



# NOURISHING THE FUTURE: ANALYZING CHILD MALNUTRITION AND PUBLIC HEALTH INTERVENTIONS IN KERALA

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**Abstract :** Undernutrition continues, particularly among children under five, even though Kerala has made impressive strides in health and nutrition metrics. This paper examines recent NFHS-5 (National Family Health Survey-5) trends, focusing on nutritional outcomes, child feeding practices, anaemia prevalence, mortality rates, and the roles of ICDS and vaccination programs. It also analyzes how socioeconomic factors and tribal marginalization influence child health and nutrition. Kerala does better than the national average; however, in order to guarantee equitable and comprehensive child development, tailored interventions are necessary, particularly for tribal people.

**Keywords:** *Malnutrition, undernutrition, nutritional status*

## INTRODUCTION

Although many hail Kerala for its exceptional health indicators, malnutrition among children under five continues to pose a persistent challenge. NFHS-5 data reveals paradoxes within this high-performing state. Despite lower rates of stunting (23.4%), wasting (15.1%), and underweight (19.1%) than the national averages, the prevalence of childhood anaemia has increased from 35.7% (NFHS-4) to 39.4% (NFHS-5), a significant gap in nutritional security. Although mothers in Kerala almost universally breastfeed, only 66.7% initiate breastfeeding within an hour of birth, and the rate of exclusive breastfeeding has declined slightly. This article critically analyzes the nutritional and health status of children under five in Kerala, highlighting trends, identifying challenges, and evaluating existing policies. It offers evidence-based recommendations to guide future policy efforts toward ensuring a malnutrition-free childhood in the state. Kerala's child mortality indicators—such as an infant mortality rate of four per 1,000 live births—are among the best in the country. Nonetheless, rural-urban and gender disparities persist, and illness management practices during diarrhoea and respiratory infections remain suboptimal. While vaccination coverage is high (78% fully vaccinated), disparities based on maternal education and social background endure.

## MALNUTRITION AMONG CHILDREN UNDER FIVE IN KERALA

Kerala is known for its comparatively high nutrition status; recent trends in child undernutrition indicators have been disconcerting. The percentage of stunted children, an indicator of chronic malnutrition, has reduced from 51% in NFHS-2 to 23.4% in NFHS-5, but it has escalated from 19.7% in NFHS-4 to 23.4% in NFHS-5 over four years. In Kerala, the percentage of underweight children has decreased from 43% in NFHS-2 to 19.7% in NFHS-5, although it has increased from 16.1% in NFHS-4 to 19.7% in NFHS-5. Policymakers must plan and implement targeted measures to address the variables driving this increasing trend. The wasting level grew by 0.1% from 15.7% to 15.8%, but decreased by 4.2 points between NFHS-2 and NFHS-5. It demands attention due to its association with acute malnutrition. The overweight rate has increased from 3.4% in NFHS-4 to 4% in NFHS-5. Child undernutrition is a persistent challenge in Kerala that contributes to childhood diseases and high child mortality rates.

Comparing the two survey rounds (NFHS-4 and NFHS-5) by age reveals how urgently assistance is needed. Stunting and underweight have increased significantly in most age groups, whereas wasting has slightly improved in some. Wasting remained almost unchanged among infants below 6 months, with 26.3% in NFHS-4 and 26.4% in NFHS-5, but children aged 6–11 months showed a considerable decline. However, among children 12–17 months, wasting rates rose from 13% to 18.3%. These data point to a critical period when children are at risk when switching from breastfeeding exclusively to supplemental feeding (Khanyile, 2015). While there was a marginal decrease in wasting among children aged 18–23 and 48–59 months, the figures remain high

enough to warrant immediate concern. The prevalence of underweight showed an upward trend across all age groups; infants under 6 months experienced a dramatic increase from 20.6% to 28.7%, and children aged 12–17 months also saw a rise from 11.6% to 22%, as shown in "Fig.1".

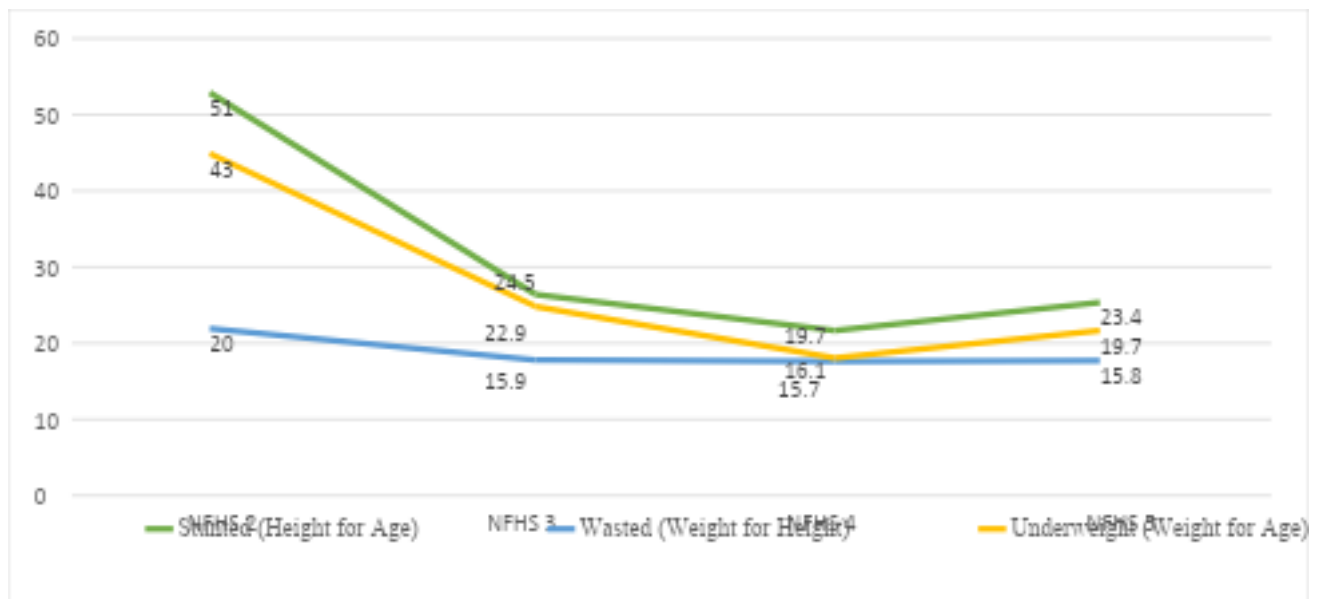


Fig. 1: Nutritional Status of Children in Kerala

Stunting, which reflects chronic undernutrition, has worsened in nearly all age groups, emphasizing the long-term and severe impact of the situation. Among children below 6 months, stunting increased from 16.1% to 22.9%, and among those aged 9–11 months, it rose from 16.8% to 22.8%. Stunting among children aged 12–17 months decreased slightly, but among children aged 18–47 months, it increased, suggesting long-term dietary deficits. Children between the ages of 18 and 23 months had a significant stunting rate (33.1%) in NFHS-5 compared to 30.5% in NFHS-4, highlighting the danger of chronic malnutrition for this age group. NFHS-5 results reveal a decline in the nutritional condition of children in Kerala, particularly in terms of underweight and stunting, with long-term ramifications.

The gender-wise examination of malnutrition in Kerala children reveals significant differences in nutritional outcomes between boys and girls, highlighting the urgent need for gender-specific therapies. There were very slight changes in wasting over time for both sexes. Among male children, the prevalence of wasting increased slightly from 15.9% in NFHS-4 to 16.3% in NFHS-5, while it decreased from 15.6% to 15.2% among females. It indicates that acute malnutrition affects both sexes at nearly equal levels, with a slight improvement observed in females. In contrast, stunting among female children increased more slowly, from 19.8% to 21%, as shown in "Fig.2". Male children in Kerala have experienced a greater increase in chronic malnutrition (underweight and stunting) between NFHS-4 and NFHS-5.

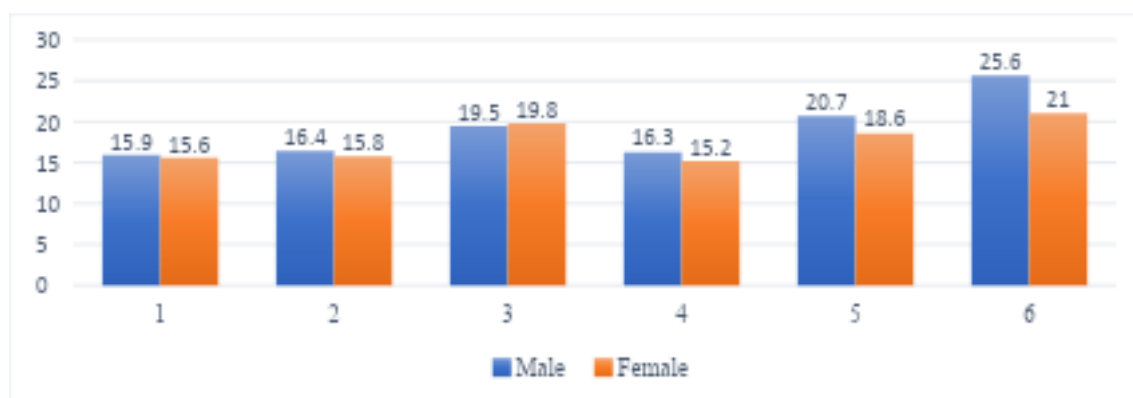


Fig. 2: Gender Wise Distribution of Malnutrition Among Children in Kerala

Underweight and stunting, which reflect chronic malnutrition, show more pronounced differences between rural and urban children. In urban areas, the proportion of underweight children increased from 15.5% in NFHS-4 to 19.4% in NFHS-5, while in rural areas, the increase was from 16.7% to 19.9%. Children in rural regions displayed a greater frequency of underweight, indicating structural and socioeconomic disparities, even though underweight status is increasing in both urban and rural areas. Stunting exhibits the most significant disparity. While urban children showed a slight increase in stunting from 19.8% to 20.1%, rural children experienced a sharp rise from 19.5% to 26.4%. Because of inadequate sanitation and low levels of maternal education and awareness, children in rural areas continue to be at risk due to the substantial rise in stunting. It highlights the need for prompt, area-specific actions to address the structural causes of child malnutrition, especially in rural Kerala.

The caste-wise distribution of malnutrition among children in Kerala, based on NFHS-4 and NFHS-5 data, reveals significant disparities across social groups, especially among Scheduled Castes (SC), Scheduled Tribes (ST), Other Backwards Classes (OBC), and Others. The Scheduled Caste (SC) group saw a slight increase in wasting from 18.6% to 19.2% and a notable rise in underweight from 22% to 24.9%. Stunting among SC children also surged from 19.1% to 30.4%, indicating a severe and alarming deterioration in chronic malnutrition. In the ST category, wasting declined from 18.8% to 10.3%, and underweight prevalence dropped slightly from 21.6% to 19.4%. In the OBC category, wasting and underweight remained relatively stable, with minor increases in both indicators. Stunting showed a modest increase from 22% to 22.4%, indicating a persistent chronic malnutrition burden. Wasting slightly declined from 14.4% to 14.2%, underweight sharply increased from 12.6% to 19.9%, and stunting rose from 15.9% to 22.2%, as shown in “Fig.3” in the ‘others’ category.

In Kerala, the frequency of child undernutrition is not balanced throughout the many districts; rather, it is more prevalent in some districts than others. Examining the incidence of stunting, wasting, and underweight children in different districts reveals this discrepancy. Malappuram emerges as a district with the highest burden of stunted children, with a staggering prevalence of 21.01%. Following is Palakkad, where 11.12% of children suffer from stunting. Other districts with notable stunting rates include Kozhikode (8.78%), Ernakulam (8.23%), and Thrissur (8.17%). Similarly, the districts with the highest prevalence of wasted children are also evident. Malappuram retakes the lead, with 19.26% of children experiencing wasting. Palakkad follows suit, with a majority of wasted children at 12.02%. Kollam (9.87%), Thiruvananthapuram (9.73%), and Ernakulam (9.47%) are also among the districts where wasting is a significant concern. For severely wasted children, which signifies an even more acute form of malnutrition, Malappuram remains at the forefront, reporting a prevalence of 19%. Palakkad must catch up, as 13.73% of its children suffer from severe wasting. Ernakulam (11.30%), Thiruvananthapuram (9.72%), and Kannur (9.66%) are other districts where this severe form of undernutrition is distressingly common.

The burden of underweight children falls unevenly across different groups. Once again, Malappuram exhibits a high prevalence, with 18.26% and 21.01% rates. Palakkad is also a district of concern, reporting underweight rates of 12.37%. Other districts grappling with this issue include Kozhikode (9.30%), Ernakulam (8.67%), and Thrissur (7.68%). Malappuram and Palakkad need urgent attention to address the high frequency of child undernutrition. The NFHS-5 survey data show a mixed picture of India's progress in terms of health and nutrition, with a positive national trajectory contrasted by worsening child undernutrition in Kerala. A multimodal strategy is required to address the issues raised by NFHS-5, especially in Kerala. Policymakers, healthcare professionals, and communities must collaborate effectively to build on the successes while tackling the persisting challenges to ensure a healthier and brighter future. Approximately one in four young women in India were married before their 18th birthday, in NFHS 5, 23% compared to NFHS 4, 27%. Bihar (40.8%), Tripura (40.1%), and West Bengal (41.6%) reported a high prevalence of girls married before the age of 18. In Kerala, 6.3% of women currently aged 20-24 married before age 18 as per NFHS-5 (2019-20), 7.6% in NFHS-4 (2015-16) and 15% in NFHS-3 (2005-06).

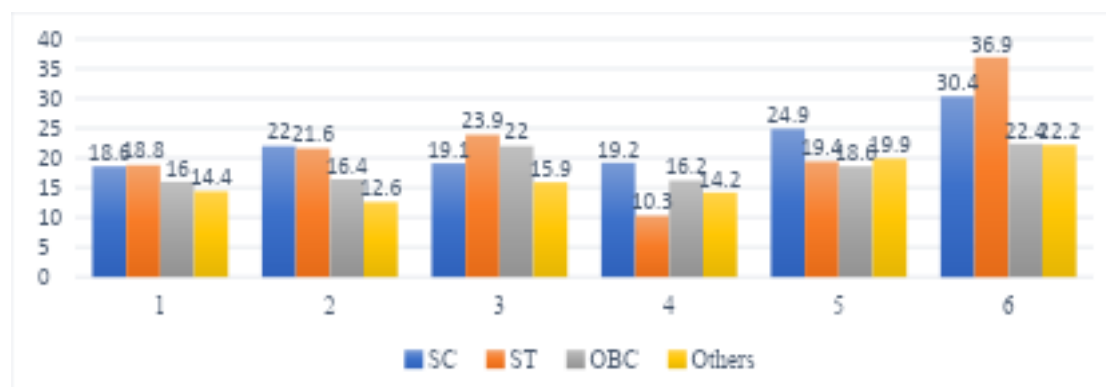


Fig. 3: Cast-wise Distribution of Malnutrition Among Children in Kerala

The total fertility rate (TFR), the average number of children born per woman, increased from 1.6 to 1.8 between 2015-16 and 2019-20 in Kerala, while at the national level, the TFR has declined from 2.2 to 2.0. Bihar (3.0) and Uttar Pradesh (2.4) have the highest rate compared to Sikkim (1.1) and West Bengal (1.4), which have the lowest rate. Kerala (1.8) and Tamil Nadu are the only states where fertility increased marginally in 2019-20. Teenage pregnancy declined only marginally by 1% between NFHS 4 and NFHS 5, and 6.8% of women in the age group of 15-19 in India were already mothers or pregnant. It is lowest in states like Kerala (2.4%), Sikkim (3.1%), and Himachal Pradesh (3.4%) and highest in Tripura (21.9%), West Bengal (16.4%) and Andhra Pradesh (12.4%) in NFHS 5.

Kerala showed a decline in mothers going for checkups in the first trimester (93.6%) in 2019-20 compared to NFHS-4 (95.1%). The percentage of mothers who received antenatal checkups (ANC) in the first trimester has decreased considerably in Kottayam (98% to 82%), Alappuzha (93% to 85%), Trivandrum (93% to 88%), Idukki (98% to 93%), Malappuram (97% to 95%), Kollam (94% to 92%) and Ernakulam (94% to 93%) and Kannur (96% to 95%) shows 1% reduction in between NFHS 4 and NFHS 5. Whereas the percentage of mothers who received ANC in the first trimester has increased considerably in Pathanamthitta (86% to 93%), Palakkad (93 to 98%), Kozhikode (95% to 98%), Wayanad (95% to 98%), and Kasargod (96 % to 97%) and Thrissur (97%), it is constant.

There has been a substantial drop in the proportion of women who had four or more ANC visits (90.1% to 78.6%) in Kerala. It may be the impact of natural calamities and the Nipah outbreak during the survey period. Kottayam, Alappuzha, and Thiruvananthapuram districts lag far behind in First-trimester registration and four or more ANC. Health facility births have been universal in Kerala since NFHS-3 (99.5%), and it ranked top in NFHS-5 (99.8%). Overall, institutional deliveries in India have increased from 26% in 1992-93 to 79% in 2015-16 and further to 89% in 2019-20. In Kerala (NFHS-5), 78% of children aged 12–23 months received complete vaccination, 20% received partial vaccination, and 2% did not receive any vaccines. The level of vaccination reported as Measles was 88.3%, BCG was 98%, three doses of Polio vaccine were 84%, and three doses of Penta were 85%.

## FEEDING PRACTICES AMONG CHILDREN

Although breastfeeding is nearly universal in Kerala, only 66.7% of children were breastfed within 1 hour of birth, as recommended, compared to 55.4% in NFHS-3. Although exclusive breastfeeding decreased from 56.2% in NFHS-3 to 55.5% in NFHS-5, many infants still miss out on the highly nutritious first milk. Kerala outperforms India in both the early initiation of breastfeeding and exclusive breastfeeding practices. The proportion of infants breastfed within an hour after birth increased in Kerala from 55.4% to 66.7% and in India from 24.5% in NFHS-3 to 41.6% in NFHS-5. Exclusive breastfeeding for the first six months improved in India (46.4% to 63.7%), but Kerala showed fluctuations, declining slightly from 56.2% in NFHS-3 to 55.5% in NFHS-5. 38.4% of children between the ages of 6 and 59 months have anaemia, with mild anaemia accounting for 24%, moderate anaemia for 15%, and severe anaemia for 1%. Anaemia can have far-reaching consequences, including maternal mortality, reduced physical and mental capacity, increased susceptibility to infections, and adverse outcomes during pregnancy. The prevalence of childhood anaemia increased from 35.7% in NFHS-4 to 39.4% in NFHS-5, as shown in “Fig.4”. Boys are more likely to be frail than girls (41% vs 38%). Although the prevalence of anaemia in children varies significantly depending on background factors, it is common in all groups. Nearly two-fifths (39.4%) of children in Kerala are anaemic, even if their mother has 12 or more years of schooling. Although Kerala does much better than the national average, the rising trend necessitates immediate actions, such as better nutrition for mothers, dietary variety, and more public health efforts to combat childhood anaemia.

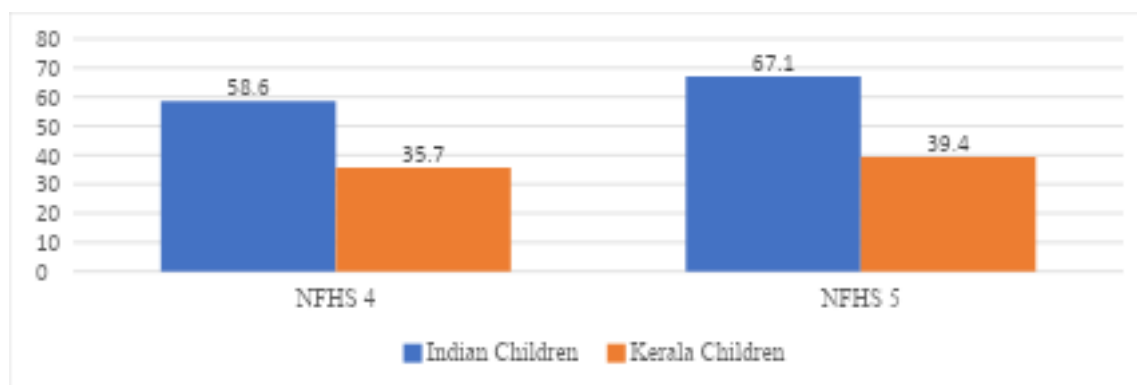


Fig. 4: Prevalence of Anaemia Among Children Under Five

## INFANT AND CHILD MORTALITY

Child mortality rates, including neonatal, post-neonatal, and infant mortality, are vital indicators of a population's health and well-being. According to NFHS-5, Kerala reported an infant mortality rate (IMR) of 4 deaths per 1,000 live births, improving from 6 in NFHS-4, 15 in NFHS-3, 16 in NFHS-2, and 24 in NFHS-1. Similarly, the under-five mortality rate declined to 5 deaths per 1,000 live births, down from 7 in NFHS-4. However, a slight disparity exists, with girls having marginally higher mortality rates than boys across all age groups below five. IMR remains less than 6 per 1,000 live births. However, it is notably higher among Hindus compared to Muslims and slightly elevated in rural areas relative to urban settings (Ministry of Health and Family Welfare).

## CHILDHOOD ILLNESSES

In the two weeks preceding the NFHS-5 survey, 2% of children under five exhibited acute respiratory infection (ARI) symptoms, such as short or difficult chest-related breathing. Caregivers took 70% of them to a health facility or provider. Additionally, 23% of children had a fever, and 89% received treatment from a health provider. Diarrhoea affected 4% of children, with 87% seeking medical help. Awareness of oral rehydration salts (ORS) for treating diarrhoea was widespread, with 98% of mothers having heard of ORS; however, only 61% of children received it. Caregivers gave 54% of children gruel, provided oral rehydration therapy (ORT) to 75%, and administered zinc supplements to 22%. Alarming, 13% of children with diarrhoea did not receive any treatment. During diarrhoea, caregivers provided inadequate feeding, only 15% of children received more than the required fluids, 24% received the correct amounts, while caregivers gave less or no fluids to 60% of children. Similarly, only 24% received the recommended amount of food or more, which could worsen their nutritional status during illness.

## VACCINATION OF CHILDREN

Vaccination remains a cornerstone of child health interventions. In Kerala, we have successfully vaccinated 78% of children between 12 and 23 months against all basic diseases, including polio, measles, tetanus, pertussis, TB, and diphtheria. Additionally, 98% of children were partially vaccinated, and only 2% had received no vaccinations. Vaccinators achieved similar coverage rates across genders and between urban and rural areas, with 77 to 78% of children vaccinated in each group. Health workers verified the vaccination status of 89% of children through vaccination cards, improving from 86% in NFHS-4. The BCG vaccine had the highest coverage at 98%, followed by measles at 89%, three doses of DPT/Penta at 85%, and three doses of polio at 84%. Notably, there is a drop from first to third doses for the DPT vaccine (from 96% to 85%) and the polio vaccine (from 95% to 84%). The Penta vaccine, not widely available during NFHS-4, contributed to some shifts in trends.

Between NFHS-4 and NFHS-5, health workers recorded a decline in DPT coverage from 90% to 85%, while they maintained stable coverage for measles and BCG at 89% and 98%, respectively. Polio vaccine coverage for three doses decreased from 89% to 84%. Furthermore, 94% of children received at least one dose of hepatitis B, and 83% completed all three doses. There is little difference in vaccination coverage between genders or urban and rural areas, with 77 to 78% coverage in both. However, it is crucial to address the disparities present among children of mothers with 8–9 years of education (70%), Muslim children (74%), and children from other backward classes (75%), who were the least likely to be fully vaccinated (Mohfw, 2021). It emphasizes the urgency and importance of addressing these disparities in our vaccination program.

## INTEGRATED CHILD DEVELOPMENT SERVICES (ICDS)

The Integrated Child Development Services (ICDS) program delivers essential nutrition and health services to children under six, pregnant and breastfeeding women, and preschool education for children aged 3 to 5 through community-based Anganwadi Centers (AWCs). According to data from NFHS-4 and NFHS-5, ICDS service coverage and utilization in Kerala have shown notable improvements, although a few areas registered slight declines. The proportion of children receiving benefits from an AWC rose from 48.8% in NFHS-4 to 56.6% in NFHS-5, indicating strengthened community outreach and program reach. Regarding child health monitoring, the proportion of kids who got checkups at AWCs rose from 34.6% in NFHS-4 to 42.2% in NFHS-5. Additionally, the number of kids weighed at AWCs increased from 44% to 51.1%.

Additionally, NFHS-5 showed better nutrition education and maternal awareness, with 44.7% of mothers receiving counselling following their child's weight, compared to 41.2% in NFHS-4. The results also show that preschool and early childhood care attendance at AWCs decreased from 35.5% in NFHS-4 to 31.9% in NFHS-5. It calls into doubt the necessity of continuing early schooling, essential for long-term nutritional results and cognitive development. Overall, the ICDS program in Kerala has made measurable progress in expanding its nutrition and health services. The results also show a drop in preschool and early childhood care attendance at AWCs, from 35.5% in NFHS-4 to 31.9% in NFHS-5. Long-term nutritional outcomes and cognitive development depend on continued engagement in early education, which is called into question by this. Considering everything, Kerala's ICDS program has successfully increased the scope of its health and nutrition services. Nonetheless, renewed efforts to revitalize early childhood education and community mobilization are essential to ensure holistic child development (Ministry of Health and Family Welfare).

## FACTORS CONTRIBUTING TO CHILD UNDERNUTRITION

Stunting is relatively high for children of higher birth orders. Lack of access to various nourishing foods can result in inadequate nutrient intake. Missed early detection and intervention possibilities can stem from poor access to high-quality healthcare services and routine checkups. Low socioeconomic position, lack of education, and poverty can make it difficult for families to give their kids healthy food. Undernutrition can be made worse by using poor sanitation and hygiene techniques, raising the risk of illnesses. Child nutrition heavily depends on maternal health. Children born to malnourished moms are more likely to be undernourished themselves.

## POLICIES UNDERTAKEN TO COMBAT MALNUTRITION

Malnutrition remains a critical issue in India, particularly among marginalized children, impacting growth, development, and overall well-being. Integrated Child Development Services (ICDS), the National Health Mission (NHM), Poshan Abhiyaan, the Mid-Day Meal Scheme, and Anaemia Mukta Bharat are just a few national programs the government has implemented. These initiatives prioritize community-driven health treatments, maternity health care, immunizations, and supplemental nutrition. The National Food Security Act (NFSA) ensures subsidized food access, while the Janani Suraksha Yojana (JSY) and Pradhan Mantri Matru Vandana Yojana (PMMVY) support maternal and infant health. VHSNCs (Village Health Sanitation and Nutrition Committees) and FSSAI's (Food Safety and Standards Authority of India) food safety initiatives enhance grassroots-level governance and food quality. Despite significant improvements, poor infrastructure, social barriers, and logistical constraints persist and must be strengthened through capacity-building, digital monitoring, and community involvement to improve public health outcomes and child nutrition.

Kerala has achieved significant strides in nutrition and health, but its Indigenous populations still experience physical remoteness, socioeconomic difficulties and restricted access to these resources. The state has started specific programs to help tribal communities obtain better healthcare access and nutrition to fight malnutrition. The Tribal Development Department, local groups, and healthcare practitioners have improved food delivery, infrastructure, and nutritional knowledge by working together. In order to address malnutrition among tribal women and children, the Kerala Scheduled Tribes Development Department has implemented specialized

nutrition initiatives that include community kitchens, nutrient-rich meal packs, and vitamin supplements. The Janani-JanmaRaksha Scheme offers financial support to ensure pregnant and lactating Indigenous women access nutritious food and essential medical care. Furthermore, Supplementary Nutrition Programs (SNPs) provide fortified meals through Anganwadi centers to address dietary deficiencies.

Health camps and mobile medical units improve access to healthcare by providing isolated tribal villages with immunizations, growth monitoring, and nutrition teaching. The health of mothers and children has dramatically improved due to these programs, which the federal and state governments fund. However, continuous financial support, community participation, and innovative strategies remain essential for sustained progress.

## CONCLUSION

Inadequate feeding practices during illnesses and declining early childhood education attendance also raise concerns about long-term health and cognitive development. Although national and state-level programs such as ICDS, Poshan Abhiyaan, and Anaemia Mukht Bharat have laid a strong foundation, their effectiveness among Indigenous communities requires strengthening. Community-based strategies, improved infrastructure, continuous health monitoring, and maternal nutrition support are critical. Tribal-specific interventions, like nutrient-rich food packs, community kitchens, and mobile health units, must be expanded with adequate funding and local engagement. This article examines Kerala's under-five children's nutritional and health status by pointing out patterns and problems and assessing current regulations. In order to guarantee that no kid in the state suffers from hunger, it provides evidence-based suggestions to direct future legislative initiatives.

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