, feeding pattern, sunlight exposure

DISCUSSION

Vitamin D deficiency was reported to have a significant incidence and adjusted chances among obese, overweight & severely obese children in the US, Obese children may require vitamin D supplementation to prevent deficiency of vitamin D.[7]

In our study, frequency of vitamin D was found in 17 (11.40%) patients. Our results were supported by a study published in American journal of clinical nutrition conducted in northern India & New Delhi on 5137 school children that showed 10.8% prevalence of vitamin D deficiency in healthy children.[8]

In southeast China, another study was published in a children's hospital affiliated with Zhejiang University of Medicine.

		Vitamin D Deficiency		P-Value
		Yes	No	
Age Group	<12	4(3.1%)	124(96.9%)	0.001
	>12	13(61.9%)	8(38.1%)	
Height	<25	4(4.9%)	78(95.1%)	0.006
	>25	13(19.4%)	54(80.6%)	
Weight (lbs)	<15	5(6.3%)	74(93.7%)	0.038
	>15	12(17.1%)	58(82.9%)	
Socioeconomic Status	<10,000	7(13.2%)	46(86.8%)	0.608
	>10,000	10(10.4%)	86(89.6%)	
Sunlight Exposure	<30 minutes / week	5(7.2%)	64(92.8%)	
	>30 minutes	12(15%)	68(85%)	0.13
Feeding Pattern	Top Feed	6(10.7%)	50(89.3%)	0.836
	Weaning	11(11.8%)	82(88.2%)	

Table-IV

Total 6008 children ranging in age 1.0 month to 16.0 years included. As a result, the frequency of serum 25 (OH) D levels of 75 nmo l / L & 50 nmol / L was lowest among babies (33.6 & 5.4%) and largest among teenagers (50 nmol/L) (89.6 & 46.4%). According to extensive studies, deficiency of vitamin D in children is common & a worldwide health problem. The frequency of vitamin D deficiency among pediatric population visiting well baby clinic has not been identified especially among those without sign & symptoms.[10]

Net intestinal absorption of calcium is up to 30.0% in a vitamin D - sufficient condition [25(OH)-D levels of greater than 50.0 nmol/L (20 ng/mL)], however absorption of calcium may reach 60 to 80% during active growth periods. In state of vitamin D deficiency, only 10% to 15% of calcium is absorbed by the intestine & total maximum phosphate re-absorption is reduced. Low ionized level of calcium stimulates parathyroid hormone (PTH) release in deficiency of vitamin D.

Deficiency of vitamin D has been related to autoimmune illnesses like type 1 diabetes & multiple sclerosis in epidemiological studies.[11,12] Children with vitamin D–deficient are four times more likely than vitamin D–sufficient children to acquire type 1 diabetes at the age of one year.[13]

Furthermore, persons who live above 35° latitudes have a larger risk of developing multiple sclerosis than those who live below this latitude, Multiple sclerosis risk has been found to be inversely proportional to the levels of vitamin D.[14,15]

According to research, Vitamin D sufficient in the mother and infant can protect against type 1 diabetes & multiple sclerosis.[16,17] Vitamin D supplementation has also been shown to be protective against rheumatoid arthritis & inflammatory bowel illness.[18,19]

CONCLUSION

Vitamin D deficiency was observed in 17 (11.40 percent) of asymptomatic children aged 1 month to 2 years who visited a tertiary hospitals hospital's well baby clinic for immunization.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
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2	**Quratulain:** Conception, Design conduct and interpretation.
3	**Versha Rani Rai:** Conception, Design and analysis.
4	**Uzma Salman:** Conception, Design and conduct.
5	**FNU Sunina:** Manuscript, Draft and Proof check.
6	**Berkha Rani:** Manuscript, Draft, Review and Proof check.