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Nutrition, POSHAN, and Policy: Analysing the Child Nutrition Trends and Responses of the State in Southern India

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Abstract

Background: Malnutrition is a severe problem globally; however, over time, with the government's support, the issue has been reduced significantly. However, in Southern India, between rounds 4 and 5 of the National Family Health Survey (NFHS), the malnutrition status has become higher. **Objectives:** This study focuses on existing trends in child undernutrition across five southern states, i.e., Tamil Nadu, Kerala, Karnataka, Andhra Pradesh, and Telangana and reviews the contribution of POSHAN Abhiyan and POSHAN 2.0 in eradicating child malnutrition in those states. **Methods:** The study conducted a comparative analysis using NFHS-4 and 5 data to examine regional disparities and policy gaps that affect the prevalence of malnutrition. Data were disaggregated by state, types of residence, and wealth index to identify the factors in this state, along with a qualitative review of POSHAN Abhiyan & POSHAN 2.0 to conclude findings. **Findings:** Results reveal that the households (HH) in rural areas significantly increased the odds of stunting in Andhra Pradesh (OR=1.35) and Kerala (OR=1.25), while their association with wasting and underweight was largely non-significant. Wealth disparities were consistent and evident that children from the poorest households had 2–3 times higher odds of stunting, e.g., Karnataka (OR=2.82) and Telangana (OR=2.54), wasting (Tamil Nadu OR=1.80), and underweight (Karnataka OR=3.25); Tamil Nadu OR=3.00) compared to the richest. This means the risk declined monotonically with increasing wealth, highlighting poverty as the dominant determinant of child undernutrition in Southern states. Socio-economic disparities and inconsistent policy implementation were significant barriers to progress. **Novelty:** This study is the first of its kind linking NFHS-4 and 5 data with a policy review to reveal overlooked urban–rural and intra-state disparities in child undernutrition in Southern India. Second, it connects nutrition outcomes to the implementation of POSHAN 1.0 and 2.0, highlighting policy gaps and the role of digital monitoring tools in achieving these outcomes.

Keywords: Child Undernutrition & Malnutrition; Southern India; Nutrition Policy; POSHAN Abhiyan; POSHAN 2.0

1 Introduction

Even after 78 years of independence, child malnutrition remains a significant global concern in India, with variation across the states^{(1), (2)}. As per the World Health Organisation (WHO), among children under the age of five, approximately 149 million were stunted, 45 million faced wasting, and 37 million were overweight^{(3), (4)}. This situation persists in different parts of the low- and middle-income countries as well. Malnutrition deficiencies are critical because maximum physical and mental growth happens during these years, and literature shows that it impacts increased morbidity and mortality as well as affects long-term health consequences among children. Besides, poverty, conflict, illness of caregivers, and displacement exposed the malnourished, i.e., stunted and wasted children, to malnutrition risks immediately. To overcome this alarming situation, international bodies implemented various initiatives. The Alma-Ata Declaration, adopted in 1978, identified proper nutrition as a key component of primary health care⁽⁵⁾. A key milestone was reached in 1992, when the first International Conference on Nutrition (ICN1) in Rome led to the adoption of the *World Declaration and Plan of Action for Nutrition*, the first comprehensive, decade-long global nutrition strategy⁽⁶⁾. Following these efforts, in 2000, the United Nations introduced the Millennium Development Goals (2000–2015), with Goal 1 focused on eradicating extreme poverty and hunger and highlighting the importance of addressing malnutrition⁽⁷⁾. The next major development to reduce malnutrition occurred in 2014, when the Second International Conference on Nutrition (ICN2) in Rome produced the Rome Declaration on Nutrition and the Framework for Action, both of which were endorsed by more than 170 member states⁽⁸⁾. By aligning with the ICN3 outcomes with the 2030 Sustainable Development Agenda, the United Nations launched the Decade of Action on Nutrition (2016–25), led by the WHO with the support of FAO, marking a significant shift in global nutritional policy^{(9), (10)}. SDG 2 and SDG 3 highlight the priorities of ending hunger, reducing all forms of malnutrition, and promoting good health⁽¹¹⁾. International efforts such as the Nutrition for Growth summits and the UN Food Systems Summit further strengthened global commitment to tackling malnutrition. Hence, over the past four decades, the international community has implemented collaborative strategies to eliminate all forms of malnutrition through the establishment of agencies, policy development, and political commitments.

These efforts, however, couldn't address the roots of malnutrition, making it a global concern in the 20th century and still today. Various authors have noted that, despite high literacy rates in the southern states, malnutrition remains prevalent^{(12), (13)}. The paper, therefore, aimed to examine the trends in malnutrition and its current context in the southern states of Andhra Pradesh (AP), Telangana, Tamil Nadu (TN), Kerala, and Karnataka. The paper also examines the factors that affect state-level interventions to address malnutrition among children in southern states. For this, the paper highlights trends in Southern India with the help of National Family Health Survey (NFHS) data and extends a holistic understanding of the interplay between nutrition indicators and state-level interventions such as policies and programmes in Southern India. The findings are based on evidence-based policy implementations and a targeted action plan to reduce undernutrition in Southern India.

2 Review Methodology

This study employed a comparative analytical design using secondary data from NFHS-4 and NFHS-5 conducted in 2015–16 and 2019–21, respectively. The study analysed 27,766 children who were alive at the time of the NFHS-5 survey in the five Southern states, i.e., TN, Kerala, Karnataka, AP, and Telangana⁽¹⁴⁾. By focusing on these five states, the study examines three key indicators of child undernutrition, such as i) stunting through low height-for-age, (ii) wasting through low weight-for-height, and (iii) underweight through low weight-for-age, among children under five years of age and discusses the prevalence and temporal changes of these. The authors defined the indicators using WHO child growth standards, where a Z score below -2 standard deviations from the reference median classifies a child as stunted, wasted, or underweight, respectively. To extract the relevant indicators, the study used state-specific fact sheets and datasets from the NFHS repository. To achieve the objectives, the study disaggregated the data by place of residence and household economic status, as measured by the wealth index, to capture intra-state variation. Moreover, to examine associations between factors such as place of residence and wealth index and malnutrition status, the authors used descriptive statistics and logistic regression.

Furthermore, a comparative approach was used to identify and understand shifts in nutritional status between the two reference periods and to highlight persistent or emerging disparities. Alongside quantitative analysis, the study incorporates a qualitative perspective on key nutrition programmes implemented by the Government during this period. Key interventions, including POSHAN Abhiyan and its successor framework, i.e., POSHAN 2, were examined through reviewing policy documents, programme guidelines, and evaluation reports. This review assesses the extent of coverage, implementation bottlenecks, and progress in system strengthening relevant to child nutrition outcomes.

3 Key Findings/Overview

3.1 Current Status of Malnutrition in the Southern States

Malnutrition is an issue that requires constant discussion by policymakers to eliminate it in any population, as for many decades, we have not been able to reduce it as per the goals. To assess the prevalence of malnutrition in the southern states of India, datasets from NFHS 4 and NFHS 5 were analysed. A total of Households comprising 27,766 children were covered in the study, and comparisons of nutritional status were made using data from NFHS-4 and NFHS-5. To get clarity, the Body Mass Index (BMI) for the states was calculated by keeping the WHO norms as the base and summarised in Figure 1.

Figure 1 demonstrates that the results for malnutrition indicators among children under five in the southern states reveal mixed trends. Among the states, Kerala, which had traditionally performed better, experienced an unexpected rise in stunting, i.e., from 19.7% to 23.4% and underweight, i.e. from 16.1% to 19.7%, sharply deviating from its earlier profile. On further analysis, it was also revealed that TN experienced a slight improvement in stunting but a significant increase in underweight children, i.e., from 23.8% to 32.9%, suggesting nutritional deficiencies despite stable levels of wasting. AP and Telangana display contrasting patterns where AP maintained a steady stunting rate with notable improvements in underweight prevalence, while Telangana recorded a concerning rise in stunting, i.e., from 28.0% to 33.1%. Karnataka showed marginal improvement in stunting but deteriorated in wasting and underweight indicators, surpassing the national average in both categories. Overall, all states except Telangana and AP reported increases in the number of underweight children in NFHS-5, whereas the national average improved slightly across all three indicators. State-level variations highlight regional disparities and challenge the assumption of nutritional superiority in Southern India.

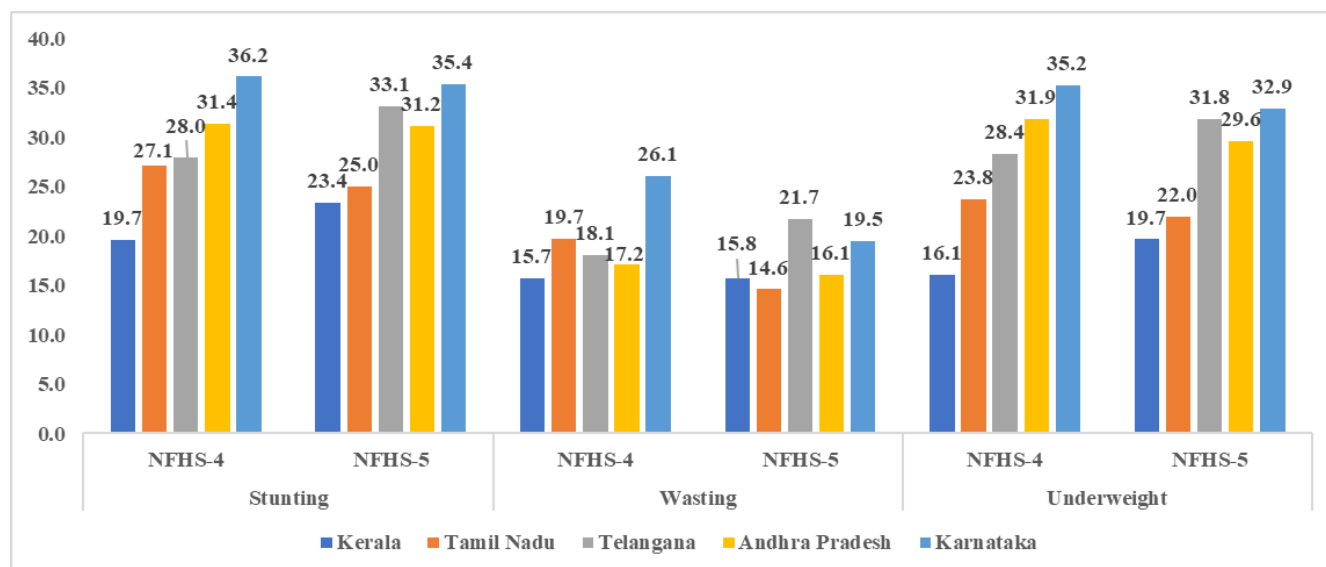


Fig 1. Malnutrition Status among the under-five children between two consecutive surveys, NFHS-4 and NFHS-5. Source: NFHS 4 (14) & NFHS 5 (15)

Given the above scenario, this study also sought to examine the distribution of the dual burden of malnutrition by type of residence, and the results are summarised in Table 1. It delineates notable disparities in child malnutrition across southern states, with urban regions increasingly vulnerable, as indicated by NFHS-5. Among the studied states, in Kerala, urban stunting increased from 19.5% to 26.4%, whereas rural rates remained relatively unchanged, thereby reversing previously held assumptions of an urban advantage. TN has made overall progress, especially in rural areas, but urban children are still more likely to be underweight. AP saw a worrying rise in urban malnutrition among children aged 0 to 5, with urban stunting rising to 34.2% and underweight to 31.4%. In rural areas, however, the rates fell slightly. Telangana is following this trend, with urban children now much more affected, with stunting rates of 35.7% and underweight rates of 35%, compared to their rural counterparts. Karnataka is still known for having high rates of urban malnutrition, especially when it comes to underweight prevalence. This rate declined from 37.7% in NFHS-4 to 34.9% in NFHS-5, but the rural rate is only slightly lower. This trend, however, challenges the traditional rural-urban dichotomy in malnutrition and indicates that, among Indian states, southern

states such as AP, Telangana, and Karnataka exhibit increasing urban child malnutrition. The main reasons for urban nutritional deficiencies are urban poverty, food insecurity, and health care disparities.

Table 1. Residential Representation of Malnutrition among the under-five children in Southern States through NFHS-4 and NFHS-5

Name of the state	Residence	NFHS-4			NFHS-5		
		Stunted	Wasted	Underweight	Stunted	Wasted	Underweight
Kerala	Rural	19.8	16.0	15.5	20.1	16.0	19.4
	Urban	19.5	15.5	16.7	26.4	15.5	19.9
Tamil Nadu	Rural	25.5	19.0	21.5	22.2	13.9	20.0
	Urban	28.6	20.3	25.7	27.2	15.2	23.5
Andhra Pradesh	Rural	28.3	15.5	28.4	23.1	17.6	25.1
	Urban	32.5	17.8	33.1	34.2	15.5	31.4
Telangana	Rural	21.0	14.9	22.1	28.1	20.0	25.8
	Urban	33.3	20.4	33.1	35.7	22.6	35.0
Karnataka	Rural	32.6	24.8	31.5	32.2	18.5	29.4
	Urban	38.5	26.9	37.7	37.2	20.1	34.9

Source: NFHS-4⁽¹⁴⁾ & NFHS-5⁽¹⁵⁾

Table 2 shows the status of malnutrition in southern states by wealth index. To achieve this, the paper attempted to categorise the wealth index of the examined samples into five distinct groups, ultimately concluding that socioeconomic gradients persist, with the most impoverished households consistently demonstrating elevated rates of malnutrition. In Kerala and TN, the overall prevalence is still lower than in other states, but NFHS-5 shows an unexpected rise in stunting among the poorest. AP and Karnataka still have high levels of undernutrition in all wealth groups, with only a little progress among the poorest groups. Telangana exhibits a worsening trend, particularly among higher and middle-income groups, challenging the notion that economic status alone provides immunity against undernutrition. Generally, across the states, the wealthiest quintile fares better; however, in several instances, such as in AP and Telangana, the NFHS-5 data indicate deterioration even within these segments. This inconsistent pattern underscores that economic growth alone has not resulted in equitable nutritional improvements, thereby emphasising the importance of targeted, equity-sensitive interventions. The data reaffirm that structural inequalities, rather than income levels alone, influence child nutrition outcomes in the region.

Several studies have reported that malnutrition is also influenced by geographic and economic disparities, with substantial variation⁽¹⁶⁾,⁽¹⁷⁾. In the context of the present paper, stunting and underweight may also affect the status. Hence, to identify the associative factors with malnutrition in the southern states, the odds ratio was applied. Across the southern states of India, geographical and economic differences exist; however, the impact of household wealth appears far more persistent and evident than that of types of residence. It also found that Stunting was significant in rural areas of AP and Kerala, with odds ratios [OR = 1.35, CI: 1.07–1.70] and [OR = 1.25, CI: 1.03–1.53], respectively, whereas the remaining states did not show statistical significance. Similarly, wasting was significant only in rural areas of AP [OR = 0.72, CI: 0.55–0.94], and underweight was significant in Karnataka [OR = 0.93, CI: 0.83–1.05]. The remaining states did not show significant associations for either stunting or wasting.

Wealth quintiles were significantly associated with stunting across all southern states, except for the middle and richer categories in AP [OR = 1.17, CI: 0.86–1.60; OR = 1.20, CI: 0.88–1.63] and Kerala [OR = 0.93, CI: 0.68–1.28; OR = 1.10, CI: 0.80–1.51], with reference to the richest quintile. Similarly, in TN, the richer category (compared to the richest) was not statistically significant. For wasting, the poorest and poorer wealth quintiles were significantly associated in three states, AP [OR = 1.84, CI: 1.25–2.73; OR = 1.60, CI: 1.08–2.37], Karnataka, and Telangana, when compared with the richest category. In TN, the poorest, poorer, and middle quintiles were found to be significant [OR = 1.80, CI: 1.35–2.39; OR = 1.46, CI: 1.11–1.93; OR = 1.38, CI: 1.05–1.81]. In contrast, in Kerala, only the poorest category showed a significant association [OR = 1.52, CI: 1.05–2.19], while the remaining categories were not significant. In the same fashion, for underweight, the middle and richer categories in AP were not significant [OR = 1.27, CI: 0.93–1.74; OR = 1.17, CI: 0.85–1.60], and in TN, the richest category was also not significant [OR = 1.22, CI: 0.96–1.56]. In Kerala, all categories were not significant except for the poorest quintile, which showed a significant association [OR = 1.77, CI: 1.28–2.47]. The remaining categories were found to be significant across the other southern states (see Table 3). These findings show that the disadvantages of living in rural areas depend on the context, being most visible in stunting in Kerala and Karnataka. Across all states, however, poverty has a much stronger and more consistent effect on children's nutrition. Children from the poorest families are between one and a half to three times more likely to suffer from

Table 2. Wealth index of Malnutrition among the under-five children in Southern States through NFHS-4 and NFHS-5

Name of the state	Wealth Index	NFHS-4			NFHS-5 (n= 27,766)		
		Stunted	Wasted	Underweight	Stunted	Wasted	Underweight
Kerala	Poorest	26.2	20.7	25.4	34.3	17.8	25.5
	Poorer	22.2	14.6	18.9	25.7	15.7	19.7
	Middle	20.3	13.8	15.3	19.1	18.0	18.7
	Richer	14.2	17.7	11.0	21.1	14.1	19.7
	Richest	14.6	11.8	9.0	19.1	13.5	16.0
Tamil Nadu	Poorest	35.6	21.2	31.4	33.9	16.9	32.2
	Poorer	31.3	21.3	28.7	27.4	14.9	25.1
	Middle	23.4	18.1	21.7	27.6	15.9	21.0
	Richer	24.4	18.9	20.8	19.0	14.0	18.2
	Richest	19.6	18.8	14.1	18.7	11.2	15.0
Andhra Pradesh	Poorest	42.2	19.7	43.2	43.1	19.5	41.4
	Poorer	36.1	16.8	35.2	35.7	17.3	33.0
	Middle	28.7	19.1	30.0	27.3	14.1	26.3
	Richer	26.5	14.2	27.8	26.2	14.9	25.0
	Richest	17.5	15.0	17.0	21.9	14.3	20.9
Telangana	Poorest	42.2	23.9	43.8	40.0	26.6	43.5
	Poorer	30.6	19.8	32.6	37.9	23.0	37.4
	Middle	26.2	16.8	27.0	33.4	21.2	30.7
	Richer	22.8	15.9	21.0	31.2	19.6	27.3
	Richest	15.5	12.7	14.2	20.9	17.5	18.4
Karnataka	Poorest	46.5	30.4	47.5	44.9	23.1	44.3
	Poorer	41.7	26.3	38.4	39.9	20.5	37.9
	Middle	35.4	25.3	34.9	33.1	19.9	30.9
	Richer	31.2	24.5	29.3	30.6	17.4	26.6
	Richest	23.1	23.6	23.6	25.0	15.3	20.9

Source: NFHS-4⁽¹⁴⁾ & NFHS-5⁽¹⁵⁾

stunting, wasting, or underweight compared to children from wealthier families. This highlights that structural poverty is a key factor shaping child health outcomes in southern India (Table 3 and 4).

3.2 State response towards undernutrition in Southern States - POSHAN I and II

NITI Aayog in one of the document in 2023 discussed about state-wise initiative to curb malnutrition in India under the Community-Based Comprehensive Care and Management of Acute Malnutrition (CMAM) which speaks about adoption of multiple schemes and programme to eradicate malnutrition among children⁽¹⁹⁾ such as supervised supplementary feeding program” (SSFP) adopted by Government of Telangana and two village health, sanitation, and nutrition days per month to assess the risk of malnutrition. Not only this, but the Government of India (GoI) also implemented Integrated Child Development Services (ICDS), Mission POSHAN 2.0, the Mid-Day Meal Scheme (PM POSHAN), nutritional rehabilitation centres, and the Pradhan Mantri Matru Vandana Yojana in these states, excluding some state-level schemes and programmes, which have led to remarkable progress in combating severe malnutrition⁽²⁰⁾.

After reviewing POSHAN Abhiyan 1.0, launched in 2018, it was reflected that, following its implementation, progress in the current nutrition level has been satisfactory to some extent; however, for the proper implementation of nutrition interventions, improved system readiness and enhanced capacity need to be geared up^{(21), (22), (23)}. The POSHAN Abhiyan also shows mixed outcomes, including low fund utilisation, inconsistent formation of convergence committees across States and Union Territories, and gaps in human resource deployment⁽²²⁾. Despite COVID-19-related setbacks, early restoration efforts demonstrate a strong commitment to restoring essential health, nutrition, and social protection services nationwide. However, when examining the Southern states, the comparative statement of the percentage of Funds used for FY 2017-18, FY 2018-19, and FY 2019-20 under

Table 3. Odds Ratio for association wealth quintile with stunting, underweight and wasted, children in Southern states of India, NFHS-5 (2019-2021).

States	Stunting	Wasting	Underweight
Karnataka (Wealth quintile)			
Richest	@		
Poorest	2.82***[2.32 - 3.41]	1.48***[1.17 - 1.85]	3.25***[2.66 - 3.96]
Poorer	2.15***[1.77 - 2.6]	1.31***[1.04 - 1.64]	2.4***[1.97 - 2.92]
Middle	1.66***[1.37 - 2.02]	1.24[0.99 - 1.56]	1.79***[1.47 - 2.19]
Richer	1.43***[1.18 - 1.75]	1.04[0.82 - 1.31]	1.48***[1.2 - 1.81]
Constant	0.31[0.26 - 0.36]	0.19[0.16 - 0.23]	0.26[0.22 - 0.3]
Andhra Pradesh (Wealth quintile)			
Richest	@		
Poorest	2.17***[1.59 - 2.96]	1.84***[1.25 - 2.73]	2.45***[1.79 - 3.36]
Poorer	1.73***[1.27 - 2.36]	1.60***[1.08 - 2.37]	1.76***[1.29 - 2.42]
Middle	1.17[0.86 - 1.6]	1.27[0.86 - 1.88]	1.27 [0.93 - 1.74]
Richer	1.20[0.88 - 1.63]	1.2[0.82 - 1.78]	1.17[0.85 - 1.60]
Constant	0.26[0.2 - 0.33]	0.17[0.13 - 0.24]	0.27[0.21 - 0.34]
Kerela (Wealth Quintile)			
Richest	@		
Poorest	1.95***[1.43 - 2.66]	1.52***[1.05 - 2.19]	1.77***[1.28 - 2.47]
Poorer	1.42***[1.05 - 1.93]	1.19[0.83 - 1.72]	1.28[0.92 - 1.77]
Middle	0.93[0.68 - 1.28]	1.28[0.9 - 1.83]	1.12[0.8 - 1.55]
Richer	1.10[0.80 - 1.51]	0.96[0.66 - 1.4]	1.21[0.87 - 1.68]
Constant	0.22[0.17 - 0.28]	0.17[0.12 - 0.22]	0.2[0.16 - 0.26]
Tamil Nadu (Wealth quintile)			
Richest	@		
Poorest	2.2***[1.75 - 2.76]	1.80***[1.35 - 2.39]	3.0***[2.35 - 3.82]
Poorer	1.66***[1.33 - 2.07]	1.46***[1.11 - 1.93]	2.03***[1.6 - 2.57]
Middle	1.58***[1.27 - 1.97]	1.38***[1.05 - 1.81]	1.4***[1.11 - 1.79]
Richer	1.07[0.85 - 1.33]	1.23[0.94 - 1.62]	1.22[0.96 - 1.56]
Constant	0.22[0.18 - 0.26]	0.13[0.1 - 0.16]	0.17[0.14 - 0.2]
Telangana (Wealth quintile)			
Richest	@		
Poorest	2.54***[2.03 - 3.17]	1.54***[1.2 - 1.97]	3.11***[2.49 - 3.89]
Poorer	2.17***[1.74 - 2.71]	1.34***[1.05 - 1.71]	2.56***[2.05 - 3.2]
Middle	1.85***[1.49 - 2.3]	1.17[0.92 - 1.49]	1.76***[1.41 - 2.19]
Richer	1.51***[1.21 - 1.88]	1.09[0.86 - 1.39]	1.56***[1.25 - 1.95]
Constant	0.26[0.22 - 0.31]	0.22[0.18 - 0.26]	0.24[0.2 - 0.28]

*** refers to 5% of level of significance; @: shows that reference category, **Source:** Author's calculation from NFHS-5 dataset⁽¹⁸⁾

Table 4. Odds Ratio for association of place of residence, with malnutrition status among the children in Southern states of India, NFHS-5 (2019-2021).

States	Stunting	Wasting	Underweight
Karnataka (Place of residence)			
Urban @			
Rural	1[0.89 - 1.13]	1.01[0.87 - 1.17]	0.93***[0.83 - 1.05]
Andhra Pradesh (Place of Residence)			
Urban			
Rural	1.35***[1.07 - 1.7]	0.72***[0.55 - 0.94]	1.07[0.85 - 1.34]
Kerala (Place of residence)			
Urban @			
Rural	1.25***[1.03 - 1.53]	0.87[0.69 - 1.1]	0.95[0.77 - 1.17]
Tamil Nadu (Place of residence)			
Urban @			
Rural	1.1[0.96 - 1.26]	0.94[0.8 - 1.11]	0.96[0.84 - 1.11]
Telangana Place of residence			
Urban @			
Rural	1.08[0.94 - 1.24]	1.05[0.9 - 1.23]	1.07[0.93 - 1.23]

*** refers to 5% of level of significance, @: shows that reference category **Source:** Author's calculation from NFHS-5 dataset⁽¹⁸⁾

POSHAN Abhiyan shows that the pace and scope of implementation vary across states⁽²⁴⁾. Figure 2 shows that Kerala and TN allocated at least 50% of their funds in both periods. This is because governments were consistently involved and began using digital monitoring tools, such as ICDS-CAS, early on. These factors helped to ensure that resources were used more effectively. Also, Karnataka and Telangana had moderate usage, with some improvement over time, but they did not meet the goals for optimal implementation. AP reported that it did not use much of the funds initially; in the first year, it used less than 10% of the funds allocated. By the end of fiscal year 2019–20, AP had significantly increased the amount of funds it utilised, indicating a delayed response but an operational response. This pattern shows that, even though the mission goals were the same, there were still substantial variations in the amount of time it required each state to execute its plans as well as how ready its institutions were. These results show the importance for states' ability to govern, plan, and coordinate effectively to implement national nutrition programs.

The effectiveness of POSHAN 1.0 is evaluated using state-level scores for service delivery and capacity inputs. Three primary indicators are assessed: the appointment of human resources (HR), the distribution of supplies, and the training and capacity building of personnel. Participation of Child Development Project Officers (CDPOs) in e-Incremental Learning Approach (e-ILA) modules, which are online courses on nutrition and early childhood education (ECE), is also measured⁽²⁵⁾. These modules aim to systematically improve worker knowledge and skills. The provision of dashboards and mobile phones is included as an additional input indicator. **Figure 2** displays the state-level scores for these service-delivery and capacity-input indicators in the southern states.

A comparative assessment of institutional capacity across the Women and Child Development (WCD) departments in five southern Indian states, based on true key input parameters such as (i) Human Resources (HR), (ii) Supplies, and (iii) Training, was given in **Figure 2**. As shown in the figure, among the southern states, TN and AP performed slightly better in terms of human resources, with scores of 3.5 and 4.5, respectively, out of 6. This means, comparatively, these two states have better staff deployment and administrative efficiency within their WCD departments. In contrast, Karnataka scores lowest, indicating limitations in staffing, as well as problems in recruitment procedures or operational management. This may also impact the frontline service delivery in the state. Similarly, TN again demonstrates robust performance for the supply's indicator, with a score of 3.5 out of 5. This reflects the state's robust supply chain management and consistency in managing essential materials required for nutrition and childcare services. Telangana and Karnataka, by comparison, rank lowest for the supply indicator, indicating inefficiencies in supply chain management, irregular distribution systems, and gaps in timely logistics service delivery. However, the third indicator training parameter proved to be the most variable among the other three. It shows that TN also scores a perfect 12, indicating a structured and sustained investment in the capacity building and skill enhancement of frontline workers, in contrast to the moderate levels of achievement in Kerala and AP. It shows that, in Kerala and AP, although

training mechanisms are functional, they require regular monitoring and sustained implementation. Karnataka again appears to lag significantly, indicating the need for improved training infrastructure and strategic planning. Overall, TN stands out as the most consistent performer across all indicators, particularly excelling in training. These findings suggest that strengthening training and capacity-building initiatives could play a crucial role in enhancing institutional readiness for child nutrition services across the southern states.

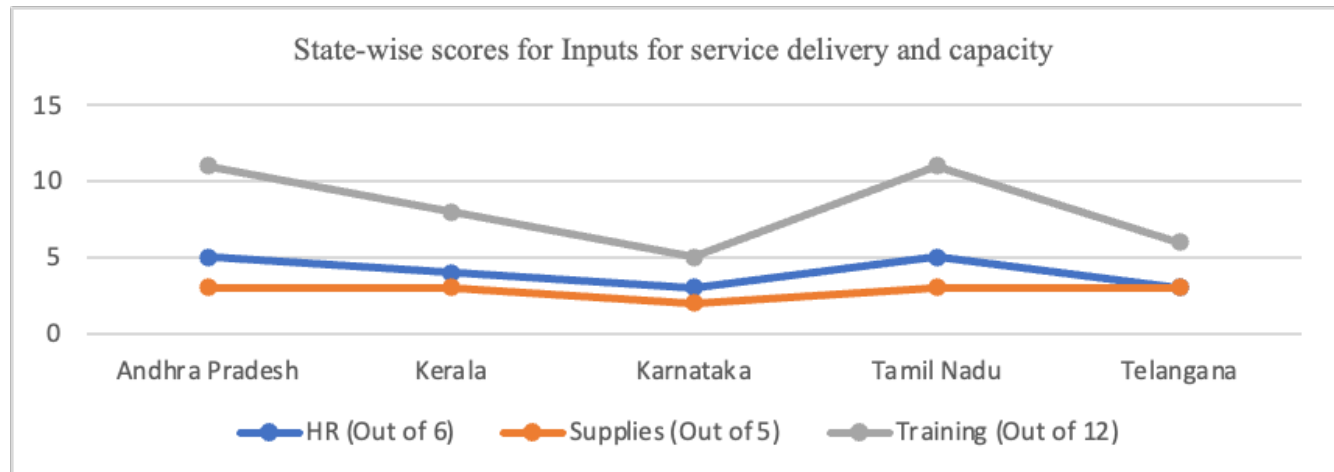


Fig 2. State-wise scores for Inputs for service delivery and capacity: Women and Child Development Department. Source: NITI Aayog & International Food Policy Research Institute, 2021 ⁽²⁴⁾

Table 5 indicates that digital inclusion of the beneficiaries in the POSHAN Tracker has increased. In the lack of earlier data on the internet, it was reported that out of the total southern states, AP, Karnataka, Kerala, TN and Telangana had beneficiaries of 19.2%, 27.6%, 12.6%, 26.7%, and 13.6% respectively. In this scenario, once again, it is very challenging for the government to implement the programme as lots of factors are impacting the malnutrition level of children.

Table 5. State-wise details of beneficiaries registered on POSHAN Tracker, 2024

State	Total Beneficiaries	Children 0-6M	Children 6M-3Y	Children 3-6Y
Andhra Pradesh	3066079 (19.2%)	164719 (0.05%)	1307082 (0.43%)	1151213 (0.38%)
Karnataka	4401317 (27.6%)	217078 (0.07%)	1738366 (0.57%)	1792408 (0.58%)
Kerala	2052065 (12.6%)	86810 (0.03%)	705910 (0.23%)	1038224 (0.34%)
Tamil Nadu	4265582 (26.7%)	233428 (0.08%)	1673707 (0.55%)	1783735 (0.58%)
Telangana	2165718 (13.6%)	111407 (0.04%)	906789 (0.30%)	864920 (0.28%)

Source: Ministry of Women and Child Development, 2024 ⁽²⁶⁾

The details of the data on the nutritional improvements observed in children enrolled in ICDS have been provided ⁽²⁶⁾. Data for the southern states have been extracted from the document. Below are the state-wise funds released and the fund utilisation statement under POSHAN Abhiyan and Mission POSHAN 2.0 for the fiscal years from 2018 to 2024, as presented in the table.

Table 6 presents the annual data on the fund releases and utilisation for Mission POSHAN Abhiyaan and POSHAN 2.0 across five southern Indian states over six consecutive fiscal years. The data revealed that Karnataka consistently received and used the highest volume of funds, demonstrating robust absorption capacity, with utilisation exceeding allocations in fiscal year 2022–23. During 2022–23, AP experienced a reduction in utilisation despite receiving substantial funds. Kerala, however, received the lowest funds among the other states under POSHAN Abhiyan, yet it also experienced a significant decrease in fund utilisation during the same period. This shows a bottleneck in the utilisation of funds in these states. TN, however, shows coherence in fund receipts and utilisation across the three implementation periods mentioned in Table 4. Telangana, despite receiving a modest budget, has consistently managed and utilised funds within the stipulated time limit.

Therefore, from the discussion, it can be inferred that larger states such as TN, Karnataka, and Telangana exhibit better absorption and implementation of funds released under POSHAN Abhiyan, whereas, comparatively, in Kerala and AP, a variability in fund utilisation has been observed, which suggests a need for further institutional strengthening.

Table 6. Statements of state-wise funds released and the fund utilisation statement under POSHAN Abhiyan and POSHAN 2.0

State	POSHAN Abhiyan		Mission POSHAN 2.0				
	2018-2021		2021-22		2022-23		2023-24
Funds released	Funds Utilised as on 31st March, 2021	Funds Released	Funds Utilised	Funds Released	Funds Utilised	Funds Released	
Andhra Pradesh	25363.32	16601.84 (65.5)	74460.38	74990.85 (100.7)	82778.78	72144.95 (87.2)	70568.20
Karnataka	14276.52	11133.42 (78)	100370.19	98461.76 (98.1)	76586.95	88564.69 (115.6)	91296.49
Kerala	10974.73	6696.51 (61)	38822.74	39797.9 (102.5)	44497.62	32543.44 (73.1)	30664.43
Tamil Nadu	25931.46	19476.85 (75.1)	65538.13	68127.94 (104.0)	76680.73	74129.75 (96.7)	88078.90
Telangana	17906.84	14824.33 (82.8)	48232.68	47929.87 (99.4)	55068.81	50333.11 (91.4)	50786.9

Source: PIB, 2021⁽²⁷⁾ and 2024⁽²⁸⁾

These trends suggest that it is essential to consider not only the quantum of financial allocations but also the administrative readiness at the state level in determining the success of central nutrition initiatives. The data from the above analysis and triangulation show that malnutrition remains a challenge despite overall national development. It is also evident that across all southern states, the wealth index shows a clear socioeconomic gradient, with children from poorer households consistently exhibiting higher rates of stunting, wasting, and underweight in both NFHS-4 and NFHS-5. Within the state, it shows mixed progress, with Kerala and TN exhibiting unexpected increases in stunting and underweight; however, in AP and Telangana, it displays worsening urban outcomes, primarily due to the strong influence of household economic status. This means, children from the poorest households were between one and a half to three times more likely to be stunted, wasted or underweight than those from the richest quantile. The odds ratio results reaffirm that financial status is a far stronger predictor of malnutrition than place of residence, as rural–urban differences were either weak or statistically insignificant in most states. NFHS-5 shows that in AP and Telangana, even among the middle and richer groups, there is deterioration. It means that economic growth alone cannot ensure equitable nutritional gains. Overall, the findings indicate that geography is not the key factor shaping malnutrition in southern India; rather, structural poverty is the primary driver. Addressing child undernutrition, therefore, requires targeted, equity-focused interventions that prioritise the poorest households and reduce widening intra-state disparities.

4 Discussion

This paper focuses on the analysis of trends in child nutrition and responses across five states in southern India. Based on the analysis, it is concluded that malnutrition deficiencies persist in these states as a multidimensional public health challenge, influenced by socioeconomic and geographical inequalities. Although southern states have historically outperformed national averages in health indicators, the present dataset reveals widening disparities, particularly in stunting and underweight trends in Kerala, TN, and Telangana. The state of Kerala, known for its high human development index, has experienced an unexpected increase in malnutrition cases. This aligns with previous findings that even high-performing states experience “hidden hunger” and nutritional transition due to dietary shifts, urban poverty, and lifestyle changes⁽²⁹⁾. Moreover, in child nutrition, the wealth index emerges as the most consistent determinant. Across all states, children from the poor quantile are more prone to higher levels of stunting, wasting, and underweight, showing a severe social gradient. The present findings support previous research indicating that household wealth significantly affects food diversity, maternal care, sanitation, and access to healthcare services⁽³⁰⁾,⁽³¹⁾. Notably, rising malnutrition among middle and richer groups in AP and Telangana signals that economic status alone no longer guarantees protection, hinting at dietary inadequacies in lifestyle and urban food insecurity.

Higher cases of stunting and underweight levels among children in Telangana and AP in urban areas prove that, in urban–rural comparison, the urban advantage is almost negligible. This has also been analysed in the literature, which identifies urban slums as hotspots of malnutrition due to overcrowding, poor housing and unstable food access⁽³²⁾,⁽³³⁾. These observations hence suggest that the uneven burden of malnutrition in southern India is caused mainly by structural poverty, intra-state inequality and differential access to services. Therefore, a targeted, context-specific and equity-driven policy response is deemed necessary.

5 Conclusion

The nutritional status in the five states studied in Southern India, as reflected in NFHS Rounds 4 and 5, summarises the intricacies and fundamental challenges. It indicates that malnutrition deficiencies are shaped by complex interactions among the Household's financial status, geographical and structural inequalities, and other factors in southern India. In other words, when southern states contribute positively to reducing the malnutrition indicators at the national level, within states, it increases the malnutrition indicators. For example, in Kerala and TN, when multiple indicators have been brought under control, the stunting and underweight among the children increase. It means that, despite national-level improvements, state-level patterns are weakening. In a nutshell, when traditionally Kerala, TN and Telangana, as southern states, perform well, Karnataka and AP show concern about the rising burdens of malnutrition. These variations underscore the need to reconsider assumptions about southern India's nutritional advantage and to recognise the deepening internal disparities masked by state averages.

Further, it was seen that the wealth index gives the most powerful and sound explanation for the current pattern of malnutrition. From the analysis, it is evident that the children from the poorer and poorest HHs experienced significantly higher odds of malnutrition, confirming that poverty remains the strongest predictor of child nutritional outcomes. It was also concluded that in spite of geographic differences, the resident area alone is not a decisive factor; rather, economic disparities within both rural and urban regions determine the malnutrition deficiencies. Urban advantage erosion shows rising vulnerability among the urban poor facing food insecurity, high living costs and limited healthcare accessibility. These patterns confirm that malnutrition is increasingly embedded within broader socioeconomic structures rather than isolated to traditionally underserved rural settings. This has been reported that undernutrition has been a primary concern among the socially marginalised communities, such as the scheduled caste and scheduled tribes, in the states of Karnataka and AP. At the same time, Telangana witnesses a rise in malnutrition among children, even among the middle and upper-income groups⁽¹⁴⁾.

However, with the acceptance of POSHAN Abhiyan 1.0 and POSHAN 2.0, it advocated structural change in the ways of controlling malnutrition in southern states, which have stopped engaging grassroot frontline workers like the Anganwadi workers, integrating digital tools like ICDS- CAS, POSHAN tracker checks to bring in more transparency and active engagement, and all multilayered governance systems to resolve the problems of undernutrition. As discussed, states such as TN and AP were among the top large states in India to utilise funds allocated for the eradication of malnutrition and for enhancing human resource deployment and training. It is believed that, with proper implementation, POSHAN 2.0 can be instrumental in eradicating undernutrition in the southern states and serve as a model for addressing malnutrition among children across socio-economic categories.

The consistent associations between low wealth and high risk of malnutrition suggest that economic deprivation shapes multiple pathways, including diet quality, healthcare utilisation, maternal nutrition, sanitation, and living conditions, which collectively influence child well-being. Policy responses must prioritise the poorest households and urban informal settlements. Social protection schemes require strengthening. Nutrition-sensitive interventions, such as food security programs, maternal education, and community-based nutrition surveillance, should be expanded. The findings highlight the need to shift from broad strategies to equity-focused and targeted actions. Interventions must address structural poverty to ensure that nutritional gains are sustained across all groups in society, and policy responses must prioritise the poorest households and urban informal settlements. Moreover, social protection schemes need to be strengthened, and nutrition-sensitive interventions, such as food security programs, maternal education, and community-based nutrition surveillance, should be expanded. The findings highlight the need to shift from broad strategies to equity-focused and targeted actions. Interventions must address structural poverty to ensure that nutritional gains are sustained across all social groups.

6 Declaration of Conflict of Interest

All authors of this study declare that no known opposing financial interest or any personal relationship that could ever appear to influence the findings in this paper have been reported so far.

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