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ORIGINAL ARTICLE

Frequency of Vitamin D deficiency in children under five years of age in a tertiary care hospital of Pakistan.

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ABSTRACT… Objective: To determine the frequency of vitamin-D deficiency in children under five years of age. **Study Design:** Cross-sectional-survey. **Setting:** Department of Pediatrics, Gulab Devi Hospital, Lahore. **Period:** 01-6-2022 to 1-12-2022. **Methods:** This cross-sectional survey was done in the Department of Pediatrics, Gulab Devi Hospital, Lahore. One hundred children, with fever, flu cough or presented for vaccination or routine check-up were included via Non-probability consecutive sampling. Children were assessed for vitamin D level. Data analysis was done in SPSS v. 25.0. **Results:** In this study, there were 100 children included with mean age of 3.8 ± 1.1 years. There were 25 (25%) male children and 75 (75%) female children. The mean duration of sun exposure per 24 hours was 1.8 ± 0.6 hours, and previous history of vitamin-D deficiency was noted in 3 (3.0%) cases. Mean vitamin-D level was calculated as 24.75 ± 9.90 ng/ml in all the children. Out of 100 children, 62 (62.0%) children had vitamin-D deficiency. **Conclusion:** According to this data, "the chances of vitamin D deficiency are higher in children less than 5 years of age belong to local community."

Key words: Children, Infant, Sunlight Exposure, Toddlers, Vitamin-D Deficiency.

INTRODUCTION

Vitamin-D is a group of fat-soluble vitamins which includes vitamins D2 and D3. Vegetables and fortified meals are a rich source of vitamin-D2.[1,2] Vitamin-D3 is primarily generated in skin by photolysis of "cutaneous 7-dehydroxycholesterol by ultraviolet radiation to create pre-vitamin-D3, & later on vitamin-D3." Vitamin-D3 may be found in meals that are animal-based including chicken or, mutton or beef.[3] The primary activated vitamin-D molecule in the body is 1, 25(OH)2D, whereas 25-hydroxyvitamin-D [25(OH)D] is the predominant form of vitamin-D and the best indication to measure vitamin-D concentrations.[4,5]

The vitamin-D influence on calcium and phosphorus metabolism and bone health is well-established. Extraosseous illnesses, such as autoimmune diseases, asthma, cardiovascular diseases, and infections, are related to Vitamin-D in an increasing number of studies.[6] Vitamin-Deficiencies and insufficiencies might occur for several causes. The vitamin-D levels of children of all ages have been the subject of much study. This might be because the Chinese Medical Association's Pediatrics Branch suggests giving babies and young children 400 international units of vitamin-D each day for the first two years of their lives.[7] Vitamin-D is mostly acquired via outdoor play in children older than 2 years old. Vitamin-D levels were found to be lower in those children who spend less time playing outside, according to research. In these studies sub-optimal levels of vitamin D were also found to be associated with winter season, low quality of diet, and low household income.[8-10]

Another research conducted in 2004 found that a large percentage of adolescents who sought primary care clinic consultation were vitamin-D deficient.[11] Various researches have been carried out internationally on vitamin-D deficiency in

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different areas of the world. In poor resource countries, the incidence is quite high. Vitamin D inadequacy and insufficiency are frequent in young people. However, the role of vitamin-D and variation in levels that affect it at various ages remain unclear. As a result, we undertook this research to provide an approximate population size for the area. So, the current study is aimed to determine the prevalence of vitamin-D deficiency in children under five years of age. This study will help in creating awareness among treating pediatricians and parents regarding the need and importance of vitamin-D for growth of children.

METHODS

It was a cross-sectional-survey conducted at the Department of Pediatrics, Gulab Devi Hospital, Lahore for a duration 6 months i.e., from 01-6-2022 to 1-12-2022. Sample size of n = 100 cases was predicted by keeping 95% confidence level, absolute precision required at 10% and percentage of vitamin-D deficiency i.e. 60% in children <5 years old.[12] Non-probability, convenient sampling technique was employed. Inclusion: Children of age 1-5 years, both genders, presenting for regular check-up, vaccination or mild fever, flu and cough were included. Exclusion: Children with severe conditions like congenital heart disease, liver failure, renal failure, systemic lupus erythematosus, sickle cell anemia, taking supplements, or treatment for infectious disease were excluded.

100 Children who fulfilled the inclusion criteria were selected from Pediatric OPD. Informed consent was taken from parents. Demographic information like age, gender, weight, height, area of residency, parent's education, income per month, house ventilation, socioeconomic status, duration of exposure to sunlight and history etc. were also obtained. Then blood samples were taken in phlebotomy area by using disposable syringes under aseptic measures to prevent blood borne diseases. All blood samples will be sent for assessment of vitamin-D level to the same laboratory of the hospital to prevent any bias in reports. Vitamin-D level <20 ng/ml were considered as vitamin-D deficiency. All the data was recorded in proforma. Ethical approval was obtained from Al-Aleem Medical College, Lahore, with vide no. AAMC/IRB/EA/31/2022 dated 13-4-2022. All analyses were performed in SPSS 21.0. Categorical variables were analyzed as frequency and percentage, while numerical variables were analyzed as mean and standard deviation.

RESULTS

In this study, there were 100 children included with mean age of 3.8 ± 1.1 years. There were 25 (25%) male children and 75 (75%) female children. The male to female ratio was 1:3. The mean height of children was 76.08 ± 8.88 cm, mean weight was 10.51 ± 2.14 kg. Out of 100 children, 32 (32.0%) belonged to rural region, 41 (41.0%) belonged to urban region and 27 (27.0%) belonged to semi urban region. Out of 100 cases, 36 (36.0%) parents were uneducated, 31 (31.0%) parents had not completed school education under matric, 21 (21.0%) parents were graduate while 12 (12.0%) parents were post-graduate. In 62 (62.0%) cases, family's income was <Rs. 50,000/- while 38 (38.0%) cases had family income >Rs. 50,000/-. House ventilation condition was poor in 51 (51.0%) cases, average in 37 (37.0%) cases and good in 12 (12.0%) cases. There were 49 (49.0%) children who belonged to low socioeconomic class, 33 (33.0%) belonged to middle socioeconomic class and 18 (18.0%) belonged to high socioeconomic class. The mean duration of sun exposure per 24 hours was 1.8 ± 0.6 hours, previous history of vitamin-D deficiency in selected children was 3 (3.0%), and family history of vitamin-D deficiency was noted in 44 (44.0%) cases. Mean vitamin-D level was observed in all children was 24.75 ± 9.90 ng/ml. Table-I

Out of 100 children, 62 (62.0%) children had vitamin-D deficiency while 38 (38.0%) children had normal vitamin-D level. Figure-1

DISCUSSION

A vital nutrient for bone health and bone growth is vitamin D. The metabolism of calcium and phosphorus also depends on it. Since there aren't many naturally occurring foods that contain vitamin D, exposure to sun-light is a key source of this nutrient.[13]

	Mean ± SD, f (%)
n	100
Age (years)	3.8 ± 1.1
Gender	
Male	25 (25%)
Female	75 (75%)
Height	76.08 ± 8.88
Weight	10.51 ± 2.14
Area of residence	
Rural	32 (32.0%)
Urban	41 (41.0%)
Semi urban	27 (27.0%)
Parent's education	
Uneducated	36 (36.0%)
Under matric	31 (31.0%)
Graduate	21 (21.0%)
Post-graduate	12 (12.0%)
Family income	
<Rs. 50,000	62 (62.0%)
>Rs. 50,000	38 (38.0%)
House ventilation	
Poor	51 (51.0%)
Average	37 (37.0%)
Good	12 (12.0%)
Socioeconomic status	
Low	49 (49.0%)
Middle	33 (33.0%)
High	18 (18.0%)
Duration of sun exposure / 24 hours	1.8 ± 0.6
History of Vitamin-D deficiency	3 (3.0%)
Family history of Vitamin-D deficiency	44 (44.0%)
Vitamin-D level in participants (ng/ml)	24.75 ± 9.90

Table-I. Demographics of children

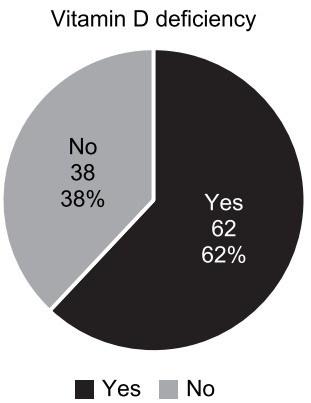

Figure-1

A 25(OH)-D level <20 ng/mL (50 nmol/L) in blood is known as deficiency.[14,15] In fact, the skin produces >90% vitamin-D body needs, whereas just 5-10% comes from food.[16] Vitamin-D insufficiency, particularly in children, has increased in prevalence with rising levels of air pollution and the concomitant drop in outdoor activities.[17]

Children's vitamin-D levels in our research averaged 24.75 ng/ml (standard deviation: 9.90 ng/ml). Among the sample of 100 kids, 62 (62.0%) were vitamin-D deficient. Another Pakistani research found a similar prevalence of 60% of vitamin-D deficiency in children under 5 years of age.[12] Vitamin-D insufficiency and inadequacy are now recognized as a major threat to public health. A larger percentage of American children between the ages of 6 and 11 have a 25(OH) D insufficiency (50 to 75 nmol/L) than those between the ages of 1 and 5.[18] A cross-sectional study from China with just over 6000 participants aged 1month to 16 years found that the prevalence of vitamin-D insufficiency (25(OH) D 50 nmol/L) ranged from 5.4% in babies to 46.4% in teenagers.[19]

Comparing our children to American children, we found that while the frequency of vitamin-D deficiency was similar. Most children aged <2-5 years (68.6%) and children between 6-16 years (88.3%) had low vitamin-D level if the threshold was lowered to 75 nmol/L. This was also true for teenagers (89.6%) and almost all children (60%).[20,21] Vitamin-D is worldwide public health concern. About one billion people all around the globe had less than normal levels of vitamin-D, while 50% of world's population has vitamin-D insufficiency.[22]

Hangzhou, China is found near 30 degrees north latitude, in the southeastern part of China. Hangzhou has more hours of sunlight than places farther north. Teenage females in Beijing had a prevalence of vitamin-D insufficiency that was 89%, far greater than the prevalence among American teenage girls (52%). Rather, the rate of vitamin-D deficiency in infants and toddlers in Shanxi was 84.3% in spring and 8.1% in autumn, than other northern areas of China.[23,24,25]

Our research shows that women are far more likely to be vitamin-D deficient than men. Oral

mucosal immunity is bolstered by vitamin-D, which in turn activates cathelicidin and other defensins to fight against pathogens.[26] Vitamin-D deficiency may result from not getting enough vitamin D rich foods or sun exposure (less than 30 minutes per week), which can lead to acute or chronic systemic illnesses.[27-29] In children and teenagers, a lack of vitamin-D may ends in rickets or muscular pain.[30] Hypo-mineralization of the molars and incisors might occur as a consequence, making teeth more susceptible to cavities.[31,32] Infant dental caries may be linked to maternal vitamin-D insufficiency.[33] Periodontal health may be enhanced by taking calcium and vitamin-D pills together.[34]

Laboratory examination of blood serum provides the precise measurements to assess vitamin-D nutritional status. Having a serum vitamin-D level of 30 ng/ml or more is considered sufficient, whereas having a level between 20 and 29.9 ng/ml is deemed insufficient.[35] Vitamin-D deficiency treatment guidelines include taking 5000 IU of vitamin-D3 per day during recuperation and 2000 IU per day afterwards.[36] Daily vitamin-D3 supplementation in the range of 10–50 ng is safe for youngsters.[30]

CONCLUSION

This has been concluded through findings of this study that the chances of vitamin-D deficiency are higher in children under five years of age belong to local community. This study has confirmed findings of prevalence of low levels of vitamin D in children under 5 as mentioned by previous study conducted in the southern of Pakistan. It is clear from the statistics that the risk of vitamin-D deficiency is high in many parts of Pakistan. Findings of this study will help in creating an awareness among pediatricians, primary care physicians and parents who are managing children for better growth and development of children.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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6	Hina Jawaid	Manuscript preparation, Resources, Data analysis, Review and editing.	
7	Muhammad Maaz Arif	Original draft, Manuscript preparation, Resources, Data analysis, Review and Editing.