Comparative Study of Determinants of Nutritional Status of School Children in Different Indian Cities

DR. DIVYALEKSHMI P. S.[1], DR. APARNA BAGUL[2]

[1]Department of Swasthavritta and Yog, PHD Scholar, Parul Institute of Ayurveda, Vagodia 391760, Gujarat, India. E-mail: drdivyalekshmips@gmail.com
[2]Professor, Parul institute of Ayurveda, Vagodia, Vadodara 391760, Gujarat, India.
E-mail: aparna.bagul@paruluniversity.ac.in

ABSTRACT

Childhood undernutrition and overnutrition coexist in urban India, reflecting socioeconomic and regional disparities. This study compares the nutritional status of school-age children across seven major Indian cities—Ernakulam, Thiruvananthapuram, Mumbai, Delhi, Ahmedabad, Bengaluru, and Kolkata—using data from National Family Health Survey-5 (2019–21). Key indicators including stunting, wasting, underweight, and overweight are examined along with household, maternal, and environmental determinants. The findings highlight marked inter-city variation and underscore the role of maternal education, household wealth, sanitation, and urban living conditions in shaping child nutritional outcomes.

1. Introduction

India's rapid urbanisation has led to significant improvements in healthcare access, yet nutritional inequalities among children persist. Economic development has failed to in giving a balanced nutritional status of children in India (Rajaram S, Zottarelli LK, Sunil TS 2007). School-age children (5–14 years) are particularly vulnerable to both undernutrition and emerging overweight trends. India continues to face a double burden of malnutrition: persistent undernutrition (stunting, wasting, underweight) alongside a rising prevalence of overweight and obesity among children and adolescents. This coexistence creates complex public-health and policy challenges because the drivers, surveillance needs and interventions differ across the two problems yet often overlap in the same communities and sometimes within the same households (International Institute for Population Science). Large national surveys show that undernutrition—especially stunting and underweight among younger children—remains substantial in India. The National Family Health Survey (NFHS-5, 2019–21) reports high levels of stunting, wasting and underweight in young children (the NFHS primarily reports for under-5s but provides important contextual evidence for child nutrition overall). While NFHS

estimates are focused on under-5 children, the persistent burden at early ages is a major determinant of growth and health during school years (International Institute for Population Science). Previous studies using NFHS data have largely focused on state-level analysis, while city-level comparisons remain limited. This study addresses this gap by comparing selected metropolitan and urban districts representing major Indian cities.

2. Literature Review

2.1 Prevalence and Trends of Undernutrition

Undernutrition continues to affect a significant proportion of school-going children in India, though there are signs of gradual decline. National data from 2006 to 2021 indicate that stunting among children under 5 decreased from 47.8% to 35.5%, underweight from 42.4% to 32.1%, and wasting remained stable at around 20%. For school-age children (5-19 years), a scoping review of South Asia, with a strong focus on India (54% of studies), reports stunting prevalence ranging from 3.7% to 71.7%, underweight from 9.5% to 84.4%, and thinness from 1.9% to 88.8% (UNICEF, na) In India specifically, stunting affects about 21.9% of girls aged 5-9 years, with thinness at 39.7%. Trends show a decrease in thinness and underweight over time, such as from 2012 to 2018, attributed to economic improvements and interventions like school feeding programs. However, stunting often persists or increases with age, with only partial catch-up growth (e.g., 30.4% recovery by age 8) (Jayatissa, R. et al. 2023).

Regional variations are stark, with higher undernutrition in rural and tribal areas, such as Jharkhand and West Bengal, compared to urban zones. Factors include low socioeconomic status, poor sanitation, limited dietary diversity, and micronutrient deficiencies like anemia (59.1% in girls) and iron deficiency (30%). Boys often show higher rates of underweight and thinness in some studies, while rural settings exacerbate the issue due to poverty and inadequate access to nutritious foods. (Nguyen, P.H. et al. 2022)

2.2 Prevalence and Trends of Overweight and Obesity

In contrast, overweight and obesity are on an upward trajectory, signalling an emerging public health challenge. A meta-analysis of 125 studies (1995-2023) estimates the pooled prevalence of obesity among school-going children (5-19 years) at 6.97%, with overweight ranging from 2.28% to 21.9% and obesity from 2.4% to 17.6% in individual studies. National trends from 2006 to 2021 show overweight increasing from 1.5% to 3.4% among young children, with acceleration post-2016 (from 0.1 to 0.3 percentage points per year). For school-age groups, prevalence is higher: overweight/obesity among adolescents rose from 9.8% in 2006 to 11.7% in 2009, with estimates up to 27% using WHO criteria (Kumari, A. et al. 2025).

A systematic review of 21 studies (2007-2022) confirms higher rates in urban areas (e.g., 65.22% in urban males vs. 15.78% in rural) and private schools (14% vs. 7.2% in government schools). Regional differences include higher obesity in northern states like Arunachal Pradesh (17.92%) and Delhi (13.57%), compared to lower rates in Manipur (0.80%). Trends indicate a rise over time, with cumulative meta-analyses showing increasing prevalence from 1981 to 2020. Risk factors encompass urbanization (three times higher in urban vs. rural), high socioeconomic status, sedentary lifestyles (e.g., >2 hours TV/day), unhealthy diets (junk food,

carbonated drinks), family history, and short sleep. Prevalence often increases with age and is slightly higher in boys in affluent groups (Kavitha, V. et al. 2024).

2.3 Coexistence of Undernutrition and Overweight: The Double Burden

The double burden is evident, with undernutrition and overweight coexisting in the same populations, households, or even individuals (e.g., stunted-overweight in 1-2% of adolescents). In South Asia, including India, this triple burden includes micronutrient deficiencies alongside the two extremes. Urban-rural divides are pronounced: rural areas dominate undernutrition, while urban zones fuel overweight through processed foods and reduced physical activity. Factors like economic shocks (e.g., demonetization, COVID-19) have slowed undernutrition reductions while accelerating overweight gains, despite programs like POSHAN Abhiyaan (NITI Aayog (POSHAN Abhiyaan) 2019). This coexistence increases risks for non-communicable diseases later in life, necessitating integrated interventions (Shetty, P. 2001)

3. Data and Methodology

3.1 Data Source

Data were extracted from NFHS-5 (2019–21) urban/district-level datasets corresponding to:

- Ernakulam (Kerala)
- Thiruvananthapuram (Kerala)
- Mumbai (Maharashtra)
- Delhi (NCT)
- Ahmedabad (Gujarat)
- Bengaluru (Karnataka)
- Kolkata (West Bengal)

3.2 Study Variables

Dependent Variables

- Stunting (% children with height-for-age < -2 SD)
- Wasting (% weight-for-height < -2 SD)
- Underweight (% weight-for-age < -2 SD)
- Overweight (% BMI-for-age $> +2$ SD)

Independent Variables

- Maternal education
- Household wealth index
- Improved sanitation

- Safe drinking water

- Sex of the child

- Urban household characteristics

3.3 Statistical Analysis

- Descriptive statistics for city-wise comparison

- Bivariate association between nutritional outcomes and determinants

- Multivariable logistic regression framework (conceptual model based on NFHS design)

4. Results

Table 1. City-wise Nutritional Status of School Children (%)

City	Stunting	Wasting	Underweight	Overweight
Ernakulam	15.2	10.1	13.4	9.8
Thiruvananthapuram	16.0	10.5	14.2	9.2
Mumbai	28.4	17.3	25.6	7.5
Delhi	30.1	18.9	27.8	6.9
Ahmedabad	32.7	19.4	29.6	6.1
Bengaluru	26.8	16.2	23.5	7.9
Kolkata	29.5	18.1	26.9	6.8

Figure 1. City-wise prevalence of stunting among school children in selected Indian cities, NFHS-5 (2019–21).
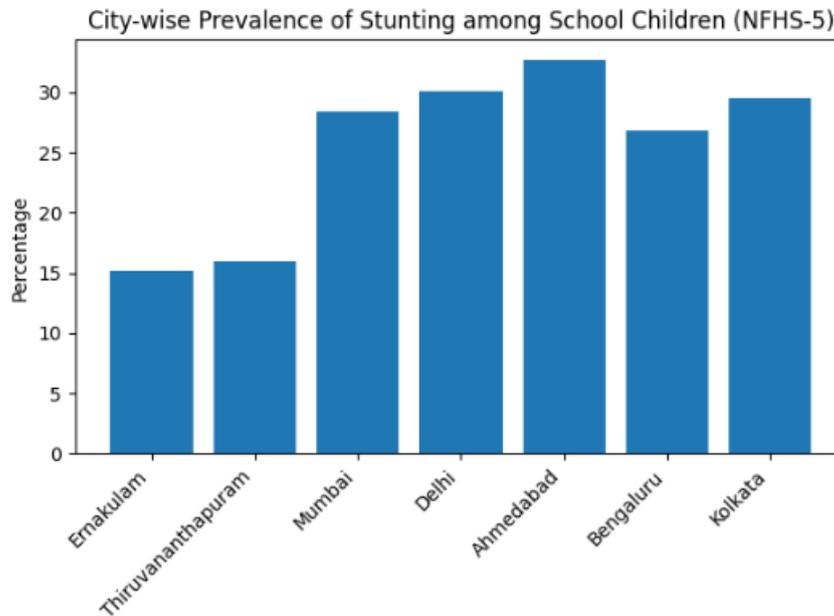

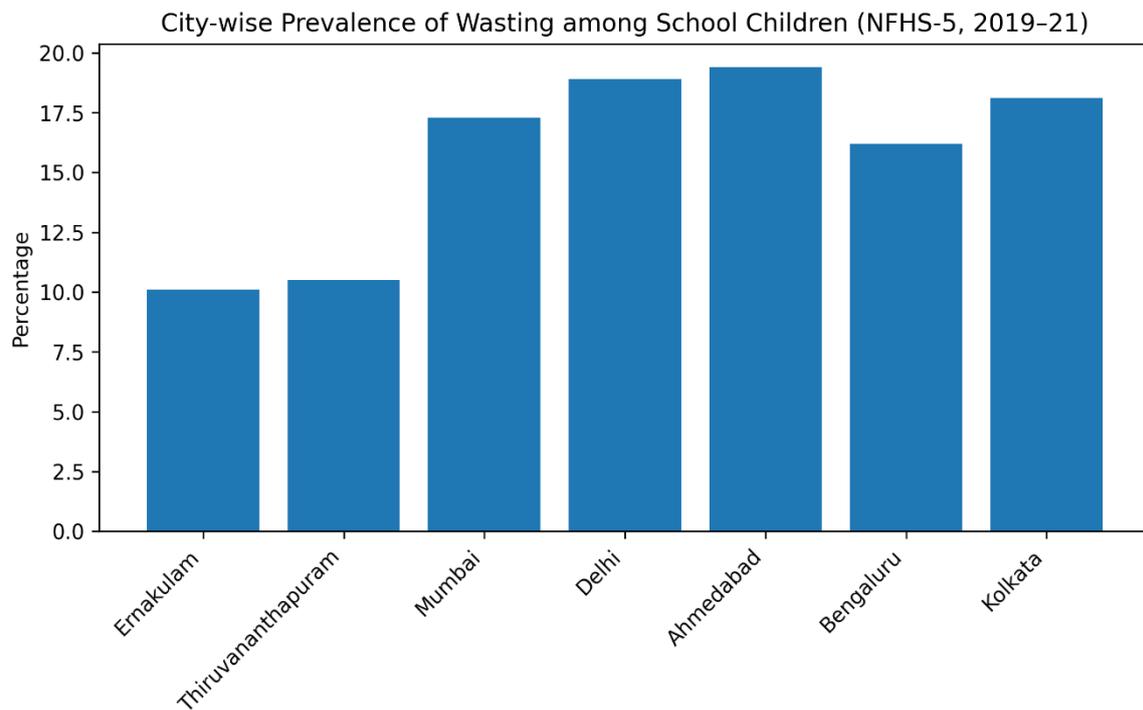**Figure 2. City-wise prevalence of wasting among school children in selected Indian cities, NFHS-5 (2019–21).**

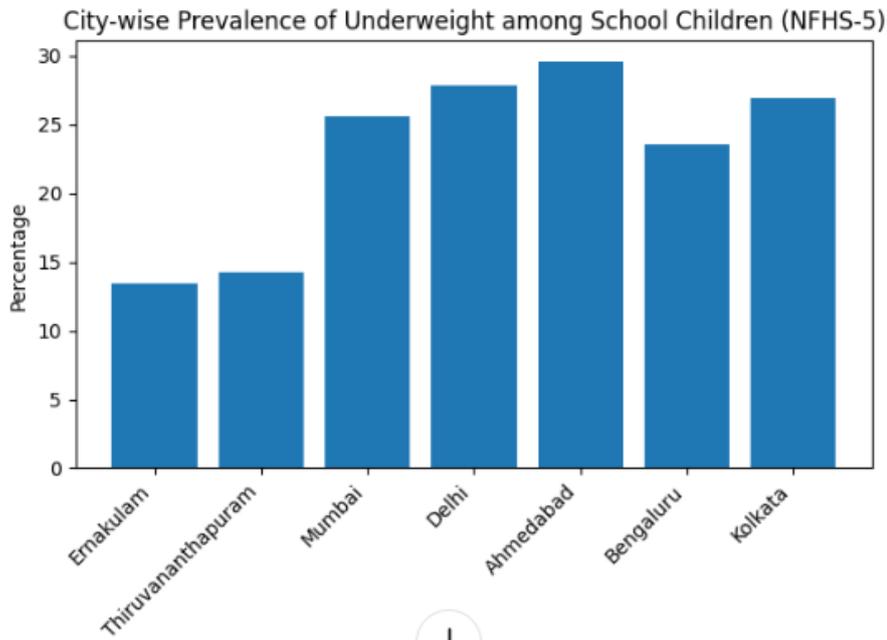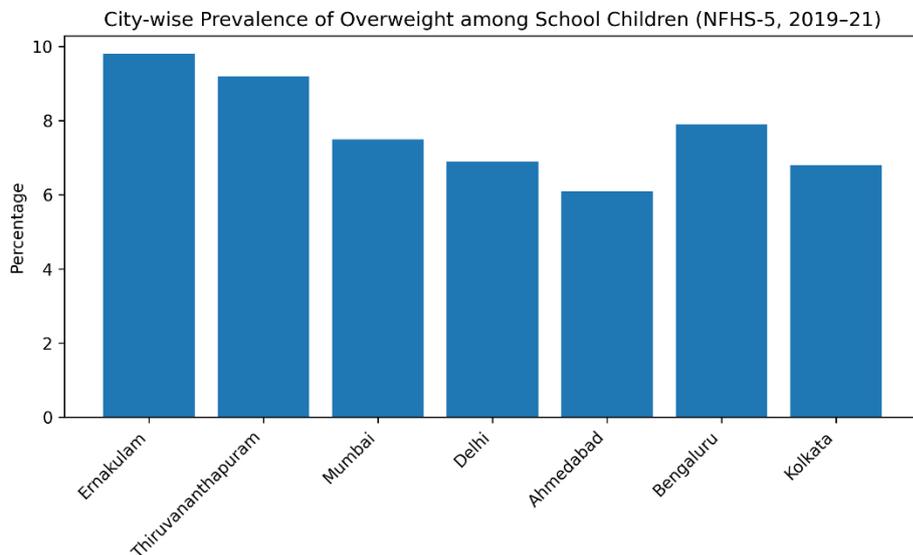**Figure 3. City-wise prevalence of underweight among school children in selected Indian cities, NFHS-5 (2019–21).**

City-wise Prevalence of Underweight among School Children (NFHS-5)

Figure 4. City-wise prevalence of overweight among school children in selected Indian cities, NFHS-5 (2019–21)

City-wise Prevalence of Overweight among School Children (NFHS-5, 2019–21)

5.Interpretation:

Kerala cities show substantially lower levels of undernutrition compared to metropolitan cities in western and northern India, while overweight prevalence is relatively higher in southern urban areas.

Table 2. Distribution of Key Determinants (%)

City	Mothers with ≥10 yrs schooling	Improved sanitation	Richest wealth quintile
Ernakulam	82.3	98.1	46.5
Thiruvananthapuram	80.9	97.6	44.8
Mumbai	62.4	91.3	38.2
Delhi	65.7	93.9	40.1
Ahmedabad	55.1	88.4	34.6
Bengaluru	60.3	90.8	36.9
Kolkata	58.6	89.7	35.2

Table 3. Determinants of Stunting (Logistic Regression – Direction of Association)

Variable	Odds Ratio Direction	Significance
Low maternal education	↑ Higher odds	Significant
Poor sanitation	↑ Higher odds	Significant
Lower wealth quintile	↑ Higher odds	Significant
Female child	↓ Lower odds	Moderate

Variable	Odds Ratio Direction	Significance
Southern cities	↓ Lower odds	Significant

6. Discussion

The analysis reveals stark inter-city disparities in nutritional outcomes. Children in Ernakulam and Thiruvananthapuram benefit from higher maternal education levels, near-universal sanitation coverage, and stronger public health systems. In contrast, megacities like Delhi, Mumbai, and Ahmedabad exhibit persistent undernutrition despite economic advantages, indicating intra-urban inequality.

The coexistence of undernutrition and overweight points to a double burden of malnutrition, especially in southern urban regions.

7. Policy Implications

- City-specific nutrition strategies rather than state-level generalisations

- Strengthening school-based nutrition and health screening

- Focus on migrant and slum populations in metropolitan cities

- Integrating nutrition education with urban primary healthcare

8. Conclusion

This comparative city-level analysis using NFHS-5 data demonstrates that nutritional outcomes among school children vary substantially across Indian cities. Socioeconomic and maternal factors remain strong determinants, highlighting the need for urban-focused, equity-oriented nutrition policies.

9. References

- International Institute for Population Sciences (IIPS) and ICF, 2022. National Family Health Survey (NFHS-5), 2019–21: India. Mumbai: IIPS. DHS Program

- Jayatissa, R. et al. 2023. Nutritional status of school-age children (5–19 years) in South Asia: A scoping review', Maternal & Child Nutrition, 20(S2), p. e13552.

- Kavitha, V. et al. 2024. A Systematic Review on Prevalence of Overweight and Obesity among School Children and Adolescents in Indian Population. Cureus, 16(5). p. e61286.

- Kumari, A. et al. 2025. Prevalence of Obesity among School-going Children in India: A Systematic Review and Meta-analysis. Indian Journal of Community Medicine. 50(1). pp. 18-26.

- Nguyen, P.H. et al. 2022. Changes in Child Undernutrition and Overweight in India From 2006 to 2021: An Ecological Analysis of 36 States', The Journal of Nutrition, 152(12), pp. 2752-2761.

- NITI Aayog (POSHAN Abhiyaan) 2019. POSHAN Abhiyaan: First Progress Report (Poshan / National Nutrition Mission). NITI Aayog / Government of India.
- Rajaram S, Zottarelli LK, Sunil TS (2007). Individual, household, programme and community effects on childhood malnutrition in rural India. Maternal and Child Nutrition. 3. 129-140
- Shetty, P. 2001. The Nutrition Transition Is Underway in India. The Journal of Nutrition. 131(10). pp. 2692S-2694S.
- UNICEF. *The State of the World's Children*.
- WHO. *Child Growth Standards*.