

Living at higher altitudes in India linked to increased risk of childhood stunting

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Living at higher altitudes in India is linked to an increased risk of stunted growth, with children living in homes 2,000 meters or more above sea level 40% more at risk than those living 1,000 meters below, finds

research published in *BMJ Nutrition Prevention & Health*.

Children living in [rural areas](#) seem to be the most vulnerable, prompting the researchers to advocate prioritizing nutritional programs in hilly and mountainous regions of the country.

Despite various initiatives, childhood stunting, caused by chronic malnutrition, remains a major public health challenge in India, affecting over a third of 5-year olds, note the researchers.

While research from other countries indicates a link between residential altitude and stunting, it's not clear if this might also be applicable in India, where a substantial number of people live more than 2,500 meters above [sea level](#).

To explore this further, the researchers drew on data from the 2015–16 National Family Health Survey (NFHS-4), a nationally representative household survey of India. Some 167,555 children under the age of 5 from across the country were included in the analysis. GPS data were used to categorize altitude level while the World Health Organization (WHO) standard was used to define stunting.

Most (98%;164,874) of the children lived less than 1,000 m above sea level; 1.4% (2,346) lived between 1,000 and 1,999m above sea level; and 0.2% (335) lived at or above 2,000m. Seven out of 10 lived in rural areas.

The overall prevalence of stunting among these children was 36%, with a higher prevalence among children aged 18–59 months (41%) than among those under 18 months of age (27%).

Stunting was more common among children of third or higher birth order (44%) than it was among firstborns (30%). Stunting rates were

even higher among those children who had been small or very small (45%) at birth.

Mothers' education emerged as an influential factor: Stunting prevalence fell as maternal educational attainment rose. The proportion of children whose mothers had had no schooling was more than double that of children whose mothers had had a higher education: 48% vs. 21%.

Other protective factors included elements of antenatal care, such as clinic visits, tetanus vaccination, and iron and folic acid supplements; proximity to [health facilities](#); and not belonging to a particular caste or indigenous tribe.

This is an [observational study](#) that captured a snapshot of the population at a specific point in time, making it difficult to confirm altitude as a cause of stunting, acknowledge the researchers. But there are plausible explanations for their findings, they suggest. For example, chronic exposure to high altitude can reduce appetite, restrict oxygen delivery to tissues, and limit nutrient absorption.

Food insecurity also tends to be greater at higher elevations where crop yields are lower and the climate is harsher. Similarly, health care provision, including implementing nutritional programs, and health care access are also more challenging, they suggest.

"In summary, concerted efforts are needed across health and nutrition sectors to address stunting, tailored to focus on higher-risk children in vulnerable areas," they conclude.

"A multipronged approach should combine reproductive health initiatives, women's nutrition programs, infant and young child feeding interventions, and food security measures. Continued research, monitoring, and evaluation will be key to guide evidence-based policies

and targeted action to ensure every Indian child has the opportunity for healthy growth and development."

Professor Sumantra Ray, Executive Director of the NNEdPro Global Institute for Food, Nutrition and Health, which co-owns *BMJ Nutrition Prevention & Health* with *BMJ*, adds, "In recent decades public health interventions in India have effectively tackled previously prevalent nutritional problems, such as Iodine deficiency, which are associated with living at higher altitudes.

"But this study highlights the complexities of malnutrition in hilly regions where wider determinants of malnutrition among the under-5s require further study to elucidate the relative contributions of heredity, environment, lifestyle, and socioeconomic factors."

More information: Geographical altitude and stunting among children aged under 5 years in India, *BMJ Nutrition Prevention & Health* (2024). [DOI: 10.1136/bmjnph-2024-000895](https://doi.org/10.1136/bmjnph-2024-000895)

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