



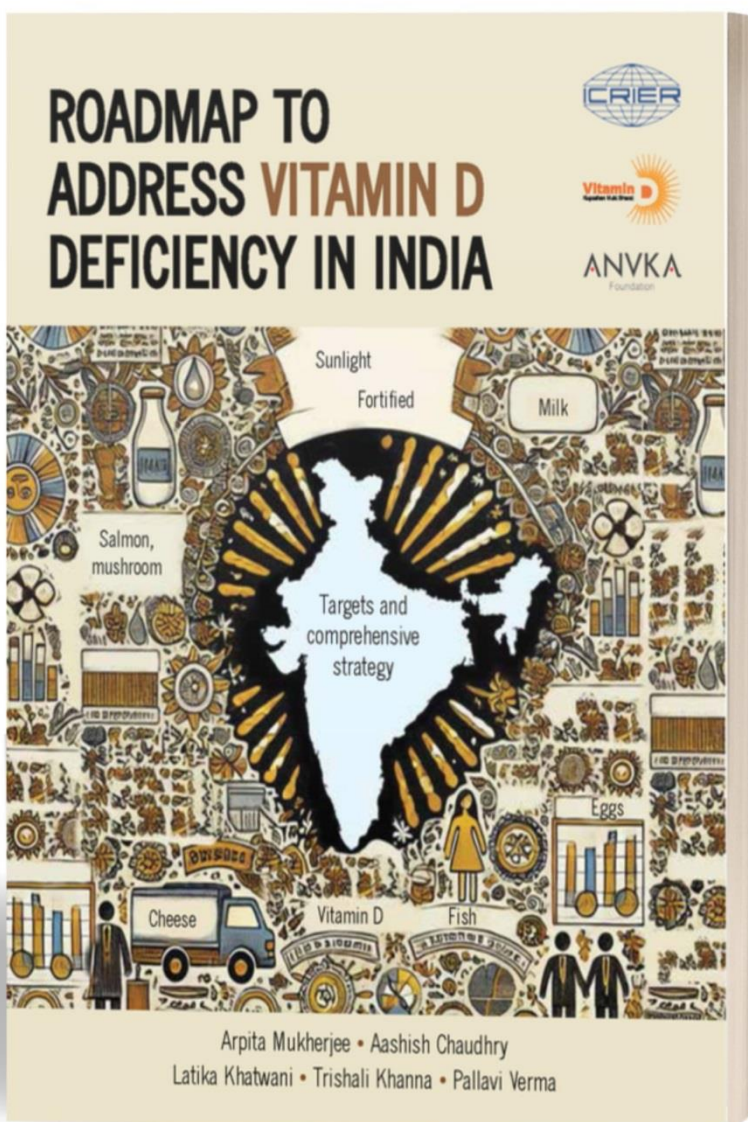
Vitamin D
Kuposhan Mukht Bharat



ANVKA
Foundation

POLICY BRIEF #43

Roadmap to Address Vitamin D Deficiency Among Women and Children: Action Points for the Ministry of Women and Child Development (MoWCD)



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Abstract

India is the most populous country in the world, with a population of 1.46 billion, of which 48% are female, and 30% are children (under 18 years). The ICRIER-ANVKA Foundation 2025 report titled, *“Roadmap to Address Vitamin D Deficiency in India”* found that one in five Indians are Vitamin D deficient and the most vulnerable groups are women and children. This deficiency poses serious and lifelong health risks, including rickets in children (46% of children are prone to rickets), poor foetal bone development during pregnancy, and osteomalacia/osteoporosis in older women (who are three times more likely than men to experience hip fractures). Women are the backbone of families, and children are the future of the nation. Addressing Vitamin D deficiency among them is critical to reduce healthcare costs, improve the quality of life, and achieve India’s long-term development goals.

This policy brief highlights the role that the Ministry of Women and Child Development (MoWCD) can play in leading the nation towards *“Vitamin D Kuposhan Mukh Bharat”*. One of the core mandates of the Ministry of Women and Child Development (MoWCD) is to address malnutrition and micronutrient deficiency. Among these, Vitamin D deficiency is one of the most widespread. This policy brief presents six key action points for the MoWCD that include, a) how to build awareness on self-identification and actions to mitigate the deficiency b) areas for capacity building and training c) developing multi-stakeholders partnerships to address the deficiency d) working with Food Safety and Standards Authority of India (FSSAI) and other government bodies to make Vitamin D fortified food available through public distribution programmes, and e) leveraging *Mission POSHAN 2.0* to address Vitamin D deficiency.

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List of Abbreviations

AWC	Anganwadi Centre
AWW	Anganwadi Worker
CDSCO	Central Drugs Standard Control Organisation
FOGSI	Federation of Obstetrics & Gynaecological Societies of India
FSSAI	Food Safety and Standards Authority of India
GAIN	Global Alliance for Improved Nutrition
HCM	Hot Cooked Meals
ICDS	Integrated Child Development Services
ICMR-NIN	Indian Council of Medical Research – National Institute of Nutrition
LSFF	Large-Scale Fortification
MoE	Ministry of Education
MoFPI	Ministry of Food Processing and Industry
MoHFW	Ministry of Health and Family Welfare
MoWCD	Ministry of Women and Child Development
NIFTEM	National Institute of Food Technology, Entrepreneurship and Management
NIN	National Institute of Nutrition
NPPA	National Pharmaceutical Pricing Authority
PHFI	Public Health Foundation of India
POSHAN	Prime Minister’s Overarching Scheme for Holistic Nutrition
SAG	Scheme for Adolescent Girls
SAMPADA	Survey for Assessment of Markers of Population Health Activity, Diet and Anthropometry
SDG	Sustainable Development Goal
THR	Take Home Ratios
UNICEF	United Nations Children's Fund
VHND	Village Health and Nutrition Day

Action Points for the Ministry of Women and Child Development (MoWCD)

Arpita Mukherjee, Aashish Chaudhry, Trishali Khanna, Latika Khatwani and Pallavi Verma

1. The Context

India is the most populated country in the world, comprising a population of 1.46 billion population, of which 0.70 billion (nearly 48%) are female,¹ and 0.44 billion (nearly 30%) are children (under 18 years).² Ensuring the health and wellbeing of women and children is critical to building a healthy, resilient and productive nation. Their nutritional needs have to be addressed to target United Nations Sustainable Development Goal (SDG) 2.2,³ which aims to end all forms of malnutrition by 2030. As India accelerates its journey toward “Viksit Bharat @2047”, investing in the nutrition of women and children will be pivotal in enhancing national productivity, reducing health burdens, and driving inclusive and sustainable development.



One in every five Indians are Vitamin D deficient, with women and children being the most vulnerable.

Source: Mukherjee et al. (2025)

One of the core mandates of the Ministry of Women and Child Development (MoWCD) is to address malnutrition and micronutrient deficiency. Among these, Vitamin D deficiency is one of the most widespread.

2. Health Impact of Vitamin D Deficiency in Vulnerable Groups



The health consequences of Vitamin D deficiency are both immediate and long-term, affecting individuals across various age groups. According to a number of studies, the two most vulnerable groups are children and women [for example, see Surve et al., (2017); Mustafa et al., (2021); Marwaha et al., (2011); Gupta et al., 2014; Tandon et al., 1981; Sharma et al. 2019].

Children: Among children, Vitamin D deficiency can lead to weak bones, stunted growth, bone deformities, delayed motor skills, dental issues and increased susceptibility to respiratory infections.⁴ In India, nearly 46% of children under the age of 10 were prone to rickets in 2020.⁵

1 <https://worldpopulationreview.com/countries/india> (Last accessed on June 18, 2025).

2 <https://data.unicef.org/how-many/how-many-children-under-18-are-there-in-india> (Last accessed on June 18, 2025).

3 SDG 2.2: to end all forms of malnutrition, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons.

4 Surve et al., (2017); Mustafa et al., (2021).

5 Reddy., (2020).

Women: For young women, particularly during pregnancy and lactation, maintaining adequate Vitamin D levels is crucial to reduce maternal mortality and morbidity, enhance cognitive development and strengthen immunity of the foetus, especially during the first 1,000 days of a child's life. During pregnancy, the body's demand for Vitamin D rises significantly.⁶ Inadequate levels during this period can increase the



risks of preeclampsia, gestational diabetes, preterm delivery and low birth weight. Vitamin D deficiency also impairs foetal bone formation and may lead to long-term health issues in infants. For breastfeeding mothers, low Vitamin D levels result in inadequate transfer through breast milk, putting infants at risk of neonatal hypocalcemia and rickets.⁷ Additionally, for adolescent girls and women of reproductive age, Vitamin D deficiency may contribute to hormonal imbalances and future fertility issues.⁸ The stages of maternal Vitamin D deficiency and its corresponding adverse effects on both mother and child are presented in Table 1.

Table 1: Stages of Vitamin D Deficiency and Adverse Effects on Mother and Child

Stage	Serum 25(OH)D	Maternal Adverse Effects	New-born Infant Adverse Effects
Severe Deficiency	<10 ng/ml	Increased risk of preeclampsia, calcium malabsorption, bone loss, poor weight gain, myopathy, higher parathyroid hormone levels	Small for gestational age, neonatal hypocalcemia, hypocalcemic seizures, infantile heart failure, enamel defects, large fontanelle, congenital rickets, rickets of infancy if breastfed
Insufficiency	11–32 ng/ml	Bone loss, subclinical myopathy	Neonatal hypocalcemia, reduced bone mineral density, rickets of infancy if breastfed
Adequacy	32–100 ng/ml	Adequate calcium balance, parathyroid hormone levels	None, unless exclusively breastfed
Toxicity	>100 ng/ml	Hypercalcemia, increased urine calcium loss	Infantile idiopathic hypercalcemia

Note: Serum 25(OH)D = Serum 25 hydroxyvitamin D.

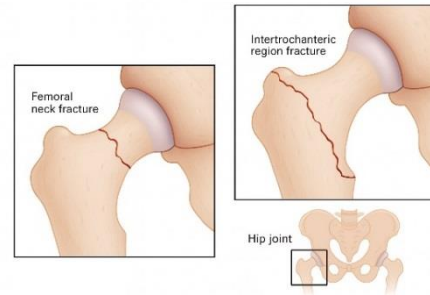
Source: Extracted and compiled from Federation of Obstetrics & Gynaecological Societies of India (FOGSI) Report 2020; https://www.fogsi.org/wp-content/uploads/tog/Sanofi_KPP_Vit_D_Booklet_V05.pdf (Last accessed on May 27, 2025).

6 Awasthi et al. (2022).

7 [Marwaha et al., (2011); Schoenmakers., (2015); Sharma et al. (2019)].

8 Khadilkar et al. (2022).

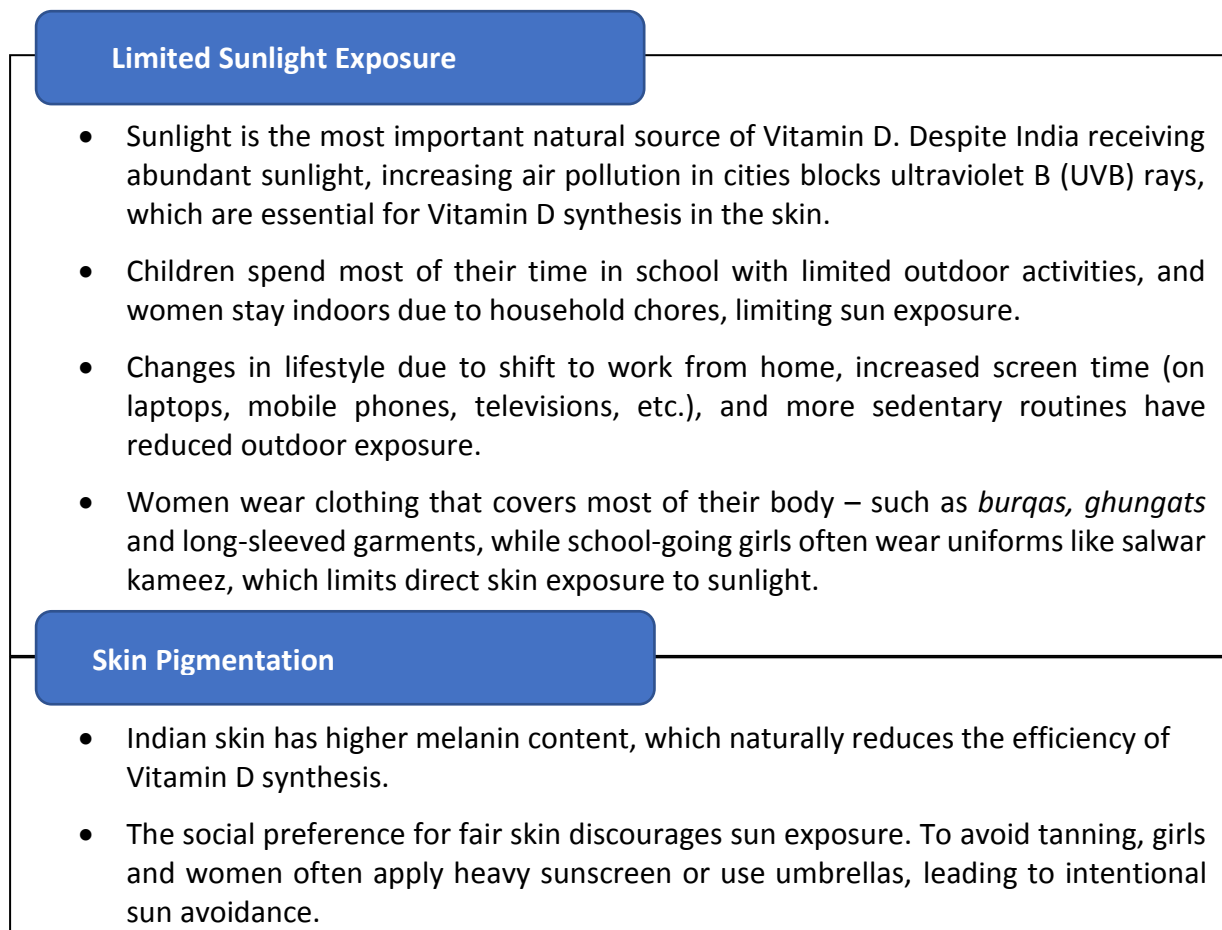
In older women, Vitamin D deficiency can lead to bone loss, increasing the risk of osteopenia, osteoporosis and age-related frailty. This significantly raises the likelihood of fractures and reduces mobility. Deficiency is also linked to autoimmune disorders such as multiple sclerosis and rheumatoid arthritis, and depression.⁹ Notably, over 600,000 hip fractures were recorded in 2020 – this number is projected to exceed one million by 2050, with women being three times more likely than men to be affected.¹⁰



3. Factors Leading to Vitamin D Deficiency

Studies in India have identified four key factors leading to Vitamin D deficiency in children and women. These are limited sun exposure, skin pigmentation, diet, pregnancy and hormonal change (for details see Figure 1).¹¹

Figure 1: Reasons for Vitamin D Deficiency in Children and Women



9 [Schott et al., (1976); Gloth et al., (1995); Meehan et al., (2014)].

10 [Reddy (2020); Bhadada et al., (2021)].

11 [Gupta et al., (2014); Tandon et al., (1981); Sharma et al., (2019)].

Diet

- Major sources of Vitamin D include non-vegetarian foods such as salmon, cod liver oil and egg yolks, and vegetarian sources like mushrooms. Such foods items are often expensive and not part of the regular Indian diet. Further, 30 per cent of the Indian population is vegetarian.

Pregnancy and Hormonal Changes

- Pregnancy and lactation increase Vitamin D requirements, making women more vulnerable to deficiency.
- Hormonal changes during adolescence and among women in the reproductive age affect Vitamin D metabolism.

Source: Aparna et al., (2028); Gupta et al., 2014; Tandon et al., 1981; Kalra et al., (2025).

4. Action Points for MoWCD to Address Vitamin D Deficiency

As the nodal ministry responsible for the welfare of women and children, MoWCD is well-positioned to address Vitamin D deficiency at the national and state levels. The following six key action points by the MoWCD will help address Vitamin D deficiency.

4.1 “Vitamin D Kuposhan Mukh Bharat” Campaign

MoWCD may partner with other ministries such as the Ministry of Health and Family Welfare (MoHFW), Ministry of Education (MoE), Ministry of Food Processing and Industry (MoFPI), and the Ministry of Ayush at the centre and relevant ministries in states to launch and support the “Vitamin D Kuposhan Mukh Bharat” campaign. Under the campaign, the MoWCD may focus on the following.



- I. Educating mothers on how to identify early signs of Vitamin D deficiency:** Develop and distribute simple toolkits that include checklists/questionnaires to help mothers to self-identify early signs of Vitamin D deficiency, such as fatigue, bone pain, muscle weakness and frequent illness. Toolkits can also provide information on Vitamin D-rich foods.
- II. Promoting simple strategies to mitigate Vitamin D deficiency:** In line with Indian Council of Medical Research – National Institute of Nutrition (ICMR–NIN) 2024 guidelines, promote sunlight exposure for about 30 minutes daily, preferably between 11:00 a.m. and 2:00 p.m.¹² Educate mothers to incorporate outdoor play and physical activity as part of their daily routine for children to ensure sun exposure.

¹² https://nin.res.in/dietaryguidelines/pdfjs/locale/DGI_2024.pdf (Last accessed on June 25, 2025).

III. Developing and circulating infographics to raise awareness: Infographics (such as benefits of sun exposure) in the form of posters, leaflets, short videos, etc., can be developed and circulated through social media and by placing them in anganwadi centres, health centres and schools.

IV. Enter into partnerships and collaborations with agencies working on addressing Vitamin D deficiency: Facilitate collaboration with organisations like the Gates Foundation, Global Alliance for Improved Nutrition (GAIN), and Vitamin D manufacturers to spread awareness on how to identify and mitigate Vitamin D deficiency.

Raising awareness among women, especially mothers, can help the move towards a “*Vitamin D Kuposhan Mukh Bharat*”, as they play a key role in the daily diet and well-being of their children.

4.2 Conduct Capacity Building/Training of Anganwadi Workers (AWWs)¹³ to Identify and Manage Vitamin D Deficiency

The MoWCD has vast network of over 13.9 lakh anganwadi centres (AWCs), supported by over 24 lakh anganwadi workers and helpers across country. AWWs can play an important role in “*Vitamin D Kuposhan Mukh Bharat*”. To strengthen their capacity, MoWCD may incorporate dedicated modules on Vitamin D deficiency in the curriculum and training of AWWs. The modules may cover early identification of Vitamin D deficiency symptoms (e.g., fatigue, muscle weakness, frequent illness), importance of safe sun exposure, identification of dietary sources rich in Vitamin D and the appropriate use of fortified foods and supplements.

AWWs may be instructed to deliver focused counselling on these topics during their routine interactions with mothers and caregivers, through Village Health and Nutrition Days (VHNDs), home visits, *POSHAN Maah*¹⁴ and *POSHAN Pakhwada*¹⁵ (fortnight in March). This will help strengthen community-level implementation and awareness.

4.3 Support and Facilitate the Reach of Vitamin D Fortified Products

MoWCD may work with Food Safety and Standards Authority of India (FSSAI) committees/experts on Food fortification and bodies like the National Institute of Food Technology, Entrepreneurship and Management (NiFTEM) to facilitate the wider reach of Vitamin D fortified products for women and children. UNICEF’s 2023 guidelines recommend fortifying widely consumed staples (for details see Box 1) with Vitamin D to prevent the deficiency on a national scale. Countries such as Bangladesh, Pakistan and Ethiopia have

13 Anganwadi Workers (AWWs): Frontline workers under the Integrated Child Development Services (ICDS) scheme who provide basic health, nutrition, and early childhood care services at the community level through anganwadi centres.

14 *POSHAN Maah* is a month-long nutrition campaign held every September to spread awareness about healthy eating and improve nutrition at the community level.

15 *POSHAN Pakhwada* is a two-week drive in March focused on involving families and communities to promote better nutrition, especially for women and children.

successfully distributed fortified foods like margarine, wheat flour and biscuits through public food supply chains.¹⁶

In India, FSSAI has allowed the fortification of milk and edible oil with Vitamin D and has mandated their inclusion in public procurement programmes.¹⁷ However, this has not yielded the desired outcomes. Oil consumption has been declining due to growing health concerns, such as the increased risk of cardiovascular diseases, as the nation moves towards a healthy diet. In the case of fortified milk, gaps in procurement and the supply chain have limited its distribution through anganwadi centres. As a result, Vitamin D deficiency remains widespread. There is now a need to go beyond milk and oil to other staples to ensure the broader reach of Vitamin D fortified products. Such fortification can be with a broader objective of addressing micronutrient deficiencies.

Box 1: The United Nations Children's Fund (UNICEF) Guideline

The UNICEF issued a guidance note on “Large-scale Food Fortification for the Prevention of Micronutrient Deficiencies in Children, Women, and Communities”, in December 2023, which outlines potential Vitamin D food vehicles for large-scale fortification (LSFF).



Table A: Potential Food Vehicles and Their Fortifiable Micronutrients

Food Vehicle	Vitamins and Minerals (Fortificant) That Can be Added
Wheat Flour	Iron, Zinc, Selenium, Vitamins A, D, B ₁ (Thiamine), B ₂ (Riboflavin), B ₃ (Niacin), B ₆ (Pyridoxine), B ₉ (Folate or Folic Acid) and B ₁₂ (Cobalamin)
Maize Flour	Iron, Zinc, Vitamins A, D, B ₁ (Thiamine), B ₂ (Riboflavin), B ₃ (Niacin), B ₆ (Pyridoxine), B ₉ (Folate or Folic Acid) and B ₁₂ (Cobalamin)
Rice	Iron, Zinc, Selenium, Vitamins A, D, B ₁ (Thiamine), B ₂ (Riboflavin), B ₃ (Niacin), B ₆ (Pyridoxine), B ₉ (Folate or Folic Acid) and B ₁₂ (Cobalamin)
Oil	Vitamins A, D, and E
Milk	Vitamins A, D, Iron and Folic Acid

Source: Extracted from United Nations Children’s Fund. Large-scale Food Fortification for the Prevention of Micronutrient Deficiencies in Children, Women and Communities: Guidance Note. New York: UNICEF, 2023. UNICEF, New York. Link: <https://www.unicef.org/media/151001/file/Large-scale%20food%20fortification%20for%20the%20prevention%20of%20micronutrient%20deficiencies%20in%20children,%20women%20and%20communities.pdf> (Last accessed on June 20, 2025).

16 <https://www.gainhealth.org/media/news/steps-toward-progressmicronutrients-gain-supports-ethiopian-government-accessingpremix>; <https://www.nutritionintl.org/>; <https://www.nutritionintl.org/project/food-fortificationprogram-ffp-pakistan/> (Last accessed on June 25, 2025).

17 https://www.fssai.gov.in/upload/uploadfiles/files/Compendium_Food_Fortification_Regulations_30_09_2021.pdf (Last accessed on June 25, 2025).

4.4 Leverage Mission POSHAN 2.0 to Address Vitamin D Deficiency

The Prime Minister's Overarching Scheme for Holistic Nutrition (POSHAN), under Mission POSHAN 2.0, aims to address malnutrition and micronutrient deficiency with a long-term vision. With its increasing budget and extensive network of AWWs, Mission POSHAN 2.0 can be effectively scaled up in the following three ways to address Vitamin D deficiency.



Mission POSHAN 2.0 is an on-going centrally-sponsored, with cost-sharing of 60:40 between the centre and state government. Launched in 2021-22, it brings together the Integrated Child Development Services (ICDS), Scheme for Adolescent Girls (SAG), and Prime Minister's Overarching Scheme for Holistic Nutrition (POSHAN) Abhiyaan under one umbrella. The mission emphasises a lifecycle approach to nutrition, focusing on the critical 1,000-day window from conception to a child's second birthday, which is vital to prevent malnutrition and ensure optimal growth and development with a budget outlay of INR20,070.90 crore in FY 2024-25 and INR 21,960 crore in FY 2025-26.

Source: <https://www.indiabudget.gov.in/doc/eb/sbe101.pdf> (Last accessed on June 06, 2025).

a) Include Vitamin D Fortified Staples in Take Home Rations (THR) and Hot Cooked Meals (HCM):

MoWCD may work with FSSAI, health and nutrition experts and state

government to include diverse vehicles of Vitamin D.

b) Scale up Successful State-led Models: Several states are already providing Vitamin D rich foods (See Box 2) to women and children specifically. Their implementation can be scaled up nationally and customised to local dietary habits and cultural preferences.

Box 2: Examples of State Schemes Enhancing Vitamin D Intake

Mukhya Mantri Doodh Uphaar Yojna in Haryana supplies 200 ml of Vitamin D3-fortified skimmed milk to pregnant/lactating women and young children (1–3 years), six days a week.

YSR Sampoorna Poshana Scheme in Andhra Pradesh provides eggs and milk via anganwadi centres to children aged 6 to 36 months, enhancing both protein and Vitamin D intake.

Source: https://www.niti.gov.in/sites/default/files/2022-06/Take-home-ration-report-30_06_2022.pdf (Last accessed on June 26, 2025).

c) Include Vitamin D as an Indicator into Poshan Tracker: Once the “Vitamin D Kuposhan Mukh Bharat” campaign is launched, MoWCD can include Vitamin D as an indicator in the POSHAN Tracker. This will enable better monitoring of fortified food intake.

Additionally, the POSHAN Tracker can be used to spread awareness by displaying simple infographics and educational content on Vitamin D. Such content will enable mothers and

caregivers to access essential information anytime, anywhere, thus enhancing awareness and informed decision-making at the household level.

4.5 Utilise the Survey for Assessment of Markers of Population Health Activity, Diet and Anthropometry (SAMPADA) Data to Target Risk Groups

The SAMPADA survey, conducted by ICMR-NIN, is India's first large-scale diet and biomarker survey in India covering 36 states and union territories, with a sample size of 2.5 lakh (including a subsample of 30,000), providing the current status of micronutrient deficiencies, including Vitamin D. The results will provide region-wise data on Vitamin D deficiency among women and children. These findings can be utilised to implement region-specific interventions and prioritise areas for intensified action under existing nutrition programmes.

4.6 Collaborate with other Ministries to Address Vitamin D Deficiency

The MoWCD can work with ministries like the Ministry of Health and Family Welfare (MoHFW), Ministry of Education (MoE) and Ministry of Food Processing and Industry (MoFPI), to address the deficiency among women and children. Similar partnerships have proven effective in the past to address other deficiencies such as Vitamin A and iodine deficiency, etc. For children, this collaboration may include the following.

- **Integration of Vitamin D Fortified Foods into the Mid-Day Meal Scheme:** Collaborate with the MoE to include Vitamin D-fortified foods in school meals in alignment with FSSAI guidelines.
- **Embedding Vitamin D Education into School Curricula:** Incorporate outdoor physical activities and benefits of sun exposure into the school curriculum to build awareness from an early age.
- **Capacity Building/Training:** Teachers can be trained to raise awareness regarding safe sun exposure, dietary sources of Vitamin D and symptoms of deficiency.
- **Disseminate Educational Content** on Vitamin D rich foods, outdoor activities, etc., through posters, videos and interactive materials in classrooms to promote behavioural change at an early age.

This convergence can ensure that children not only receive nutritional support but also the knowledge to make informed health choices.

Overall, by leveraging existing infrastructure like Mission POSHAN 2.0 and through multi-stakeholders' partnerships and collaborations, MoWCD can play a pivotal role in "*Vitamin D Kuposhan Mukh Bharat*".

References

- Aparna, P., Muthathal, S., Nongkynrih, B., Gupta, S., (2018).** Vitamin D deficiency in India. *Journal of Family Medicine and Primary Care*, 7(2), 324. https://doi.org/10.4103/jfmpc.jfmpc_78_18 (Last accessed on May 27, 2025).
- Bhadada, S. K., Chadha, M., Sriram, U., Pal, R., Paul, T.V., Khadgawat, R., Joshi, A., Bansal, B., Kapoor, N., Aggarwal, A., Garg, M. K., Tandon, N., Gupta, S., Kotwal, N., Mahadevan, S., Mukhopadhyay, S., Mukherjee, S., Kukreja, S. C., Rao, S. D., & Mithal, A. (2021).** The Indian Society for Bone and Mineral Research (ISBMR) position statement for the diagnosis and treatment of osteoporosis in adults. <https://pubmed.ncbi.nlm.nih.gov/34176015/> (Last accessed on May 27, 2025).
- Gloth, F. M. III, Gundberg, C. M., Hollis, B. W., Haddad, J. G., Tobin, J. D. (1995).** Vitamin D deficiency in homebound elderly persons. *The Journal of the American Medical Association* 1995;274: 1683–6. <https://pubmed.ncbi.nlm.nih.gov/7474272/> (Last accessed on May 27, 2025).
- Kalra, S., Zargar, A. H., Das, A. K., Baidya, A., Dasgupta, A., Selvan, C., Bantwal, G., Kapoor, N., Lakhani, O. J., Agarwal, P. K., Bajaj, S., & Sarathi, V. (2025).** Prevention and treatment of Vitamin D deficiency in India: an expert group consensus. *Indian Journal of Endocrinology and Metabolism*, 29(1), 13–26. https://doi.org/10.4103/ijem.ijem_264_24 (Last accessed on May 27, 2025).
- Khadilkar, A., Kajale, N., Oza, C., Oke, R., Gondhalekar, K., Patwardhan, V., Khadilkar, V., Mughal, Z., Padidela, R. (2022).** Vitamin D status and determinants in Indian children and adolescents: a multicentre study. *Scientific Reports*, 12(1), 16790. <https://pubmed.ncbi.nlm.nih.gov/36202910/> (Last accessed on June 26, 2025).
- Longitudinal Ageing Study in India (LASI) Wave 1, 2017-18**, India Report, International Institute for Population Sciences, Mumbai. International Institute for Population Sciences (IIPS), National Programme for Health Care of Elderly (NPHCE), MoHFW, Harvard T. H. Chan School of Public Health (HSPH) and the University of Southern California (USC) 2020. https://www.iipsindia.ac.in/sites/default/files/LASI_India_Report_2020_compressed.pdf (Last accessed on May 27, 2025).
- Marwaha, R. K., Tandon, N., Chopra, S., Agarwal, N., Garg, M. K., Sharma, B., Kanwar, R. S., Bhadra, K., Singh, S., Mani, K., & Puri, S. (2011).** Vitamin D status in pregnant Indian women across trimesters and different seasons and its correlation with neonatal serum 25-hydroxyVitamin D levels. *British Journal of Nutrition*, 106(9), 1383–1389. <https://doi.org/10.1017/s000711451100170x> (Last accessed on May 27, 2025).

- Meehan, M., & Penckofer, S. (2014).** The role of Vitamin D in the aging adult. *Journal of Aging and Gerontology*, 2(2), 60–71. <https://doi.org/10.12974/2309-6128.2014.02.02.1> (Last accessed on May 27, 2025).
- Mukherjee, A., Chaudhry, A., Khatwani, L., Khanna, T., and Verma, P. (2025).** “Roadmap to Address Vitamin D Deficiency in India”, Academic Foundation and ICRIER, 2025. (Report) ISBN: 9789332706866. https://icrier.org/pdf/ES_Roadmap-to-Address-Vitamin-D_Deficiency.pdf (Last accessed on June 26, 2025).
- Mustafa, A., & Shekhar, C. (2021).** Concentration levels of serum 25-Hydroxyvitamin-D and Vitamin D deficiency among children and adolescents of India: a descriptive cross-sectional study. *BioMed Central Paediatrics*, 21(1). <https://doi.org/10.1186/s12887-021-02803-z> (Last accessed on May 27, 2025).
- Reddy, K. A. (2020).** **Prevalence of rickets:** A clinical study. *International Journal of Contemporary Pediatrics*, 7(3), 593. <https://doi.org/10.18203/2349-3291.ijcp20200684> (Last accessed on May 27, 2025).
- Schoenmakers, I., Pettifor, J. M., Peña-Rosas, J., Lamberg-Allardt, C., Shaw, N., Jones, K. S., Lips, P., Glorieux, F. H., & Bouillon, R. (2015).** Prevention and consequences of Vitamin D deficiency in pregnant and lactating women and children: A symposium to prioritise Vitamin D on the global agenda. *The Journal of Steroid Biochemistry and Molecular Biology*, 164, 156–160. <https://doi.org/10.1016/j.jsbmb.2015.11.004> (Last accessed on May 27, 2025).
- Schott, G. D., Wills, M. R.** Muscle weakness in osteomalacia. <https://pubmed.ncbi.nlm.nih.gov/55903/> (Last accessed on May 27, 2025).
- Sharma, N., Nath, C., & Mohammad, J. (2019).** Vitamin D status in pregnant women visiting a tertiary care center of North Eastern India. *Journal of Family Medicine and Primary Care*, 8(2), 356. https://doi.org/10.4103/jfmprc.jfmprc_404_18 (Last accessed on May 27, 2024).
- Surve, S., Chauhan, S., Amdekar, Y., & Joshi, B. (2017).** Vitamin D deficiency in children: An update on its prevalence, therapeutics and knowledge gaps. *Indian Journal of Nutrition*, 4(3), 167. <https://www.opensciencepublications.com/fulltextarticles/IJN-2395-2326-4-167.html> (Last accessed on May 27, 2025).
- Tandon, R.K., Joshi, Y.K., Singh, D.S., Narendranathan, M., Balakrishnan, V., Lal, K.** Lactose intolerance in North and South Indians. *The American Journal of Clinical Nutrition*. 1981;34:943–946 <https://pubmed.ncbi.nlm.nih.gov/7234720/> (Last accessed on January 21, 2025).



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At the heart of ANVKA's mission is the promotion of innovative education that integrates the socio-political, economic, spiritual and aesthetic dimensions. The foundation advocates the re-education of relationships, challenging patriarchal norms and fostering mutual respect and dignity to build a more equitable society. ANVKA works to dismantle oppressive social structures, focusing on creating a future grounded in love, understanding and equality. Additionally, the foundation promotes environmental sustainability and livelihoods that are ecologically responsible and socially fair, recognizing the interconnectedness of all life and striving for harmony between humans and the environment. Their efforts also include promoting active citizenship by encouraging individuals to engage in participatory democracy and take an active role in shaping their communities.

ANVKA's health interventions prioritize preventive care for vulnerable populations, emphasizing the importance of building a culture of compassionate community support. Through these initiatives, the foundation empowers communities to actively participate in shaping their futures, fostering social justice and promoting inclusivity. ANVKA's core areas of focus include education, gender equality, empowerment, environmental protection, community development, and health and well-being. Their innovative educational programs are grounded in lived experiences, integrating multiple dimensions, while their gender equality initiatives challenge societal norms to build respectful, equitable relationships. The foundation promotes livelihoods that are economically viable and environmentally sustainable, while also advocating for a harmonious relationship with nature.

Guided by values of holistic well-being, community engagement, social justice, sustainability and innovation, ANVKA strives to build a just, inclusive and thriving world for all. Together, we can create a brighter, more equitable future.



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