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Vitamin D Deficiency in General Paediatric Population Presented in Combined Military Hospital, Malir

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ABSTRACT

Objective: To determine the frequency of vitamin D deficiency in the paediatric population presenting at Combined Military Hospital, Malir.

Methodology: This descriptive cross-sectional study was conducted at the Pediatric Outpatient Department (OPD) of Combined Military Hospital, Malir, from July to November 2021. Children aged 6 months to 12 years, including both boys and girls who presented to the pediatric department for routine care, nutritional concerns, or nonspecific symptoms potentially related to micronutrient deficiency, were included. A 3–5 mL sample of venous blood was collected aseptically from each participant for biochemical assessment of vitamin D levels. A serum 25-hydroxyvitamin D level of <20 ng/mL was considered deficient. All relevant information was entered and analyzed using SPSS version 26.

Results: Of the participants, 54.5% were female and 45.5% were male. Most children (47.7%) were aged 1–5 years. Approximately half (50%) of the children were found to have vitamin D deficiency, while 31.8% had insufficient levels and only 18.2% had sufficient levels. Sunlight exposure, type of dairy product intake, fish and meat consumption, and socioeconomic status were significantly associated with serum vitamin D levels ($p < 0.05$).

Conclusion: A high prevalence of vitamin D deficiency was observed among children and was strongly associated with inadequate sunlight exposure, poor dietary intake, and low socioeconomic status.

Keywords: Paediatric OPD, Vitamin D, Deficiency, Insufficiency, Children

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Introduction

Vitamin deficiencies represent a significant public health concern worldwide, particularly in the paediatric population. Vitamins play a crucial role in growth, immunity, development, and long-term health outcomes.[1–3] Vitamin D is an essential fat-soluble micronutrient. The paediatric population is particularly vulnerable to its deficiency, as children grow at a faster rate during this stage of life.[4] When circulating 25-hydroxyvitamin D levels fall below 20 ng/mL, it is classified as vitamin D deficiency.[5] Vitamin D deficiency is considered one of the most prevalent and concerning micronutrient deficiencies due to its vital role in regulating the immune system, skeletal development, cell growth, and bone metabolism.6 Children with vitamin D deficiency may experience several adverse health outcomes, including skeletal abnormalities, rickets, impaired lung health, an increased risk of fractures, and even cognitive and behavioral problems.[7]

Despite abundant sunshine in many parts of the world, vitamin D deficiency remains common among children in Eastern, African, and American regions, affecting approximately 24% to 65% of them.[8] In Central China, the prevalence of vitamin D deficiency in the paediatric population is reported to be 17.7%, with higher rates observed during summer.[9] In Taiwan, the prevalence is 48.9%, with a higher proportion among female patients

and a 1.7-fold increased risk during spring and winter.[6] In urban regions of India, the prevalence reaches up to 70%.[10] In Pakistan, the prevalence of vitamin D deficiency is alarmingly higher than the global average. A recent study from Karachi reported a 72% prevalence of vitamin D deficiency among children under five years of age, with age-specific and seasonal trends indicating higher deficiency among older children and during the winter season.[7]

Vitamin D deficiency in early life has multiple clinical consequences, with even serious concerns arising in the context of infectious disease.[11] Rickets is a most notable consequence of deficiency, with high prevalence in developing countries, including Pakistan.[12] A cross-sectional research study from Peshawar, Pakistan revealed that vitamin D deficiency was more common among child population suffering from respiratory tract infections and these children experienced longer stay at hospital.[13] An Indian study reported significantly higher respiratory infection rates (67.1%) among Vitamin D deficient paediatric population, with significant association between Vitamin D deficiency and higher severity and incidence of respiratory tract infection.[14] A recent meta-analysis revealed vitamin D deficiency among 53.7% of children suffering for asthma in Asian and African regions.[15] A more recent study from Romania reported association between BMI and serum vitamin D, with significantly higher prevalence of vitamin D deficiency among severely obese children (71.5%) than the obese and overweight children (69% and 61.5% respectively).[16] Existing studies exhibit widespread vitamin D deficiency in paediatric population in addition to risk stratification by age, gender, and season. However, local data is insufficient in this context. Therefore, this study is intended to determine the frequency of vitamin D deficiency in paediatric population presented at combined military Hospital, Malir. The exploration of the current prevalence and related factors of vitamin D deficiency in children may help guide public health strategies, improve early detection, and support the development of effective preventive and management strategies.

Methodology

The present descriptive cross-sectional study was conducted at the Pediatric Outpatient Department (paediatric OPD) of Combined Military Hospital, Malir. The study was carried out over a period of six months, from July 2021 to November 2021, to assess the prevalence and patterns of vitamin D deficiency among the paediatric population.

All children aged 6 months to 12 years, including both boys and girls who presented to the pediatric department for routine care, nutritional concerns, or nonspecific symptoms potentially related to micronutrient deficiency, were included. Children with chronic diseases, congenital abnormalities, severe malnutrition, a diagnosis of sepsis or jaundice, and those who had received multivitamin supplementation within the past four weeks were excluded.

A non-probability consecutive sampling technique was used to enroll eligible participants until the required sample size was achieved. A sample size of 50 cases was calculated using the WHO sample size calculator, based on the expected prevalence of vitamin D deficiency in children, with a 95% confidence interval and a 5% margin of error.

The study was conducted after obtaining ethical approval from the Institutional Ethical Review Committee (Ref No. 56/2021/Trg/ERC). Written informed consent was obtained from the parents or legal guardians of all participating children after clearly explaining the purpose, objectives, and procedures of the study. Parents were informed that participation was entirely voluntary and that they could withdraw at any stage without any consequences. They were assured that all personal and medical information would be kept strictly confidential and used solely for research purposes.

Results

A total of 88 children were studied in the study, 54.5% were female and 45.5% were male. Most children were between 1–5 years old (47.7%), followed by 6–12 years (42%) and less than 1 year (10.2%). A family history of vitamin D deficiency was reported in 42%, while 21.6% were unaware of any history. Sun exposure was inadequate in the majority (59.1%). Only 36.4% consumed all common dairy products (milk, eggs, yogurt), and 72.7% had inadequate fish and meat intake. Slightly more than half (53.4%) lived in urban areas, and 55.7% belonged to a satisfactory socioeconomic status. Associated medical conditions included iron deficiency anemia (25%), undernutrition (19.3%), kidney disease (9.1%), and obesity (8%), while 38.6% had no known conditions. Table I

Out of all children, half (50%) were found to have vitamin D deficiency (serum levels <20 ng/ml), while 31.8% had insufficient levels (20–29.9 ng/ml), and only 18.2% had sufficient levels (>30 ng/ml). This highlights a high prevalence of inadequate vitamin D status in the pediatric population. Table II

Table I: Demographic and clinical characteristics of the patients. (n=88)

Variables		N	%
Gender of baby	Male	40	45.5
	Female	48	54.5
Age groups	Less than 1 year	9	10.2
	1- 5 years	42	47.7
	6- 12 years old	37	42.0
Family history of vitamin d deficiency	Yes	37	42.0
	No	32	36.4
	Don't know	19	21.6
Sun exposure	Adequate	34	38.6
	Inadequate	52	59.1
	none	2	2.3
Types of dairy product intake	Milk	15	17.0
	Eggs	13	14.8
	Yogurt	11	12.5
	All of the above	32	36.4
	none	17	19.3
Fish and meet intake	Adequate	19	21.6
	Inadequate	64	72.7
	None	5	5.7
Residential status	Urban	47	53.4
	Rural	41	46.6
SES	High	6	6.8
	Satisfactory	49	55.7
	Low	33	37.5
Associated medical conditions	Iron deficiency Anemia	22	25.0
	Kidney Disease	8	9.1
	Obesity	7	8.0
	Under nutrition/ Malnutrition	17	19.3
	None	34	38.6

Table II: Serum Vitamin D levels among study population.

Serum Vitamin D levels	Frequency	Percent
Sufficient (>30 ng/ml or >75 nmol/L)	16	18.2
Insufficient (20- 29.9 ng/ml)	28	31.8
Deficient (<20 ng/ml)	44	50.0
Total	88	100.0

According to the post-stratification analysis the sunlight exposure, type of dairy product intake, fish and meat intake, and socioeconomic status had significant associations with serum vitamin D levels ($p < 0.05$). Children with adequate sunlight exposure and regular consumption of fish, meat, and a combination of dairy products were more likely to have sufficient vitamin D levels. In contrast, vitamin D deficiency was more prevalent among those with inadequate sun exposure, poor dietary intake, and low socioeconomic status. However no statistically significant association was observed with age, gender, or residential status ($p > 0.05$). Table III

Discussion

Vitamin-D (25-hydroxyvitamin D) deficiency has raised global concerns regarding its negative effect on overall health and quality of life in pediatric populations,

Table III: Post stratification with respect to the effect modifiers. (n=88)

Variables		Serum vitamin D level			Total	p-value
		Sufficient	Insufficient	Deficient		
Age Of neonates	Less than 1 year	1 (1.1%)	3 (3.4%)	5 (5.7%)	9 (10.2%)	0.94
	1- 5 years	7 (8%)	13 (14.8%)	22 (25%)	42 (47.7%)	
	6- 12 years old	8 (9.1%)	12 (13.6%)	17 (19.3%)	37 (42%)	
Gender	Male	9 (10.2%)	13 (14.8%)	18 (20.5%)	40 (45.5%)	0.569
	Female	7 (8%)	15 (17%)	26 (29.5%)	48 (54.5%)	
Sunlight exposure	Adequate > 15- 30 min/weekday	14 (15.9%)	8 (9.1%)	12 (13.6%)	34 (38.6%)	0.001
	Inadequate <15 min/ weekday	2 (2.3%)	19 (21.6%)	31 (35.2%)	52 (59.1%)	
	None	0 (0%)	1 (1.1%)	1 (1.1%)	2 (2.3%)	
Type of daily dairy product intake	Milk	1 (1.1%)	4 (4.5%)	10 (11.4%)	15 (17%)	0.004
	Eggs	1 (1.1%)	5 (5.7%)	7 (8%)	13 (14.8%)	
	Yogurt	1 (1.1%)	5 (5.7%)	5 (5.7%)	11 (12.5%)	
	All of the above	12 (13.6%)	12 (13.6%)	8 (9.1%)	32 (36.4%)	
	None	1 (1.1%)	2 (2.3%)	14 (15.9%)	17 (19.3%)	
Fish And Meet intake	Adequate > 2-3 times/week	12 (13.6%)	4 (4.5%)	3 (3.4%)	19 (21.6%)	0.001
	Inadequate <1-2 times/week	3 (3.4%)	23 (26.1%)	38 (43.2%)	64 (72.7%)	
	None	1 (1.1%)	1 (1.1%)	3 (3.4%)	5 (5.7%)	
Residential status	Urban	10 (11.4%)	19 (21.6%)	18 (20.5%)	47 (53.4%)	0.06
	Rural	6 (6.8%)	9 (10.2%)	26 (29.5%)	41 (46.6%)	
Socioeconomic status	High	3 (3.4%)	1 (1.1%)	2 (2.3%)	6 (6.8%)	0.001
	Satisfactory	13 (14.8%)	18 (20.5%)	18 (20.5%)	49 (55.7%)	
	Low	0 (0%)	9 (10.2%)	24 (27.3%)	33 (37.5%)	

with prolonged deficiency of Vitamin-D in this vulnerable subset of population predisposing them to increased risk of several musculoskeletal conditions, including osteomalacia, bone fragility, rickets, and fractures.[17] Present study assessed vitamin D deficiency among 88 children, most of whom were girls (54.5%), with the most common age group being 1–5 years (47.7%), followed by 6–12 years (42%) and those under 1 year (10.2%). Additionally, family history of vitamin D deficiency was in (42%) children, inadequate sun exposure (59.1%), most of the children 72.7% had inadequate fish and meat intake, while only 36.4% consumed all common dairy products. Comparable demographic findings were noted in the studies of Razzaq et al,[18] and Jamali et al.[19]

In this study, half (50%) of the children were found to have vitamin D deficiency (serum levels <20 ng/mL), while 31.8% had insufficient levels (20–29.9 ng/mL), and only 18.2% had sufficient levels (>30 ng/mL). These findings highlight a high prevalence of inadequate vitamin D status in the paediatric population.

In line with these results, a study conducted by Javaid et al.[20] reported vitamin D deficiency in 50% of paediatric patients, severe deficiency in 25%, sufficient vitamin D levels in 18.7%, and hypervitaminosis in 6.3%. Similarly, another study conducted by Moorani et al.[21] found that 49.6% of children were deficient in vitamin D, 15.4% had insufficiency, 25% had normal vitamin D levels, and 10% were severely deficient. Compared to our findings, their study showed slightly higher rates of deficiency and sufficiency, with a somewhat lower prevalence of insufficiency, suggesting regional variability but an overall similar trend.

In contrast, Stein et al.[22] documented vitamin D deficiency in 16% of children, insufficiency in 24%, and suboptimal vitamin D levels in 40%. Their reported prevalence was lower than that observed in our study, possibly due to differences in geographic location, sun exposure, dietary habits, or study population characteristics.

The current study, children with adequate sunlight exposure and regular consumption of fish, meat, and a combination of dairy products were more likely to have sufficient vitamin D levels. In contrast, vitamin D deficiency was more prevalent among those with inadequate sun exposure, poor dietary intake, and low socioeconomic status. Based on post-stratification analysis, the sunlight exposure, type of dairy product intake, fish and meat intake, and socioeconomic status had significant associations with serum vitamin D levels ($p < 0.05$). However, no statistically significant association was observed with age, gender, or residential status ($p > 0.05$). In agreement with our findings, Mithal et al[22] documented that dietary habits and sunlight exposure were significantly correlated with vitamin D levels. However, their results were contradictory to our findings in terms of significant association of age, gender, and residence with vitamin D deficiency. Moreover, in proportion to our findings, Javaid et al[20] reported statistically insignificant association of vitamin D status with gender and residential status ($p<0.05$). Similarly, Moorani et al.[21] reported that vitamin D deficiency was more prevalent among children from low socioeconomic backgrounds and those with inadequate sunlight exposure. Likewise, a study conducted by Herdea et al.[17] found no significant association between age and vitamin D deficiency. However, in contrast to our findings, they reported no association between sunlight exposure and vitamin D deficiency.

Overall, this study revealed an alarming prevalence of vitamin D deficiency among children, highlighting a growing public health concern that warrants urgent attention. The high prevalence, along with multiple associated risk factors—including inadequate sunlight exposure, poor dietary intake, and certain medical conditions—underscores the need for routine screening and increased awareness among parents and healthcare providers. Awareness programs focused on nutritional education, promotion of safe sunlight exposure, and implementation of targeted supplementation strategies may play a critical role in reducing the burden of vitamin D deficiency and improving the overall health of children.

Conclusion

Study concluded a significant burden of vitamin D deficiency among the pediatric population, with around half of the children exhibiting deficient levels. Findings underscore the critical influence of modifiable lifestyle and dietary factors particularly inadequate sunlight exposure, poor intake of vitamin D-rich foods and lower socioeconomic status on vitamin D level. However, the strong association between vitamin D status and environmental and nutritional variables suggests that targeted public health interventions, such as promoting outdoor physical activity, nutritional education, and popper food access, are urgently required. Addressing

these gaps is essential for preventing the long-term developmental, skeletal, and immunological consequences of hypovitaminosis D in children, especially in our resource-limited regions.

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