

VITAMIN D DEFICIENCY: A GLOBAL PEDIATRIC HEALTH CONCERN***¹Dr. Bhagyashri Shamsundar Bhosale, ²Dr. Sunil Babasaheb Rathod, ³Dr. Jyotsna Ahir**

^{*1,2}PG Scholar, Department of Balrog, Loknete Rajarambapu Patil Ayurvedic Medical College & Hospital, Post Graduate Institute & Research Centre, Urun-Islampur, Sangli Road, Tal. Walwa, Dist. Sangli, Maharashtra.

³HOD and Professor of Department of Balrog Loknete Rajarambapu Patil Ayurvedic Medical College & Hospital, Post Graduate Institute & Research Centre, Urun-Islampur, Sangli Road, Tal. Walwa, Dist. Sangli, Maharashtra.

***Corresponding Author: Dr. Bhagyashri Shamsundar Bhosale**

PG Scholar, Department of Balrog, Loknete Rajarambapu Patil Ayurvedic Medical College & Hospital, Post Graduate Institute & Research Centre, Urun-Islampur, Sangli Road, Tal. Walwa, Dist. Sangli, Maharashtra.

DOI: <https://doi.org/10.5281/zenodo.21294254>

How to cite this Article: ^{*1}Dr. Bhagyashri Shamsundar Bhosale, ²Dr. Sunil Babasaheb Rathod, ³Dr. Jyotsna Ahir. (2026). Vitamin D Deficiency: A Global Pediatric Health Concern. European Journal of Pharmaceutical and Medical Research, 13(7), 513-516.

This work is licensed under Creative Commons Attribution 4.0 International license.



Article Received on 16/06/2026

Article Revised on 07/07/2026

Article Published on 10/07/2026

ABSTRACT

Vitamin D deficiency is a major global public health concern affecting millions of children across both developed and developing countries. Despite the availability of abundant sunlight in many regions, the prevalence of vitamin D deficiency remains high due to inadequate sun exposure, poor dietary intake, increased indoor lifestyles, skin pigmentation, obesity, and limited access to fortified foods. Vitamin D plays a vital role in calcium and phosphorus homeostasis, bone mineralization, immune function, and normal growth and development. Deficiency during childhood is associated with nutritional rickets, delayed skeletal growth, impaired bone health, muscle weakness, and an increased susceptibility to infections and other chronic diseases. Emerging evidence also suggests a relationship between vitamin D deficiency and various non-skeletal disorders, including autoimmune diseases, metabolic abnormalities, and respiratory illnesses. This review highlights the global epidemiology, major risk factors, health consequences, prevention strategies, and public health implications of vitamin D deficiency in children. Effective preventive measures, including adequate sunlight exposure, dietary modification, food fortification, routine supplementation for high-risk groups, and parental education, are essential to reduce the burden of this preventable nutritional disorder. Early identification and implementation of evidence-based public health interventions can significantly improve child health outcomes and contribute to healthier future generations.

KEYWORDS: Vitamin D deficiency, children, pediatrics, public health, nutritional deficiency, rickets, vitamin D supplementation, child health.

INTRODUCTION

Vitamin D plays an essential role in maintaining bone health through regulating calcium concentrations in the body. The development of vitamin D deficiency is associated with deteriorating bone health and in severe cases, hypocalcemia, rickets, and osteomalacia in children and adults.^[1]

The primary source of vitamin D is sunlight exposure, which has been limited or blocked extensively for many children over the past 20 years due to the association of skin cancer and ultraviolet rays.

There has also been a piquing interest in vitamin D in pediatric patients due to the recent epidemiologic reports

suggesting that vitamin D may protect against autoimmune disease and play a role in innate immunity.^[2]

In North America and the United Kingdom, there are no current definitive prevalence estimates available for vitamin D- deficiency rickets because recent publications have been mainly case reports or case series obtained from hospital admissions records. The 2 largest series reported 126 cases over a period of 10 years in Australia⁴ and 104 cases over 2 years in Canada.^[3]

Reported and published cases of nutritional rickets in the United States increased from 65 between 1975 and 1985 to 166 between 1986 and 2003.⁶ Since then, 3 reports

added another 62 cases to the American literature.^{7–9} It should also be recognized that in other parts of the world, nutritional rickets remains a public health problem.^[4–7]

Vitamin D plays a fundamental role in calcium and phosphorus homeostasis, bone mineralization, skeletal growth, and neuromuscular function. Beyond its classical role in bone health, vitamin D also influences immune regulation, cell proliferation, and inflammatory responses. In children, inadequate vitamin D levels can impair normal growth and development, leading to nutritional rickets, osteomalacia, delayed motor milestones, muscle weakness, and an increased risk of fractures. Emerging evidence further suggests that vitamin D deficiency may be associated with respiratory infections, autoimmune disorders, allergic diseases, obesity, and metabolic disturbances, highlighting its broader implications for child health.^[8–10]

The prevalence of vitamin D deficiency varies widely across different geographic regions, age groups, and ethnic populations. Despite abundant sunshine in many tropical countries, including India, a high proportion of children continue to exhibit suboptimal vitamin D status. Factors such as darker skin pigmentation, cultural clothing practices, exclusive breastfeeding without supplementation, maternal vitamin D deficiency, obesity, malabsorption disorders, and limited exposure to sunlight significantly increase the risk of deficiency.^[9,10] These findings indicate that adequate sunlight alone is insufficient to ensure optimal vitamin D status in children.

Globally, vitamin D deficiency has become an important pediatric health challenge because of its long-term effects on physical growth, skeletal development, and immune function. Early diagnosis and timely intervention through nutritional counseling, food fortification, vitamin D supplementation, and public health awareness programs are essential strategies for reducing the burden of this preventable disorder. Understanding the epidemiology, risk factors, clinical consequences, and preventive approaches is therefore crucial for healthcare professionals, policymakers, and researchers working to improve child health outcomes worldwide.^[8–11]

Deficiency of vitamin D

Vitamin D deficiency is a common nutritional disorder characterized by inadequate levels of circulating 25-hydroxyvitamin D [25(OH)D], resulting in impaired calcium and phosphorus metabolism and defective bone mineralization. Vitamin D is synthesized in the skin following exposure to ultraviolet B (UVB) radiation and is obtained in smaller amounts from dietary sources such as fatty fish, egg yolks, fortified dairy products, and supplements. Because few foods naturally contain sufficient vitamin D, sunlight remains the primary source for maintaining adequate vitamin D status.^[12,13]

The Endocrine Society defines vitamin D deficiency as a serum 25(OH)D concentration of less than 20 ng/mL (50 nmol/L), vitamin D insufficiency as 21–29 ng/mL (52.5–72.5 nmol/L), and sufficiency as 30 ng/mL or higher (1). Children are particularly vulnerable because adequate vitamin D is essential for skeletal growth, bone mineralization, muscle function, and immune regulation. Persistent deficiency during infancy and childhood can impair normal growth and predispose children to significant skeletal abnormalities.^[12–14]

AIM

To review the current evidence on vitamin D deficiency as a global pediatric health concern, with emphasis on its epidemiology, risk factors, clinical consequences, diagnosis, prevention, and management strategies.

OBJECTIVES

- 1) To describe the physiological role and importance of vitamin D in the growth and development of children.
- 2) To review the global prevalence and epidemiology of vitamin D deficiency among the pediatric population.
- 3) To identify the major causes and risk factors associated with vitamin D deficiency in children.
- 4) To examine the clinical manifestations and health consequences of vitamin D deficiency in childhood.
- 5) To summarize the current diagnostic methods and recommendations for assessing vitamin D status in children

MATERIALS AND METHODS

Study Design

This review article was conducted using a narrative literature review approach to summarize the current evidence regarding vitamin D deficiency as a global pediatric health concern.

Literature Search Strategy

A comprehensive literature search was performed using electronic databases, including PubMed/MEDLINE, Scopus, Web of Science, Google Scholar, and the Cochrane Library. In addition, publications from international health organizations, including the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), were reviewed to obtain relevant epidemiological and public health information. The search was conducted using combinations of the following keywords: vitamin D deficiency, children, pediatric population, hypovitaminosis D, rickets, vitamin D supplementation, child health, epidemiology, prevalence, risk factors, and public health. Boolean operators (AND, OR) were used to refine the search strategy.

Inclusion Criteria

The review included:

Original research articles, systematic reviews, meta-analyses, narrative reviews, and clinical practice

guidelines. Studies involving infants, children, and adolescents (0–18 years). Articles published in English.

Studies addressing the epidemiology, risk factors, clinical manifestations, diagnosis, prevention, and management of vitamin D deficiency in children. Publications from peer-reviewed journals and recognized international organizations.

Exclusion Criteria

The following were excluded:

- Studies involving only adults.
- Case reports, conference abstracts, editorials, letters to the editor, and unpublished manuscripts.
- Articles not available in English.
- Studies with insufficient methodological quality or incomplete data.

Ethical Considerations

As this study is based exclusively on previously published literature, no human participants were involved, and ethical approval or informed consent was not required.

RESULT

The reviewed literature consistently identified vitamin D deficiency as one of the most prevalent nutritional deficiencies among children worldwide. Studies conducted across Asia, the Middle East, Africa, Europe, and North America reported a high prevalence of vitamin D deficiency despite differences in geographic location and sunlight availability. The findings indicated that infants, school-aged children, and adolescents are particularly vulnerable, especially those with limited sunlight exposure, darker skin pigmentation, inadequate dietary intake, obesity, chronic illnesses, or maternal vitamin D deficiency.

The literature demonstrated that vitamin D deficiency is associated with significant skeletal complications, including nutritional rickets, osteomalacia, delayed bone growth, impaired bone mineralization, muscle weakness, and an increased risk of fractures. In addition, several studies reported associations between vitamin D deficiency and increased susceptibility to respiratory infections, allergic diseases, autoimmune disorders, obesity, and metabolic abnormalities, although evidence for some non-skeletal outcomes remains inconclusive.

Most studies emphasized that inadequate sunlight exposure, poor dietary intake, lack of food fortification, exclusive breastfeeding without vitamin D supplementation, and limited awareness among parents are major contributing factors. The reviewed evidence also highlighted considerable variation in screening practices and supplementation guidelines across countries. Preventive strategies, including vitamin D supplementation, food fortification, nutritional counseling, and safe sunlight exposure, were consistently reported as effective approaches to improving vitamin D

status and reducing the burden of deficiency among children.

CONCLUSION

Vitamin D deficiency remains a major global pediatric health concern that affects the growth, skeletal development, and overall health of children. Despite advances in healthcare, the prevalence of vitamin D deficiency continues to be high in both developed and developing countries. Early identification of at-risk children, promotion of adequate sunlight exposure, consumption of vitamin D-rich and fortified foods, and appropriate supplementation are essential to prevent deficiency and its associated complications. Strengthening public health policies, improving parental awareness, and implementing evidence-based screening and prevention programs can substantially reduce the global burden of vitamin D deficiency. Further high-quality research is needed to optimize screening strategies, supplementation guidelines, and long-term management approaches to improve child health outcomes worldwide.

REFERENCES

1. Misra M, Pacaud D, Petryk A, et al. Vitamin D deficiency in children and its management: review of current knowledge and recommendations. *Pediatrics*, 2008; 122(2): 398-417.
2. Holick MF. Vitamin D deficiency. *N Engl J Med*. 2007; 357(3): 266-281.
3. Ward LM. Vitamin D deficiency in the 21st century: a persistent problem among Canadian infants and mothers. *CMAJ*, 2005; 172(6): 769–770.
4. Wondale Y, Shiferaw F, Lulseged S. A systematic review of nutritional rickets in Ethiopia: status and prospects. *Ethiop Med J*, 2005; 43(3): 203–210.
5. Muhe L, Lulseged S, Mason KE, Simoes EA. Case-control study of the role of nutritional rickets in the risk of developing pneumonia in Ethiopian children. *Lancet*, 1997; 349(9068): 1801–1804.
6. Harris NS, Crawford PB, Yangzom Y, Pinzo L, Gyaltzen P, Hudes M. Nutritional and health status of Tibetan children living at high altitudes. *N Engl J Med*, 2001; 344(5): 341–347.
7. Banajeh SM, al-Sunbali NN, al-Sanahani SH. Clinical characteristics and outcome of children aged under 5 years hospitalized with severe pneumonia in Yemen. *Ann Trop Paediatr*, 1997; 17(4): 321–326.
8. Huh SY, Gordon CM. Vitamin D deficiency in children and adolescents: epidemiology, impact and treatment. *Rev Endocr Metab Disord*, 2008; 9(2): 161–170.
9. Shin YH, Yu J, Kim KW, Ahn K, Hong SA, Lee E. Vitamin D status and childhood health. *Korean J Pediatr*, 2013; 56(10): 417–423.
10. Challa A, Makariou S, Siomou E. Pediatric hypovitaminosis D: molecular perspectives and clinical implications. *Hormones (Athens)*. 2017; 16(1): 23–38.

11. Cashman KD. Vitamin D in childhood and adolescence. *Postgrad Med J.*, 2007; 83(978): 230–235.
12. Holick MF, Binkley NC, Bischoff-Ferrari HA, Gordon CM, Hanley DA, Heaney RP, et al. Evaluation, treatment, and prevention of vitamin D deficiency: An Endocrine Society clinical practice guideline. *J Clin Endocrinol Metab.*, 2011; 96(7): 1911-30.
13. Holick MF. Vitamin D deficiency. *N Engl J Med.* 2007; 357(3): 266-81.
14. Misra M, Pacaud D, Petryk A, Collett-Solberg PF, Kappy M; Drug and Therapeutics Committee of the Lawson Wilkins Pediatric Endocrine Society. Vitamin D deficiency in children and its management: Review of current knowledge and recommendations. *Pediatrics*, 2008; 122(2): 398-417.