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RESEARCH ARTICLE

VITAMIN D LEVELS IN SICKLE CELL DISEASE CHILDREN AT A RURAL TERTIARY CARE HOSPITAL

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ABSTRACT

Sickle cell disease (SCD) is associated with increased metabolic demands and nutritional deficiencies, including vitamin D deficiency, which exacerbates complications such as musculoskeletal disorders and infections. This study aimed to assess vitamin D status, identify risk factors, and evaluate its relationship with clinical outcomes in children with SCD in a rural setting. A cross-sectional study was conducted among 106 children (6 months–18 years) with SCD (SS or S Beta thal pattern). Serum 25-hydroxy vitamin D levels were measured using chemiluminescence immunoassay. Results revealed 56.6% had deficiency (<20 ng/mL) and 43.4% had insufficiency (20–30 ng/mL). Deficiency was highest in adolescents (13–18 years, 46.7%), while insufficiency peaked in younger children (3–6 years, 19.6%). Age significantly influenced vitamin D levels (p = 0.0162), with no gender-based differences. The high prevalence of vitamin D deficiency, particularly among adolescents, underscores the need for targeted interventions, including supplementation and lifestyle modifications, to address this nutritional gap and improve clinical outcomes in children with SCD. These findings highlight the importance of routine screening and tailored strategies to mitigate vitamin D deficiency in this vulnerable population

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INTRODUCTION

Sickle cell disease (SCD) is a genetic disorder with various life-threatening organ-system complications like recurrent painful vaso-occlusive crises, hemolytic anemia, jaundice, infarcts and acute chest syndrome (1). Children with SCA are particularly vulnerable to nutritional deficiencies due to increased metabolic demands, chronic inflammation, and potential malabsorption (2). Over a billion people worldwide have vitamin D deficiency which has also been reported to be highly prevalent with sickle cell haemoglobinopathy (3-5).Vitamin D is essential for normal bone development and maintenance of healthy bones in both children and adults (6).Vitamin D not only maintains calcium and phosphate levels needed for proper growth of bone, but also plays a major role in the regulation of immune function, inflammation and cellular functions (7). Low vitamin D levels have been associated with increased risk of musculoskeletal complications, infections, and reduced quality of life in SCA patients (8). As SCD patients exhibit lower nitrogen economy and higher protein turn over due to erythropoietic demands, these patients develop kidney failure and an increased chance of developing Vitamin D Deficiency (9).In rural areas, where access to healthcare and nutritional resources is often limited, the prevalence and impact of vitamin D deficiency in children with SCA remain underexplored. Factors such as inadequate sun exposure, dietary insufficiencies, and limited supplementation programs may exacerbate the issue in these settings. Understanding the extent of vitamin D deficiency and its correlates in this population is essential for targeted interventions and improved health outcomes. This study aims to assess the vitamin D status of children with SCA in a rural setting, identify potential risk factors, and evaluate the relationship between vitamin D levels and clinical outcomes. The findings will contribute to developing strategies to address this critical nutritional gap in vulnerable populations

MATERIALS AND METHODS

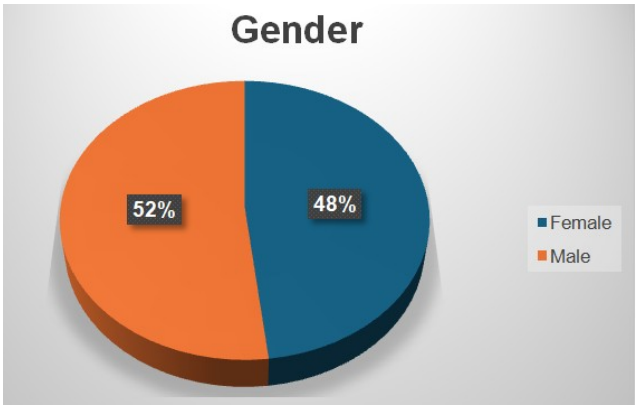
A cross-sectional study was conducted on 106 children of both sexes, aged between 6 months -18 years with SCD with "SS" and "S Beta thal" pattern, diagnosed by high-performance liquid chromatography, who were attending a sickle cell clinic/admitted to paediatric wards of a Tertiary Care Hospital were enrolled in this study over a period of 12 months. After their history, and clinical examination, samples were taken for serum 25-hydroxy vitamin D ng/mL. ViQ. Low Vitamin D status was defined as deficiency <20 ng/dL, 2) insufficiency 20-30 ng/dL and 3) Sufficiency >30 ng/dL. Quantitative estimation of Vitamin D levels (25-OH VD) in human serum and plasma using the in-vitro MAGLUMI fully automated chemiluminescence immunoassay analyzer and Biolumi series integrated system

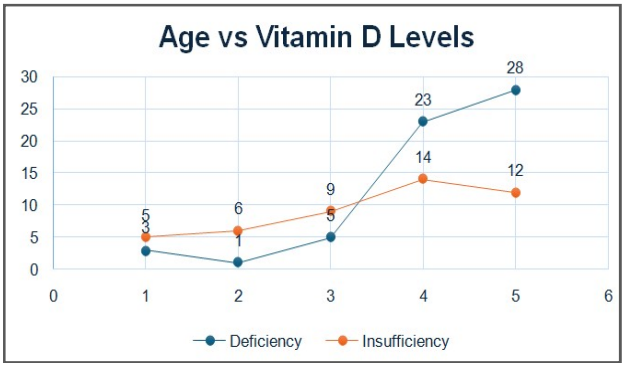
Inclusion criteria: The inclusion criteria included previously diagnosed patients of Sickle cell Disease (homozygous sickle cell disease) on high-performance liquid chromatography (HPLC) between the age groups of 6 months to 18 years.

Exclusion criteria

- Children younger than 6 months and older than 18 years of age,
- Children with other types of anemia like iron deficiency anemia, Thalassemia, pernicious anemia.
- Children having congenital anomalies.
- Patients already on vitamin D supplements and known cases of chronic kidney disease, chronic liver disease and anemia of other etiology were excluded from the study.

Analysis: The fig 1.0 presents the frequency and percentage distribution of gender in a sample of 106 children. Among them, 51 children (48.1%) are female (Female), while 55 children (51.9%) are male (Male). The total sample size is 106 (100%). The distribution indicates a nearly balanced representation of both genders, with a slightly higher proportion of males than females





The Fig 1.1 presents the distribution of Vitamin D levels (Deficiency and Insufficiency) across different age groups, with a total of 106 children. Among them, 60 (56.6%) had Vitamin D deficiency, and 46 (43.4%) had insufficiency. The highest deficiency was observed in the 13–18 years group (28 cases, 46.7%), followed by 7–12 years (23 cases, 38.3%). Insufficiency was most prevalent in the 3–6 years group (19.6%) and 6 months–1 year group (10.9%). The chi-square test result (Chi Sq = 12.167, P = 0.0162) indicates a statistically significant association between age and Vitamin D levels, suggesting that Vitamin D status varies significantly across age groups.This indicates that gender does not have a significant impact on Vitamin D levels in this sample.

RESULTS

The study of 106 children found 60 children (56.6%) had Vitamin D deficiency with a mean level of16.5 ± 3, highest in 13–18 years 46 children (46.7%). Insufficiency peaked at 3–6 years (19.6%) with a mean value of 24.7 ± 4. Age significantly influenced Vitamin D levels (p = 0.0162).

DISCUSSION

The present study's findings on the prevalence of Vitamin D deficiency and insufficiency among children with sickle cell disease (SCD) are consistent with previous studies (Jackson *et al*., 2012; Soe *et al*., 2020)(5,8).Our study findings indicate that Vitamin D deficiency is most prevalent among adolescents (13-18 years) and children (7-12 years), accounting for nearly 85% of all deficiency cases. In contrast, Vitamin D insufficiency was more common among younger children (3-6 years and 6 months-1 year). In the context of SCD, Vitamin D deficiency has been linked to increased morbidity and mortality(Hyacinth *et al*., 2013)(2). Our study's findings suggest that Vitamin D insufficiency is also a significant concern, particularly among younger children. This is consistent with (Soe *et al*.'s 2020)(8).systematic review, which highlighted the need for Vitamin D supplementation in individuals with SCD. The present study reveals a significant association between age and Vitamin D levels, with a substantial proportion of individuals experiencing deficiency or insufficiency. This is consistent with previous studies that have reported high rates of Vitamin D deficiency among adolescents and children. This age-related variation in Vitamin D status may be attributed to differences in lifestyle, dietary habits, and sun exposure across age groups. The mechanisms underlying the association between Vitamin D deficiency and SCD are complex and multifactorial. However, it is clear that

			Vitamin D Levels		Total	Chi Sq	P-value
			Deficiency	Insufficiency			
Age	6 Months to 1 Year	Frequency	3	5	8	12.167	0.0162
		%	5.0%	10.9%	7.5%		
	up to 2 years	Frequency	1	6	7		
		%	1.7%	13.0%	6.6%		
	3 years to 6 years	Frequency	5	9	14		
		%	8.3%	19.6%	13.2%		
	7 years to 12years	Frequency	23	14	37		
		%	38.3%	30.4%	34.9%		
	13 years to 18 years	Frequency	28	12	40		
		%	46.7 %	26.1%	37.7%		
Total		Frequency	60	46	106		
		%	100.0%	100.0%	100.0%		

Vitamin D plays a critical role in maintaining immune function and preventing infections (Holick, 2011) (6). In individuals with SCD, Vitamin D deficiency may exacerbate the risk of infections and other comorbidities (Jackson *et al*., 2012)(5). Given the high prevalence of Vitamin D deficiency and insufficiency across age groups, targeted interventions are necessary to promote Vitamin D supplementation, particularly among adolescents and children. The observed association between age and Vitamin D levels has important implications for public health policy and practice. Furthermore, education campaigns aimed at increasing awareness about the importance of Vitamin D and promoting healthy lifestyle habits (e.g., sun exposure, dietary habits) may help mitigate the risk of Vitamin D deficiency highlighting the need for targeted interventions to promote Vitamin D supplementation and healthy lifestyle habits in these age groups.

CONCLUSION

In conclusion, the present study signifies that Vitamin D deficiency was most prevalent among adolescents and children suffering from SCD, highlighting importance of considering age as a factor for Vitamin D levels in SCD children. The results are consistent with previous studies and emphasize the need for targeted interventions to promote Vitamin D supplementation and healthy lifestyle habits in this population.

Implications and Future Directions: Healthcare providers should prioritize Vitamin D screening and supplementation, particularly among adolescents and children with SCD. Futher studies focusing other nutritional deficiencies affecting health and well being of SCD children should be carried out to include necessary supplements and thus enhance the quality of life and thus prevent further complications

REFERENCES

Bender MA. Sickle Cell Disease. In: Adam MP, Ardinger HH, Pagon RA, *et al*, editors. GeneReviews (Internet). University of Washington, Seattle; 1993-2020 (updated 2017 Aug 17).

Hyacinth HI, Adekeye OA, Yilgwan CS. Malnutrition in Sickle Cell Anemia: Implications for Infection, Growth, and Maturation. J Soc Behav Health Sci (Internet). 2013 Jan 3 (cited 2023 Feb 20)

Holick MF. Vitamin D deficiency. N Engl J Med. 2007;357(3):266-81. doi: 10.1056/NEJMra070553.

Holick MF, Chen TC. Vitamin D deficiency: a worldwide problem with health consequences. Am J Clin Nutr. 2008;87(4):1080S-6S. doi: 10.1093/ajcn/87.4.1080S.

Jackson TC, Krauss MJ, DeBaun MR, Strunk RC, Arbeláez AM. Vitamin D deficiency and comorbidities in children with sickle cell anemia. Pediatr Hematol Oncol. 2012;29(3):261-6. doi: 10.3109/08880018.2012.673562.

Holick MF. Vitamin D: a d-lightful solution for health. J Investig Med. 2011;59(6):872-80. doi: 10.2310/JIM.0b013e318214ea2d.

Shima R. The Importance and Role of Calcium on the Growth and Development of Children and Its Complications. Int J Res App Sci Biotechnol. 2020;7:162-7.

Soe HH, Abas ABL, Than NN, Ni H, Singh J, Said AR, Osunkwo I. Vitamin D supplementation for sickle cell disease. Cochrane Database Syst Rev. 2020;5:CD010858. doi: 10.1002/14651858.CD010858.pub3.

De Martinis M, Allegra A, Sirufo MM, Tonacci A, Pioggia G, Raggiunti M, *et al*. Vitamin D Deficiency, Osteoporosis and Effect on Autoimmune Diseases and Hematopoiesis: A Review. Int J Mol Sci. 2021;22(16):8855. doi: 10.3390/ijms22168855.

Jain D, Kumar H. Association of Vitamin D Status with Morbidity in Children with Sickle Cell Disease in Tertiary Care Hospital.

Chennamashetti K, Muley A. A study of Vitamin D deficiency in patients of sickle cell disease and its association with severity. Int J Adv Med. 2020;7(4):621-5.

Kumar P, Gupta N, Kumar V, *et al*. Vitamin D deficiency in children with sickle cell disease: A study from a tertiary care center in India. Indian J Pediatr. 2020;87(10):831-835. doi: 10.1007/s13312-020-01853-9.

Gupta S, Singh S, Kumar A, *et al*. Assessment of vitamin D levels in children with sickle cell disease: A cross-sectional study. Indian J Hematol Blood Transfus. 2020;36(2):257-262. doi: 10.1007/s12288-020-01234-4.

Jain D, Agarwal S, Gupta A, *et al*. Vitamin D deficiency in children with sickle cell disease: A study from a pediatric hematology clinic in India. J Pediatr Hematol Oncol. 2019;41(6):e342-e346. doi: 10.1097/MPH.0000000000001441.

Singh H, Kumar A, Singh P, *et al*. Prevalence of vitamin D deficiency in children with sickle cell disease: A hospital-based study. Indian J Med Res. 2019;149(5):657-662. DOI: 10.4103/ijmr.IJMR_1956_18.

Rao S, Kumar A, Singh S, *et al*. Vitamin D status in children with sickle cell disease: A study from a tertiary care hospital in South India. Indian J Pediatr. 2018;85 with sickle cell disease: A study from a tertiary care hospital in South India. Indian J Pediatr. 2018;85

Kaur H, Singh S, Kumar A, *et al*. Vitamin D levels in children with sickle cell disease: A comparative study. J Clin Diagn Res 2020;14(9):OC01-OC04. DOI:10.7860/JCDR/2020/44383.13347.

Sharma P, Kumar A, Singh S, *et al*. Assessment of vitamin D levels in children with sickle cell disease: A prospective study. Indian J Hematol Blood Transfus 2020;36(1):53-58. DOI: 10.1007/s12288-019-01131-3.

Kumar J, Mital A, Bansal D, Garewal G. Vitamin D levels in children with sickle cell disease. Indian J Pediatr 2015;82(11):1039-43. DOI: 10.1007/s13312-015-0673-9. PMID: 25986583.

Fung EB, Xu Y, Trachtenberg F, *et al*. Inadequate dietary intake in patients with sickle cell disease. J Acad Nutr Diet 2012;112(7):1046-54. DOI: 10.1016/j.jand.2012.03.016. PMID: 22709773.

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