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Prevalence and Socioeconomic and Demographic Correlates of Stunting among Children Under Five in Odisha, India: Evidence from NFHS-5

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Abstract

Background: Stunting remains an important form of chronic undernutrition among children aged 0–59 months and is associated with adverse health and developmental outcomes. Although the prevalence of stunting in Odisha has declined substantially over successive rounds of the National Family Health Survey (NFHS), it continues to affect a considerable proportion of children. This study examined the prevalence and socioeconomic and demographic correlates of stunting among children under five years of age in Odisha.

Methods: The study used unit-level data from the fifth round of the National Family Health Survey (NFHS-5), conducted during 2019–2021, to examine the socioeconomic and demographic correlates of stunting, while data from previous NFHS rounds were used to assess prevalence trends over time. The analysis included children aged 0–59 months in Odisha. Stunting was defined as height-for-age Z-score below −2 standard deviations and severe stunting as below −3 standard deviations according to the WHO Child Growth Standards. Bivariate analyses were used to estimate prevalence across population subgroups. Multivariable binary logistic regression was subsequently performed separately for stunting and severe stunting, with results presented as adjusted odds ratios (AORs) and 95% confidence intervals (CIs).

Results: Overall, 31% of children were stunted and 11.40% were severely stunted (NFHS-5). Stunting prevalence was highest among children from the poorest households (43.20%), those whose mothers had no formal education (47.88%), children of underweight mothers (40.56%), and children of sixth or higher birth order (57.34%). In the adjusted analysis, household wealth showed a strong inverse gradient: children from the richest households had 66% lower odds of stunting than those from the poorest households (AOR=0.34; 95% CI: 0.24–0.49). Higher maternal education was also associated with lower odds of stunting (AOR=0.62; 95% CI: 0.46–0.83). Children aged 12–35 months had nearly twice the odds of stunting compared with those below six months (AOR=1.95; 95% CI: 1.62–2.34), while children of sixth or higher birth order had higher odds (AOR=1.87; 95% CI: 1.26–2.77). Maternal underweight was associated with higher odds of stunting (AOR=1.19; 95% CI: 1.06–1.34), whereas maternal overweight was associated with lower odds (AOR=0.70; 95% CI: 0.60–0.82).

Conclusion: Childhood stunting in Odisha remains substantial despite a sustained decline in prevalence over successive NFHS rounds. Household wealth and maternal education showed the most consistent associations with stunting, while child age, birth order and maternal nutritional status were also important correlates. Strengthening interventions addressing socioeconomic disadvantage, maternal education and

nutrition, and vulnerable periods of child growth may contribute to further reductions in childhood stunting in Odisha.

Background

Childhood stunting is a major form of chronic undernutrition and represents a significant constraint on children's physical and cognitive development. It is defined as a height-for-age or length-for-age below −2 standard deviations from the median of the WHO Child Growth Standards (WHO, 2006). Stunting is associated with an increased risk of mortality, impaired cognitive development and poorer educational outcomes. Evidence has shown that stunted children may have substantially lower cognitive performance, including a higher likelihood of lower IQ scores (Aurora et al., 2021). The consequences may extend into adulthood, with individuals who experienced stunting during childhood facing reduced productivity and earning potential; undernutrition has also been associated with substantial economic losses in low- and middle-income countries (McGovern et al., 2017). Given its wide-ranging health, developmental and socioeconomic consequences, childhood stunting is an important indicator for monitoring progress towards Sustainable Development Goal (SDG) Target 2.2, which aims to end all forms of malnutrition (United Nations, 2025).

The underlying causes of stunting are multifactorial and reflect a combination of socioeconomic, nutritional, maternal and environmental conditions. These include limited access to healthcare services, inadequate dietary diversity, chronic food insecurity, poor water, sanitation and hygiene (WASH) conditions, persistent poverty, rural–urban disparities and gender inequalities (World Health Organization, 2024). Maternal factors, including inadequate nutrition during pregnancy, short maternal stature, short birth intervals and adolescent pregnancy, are also associated with child stunting. Maternal undernutrition may further contribute to intrauterine growth restriction, which has been estimated to account for approximately 20% of childhood stunting (Black et al., 2013).

Childhood stunting is shaped by multiple socioeconomic, maternal, demographic and environmental factors. Maternal characteristics, particularly maternal height and nutritional status, emerged as important correlates of child linear growth, while household socioeconomic conditions and parental education were also associated with children's height-for-age (Fenske et al., 2013). Children from poor households had 2.67 times the odds of stunting compared with children from rich households (OR=2.67; 95% CI: 2.54–2.81). Stunting was also more prevalent among children of underweight mothers, children of fourth or higher birth order, SC/ST children, children of mothers without education, and rural children. Approximately 60% of stunted children in that analysis had mothers who were illiterate. Children from working mothers also have higher risk of stunting (Prasad et al., 2021).

Five most important predictors were short maternal stature, lack of maternal education, being in the lowest wealth quintile, poor dietary diversity and maternal underweight. Together, these factors accounted for an estimated 67.2% of the population-attributable risk for stunting and 69.7% for underweight (Corsi et al., 2016). Among children aged 6–23 months, the strongest correlates included maternal height, household wealth, maternal BMI, dietary diversity, maternal education and age at marriage. Short maternal stature was particularly strongly associated with stunting (Kim et al., 2017).

Maternal BMI has also been identified as a significant predictor of stunting. Children of underweight mothers had substantially higher odds of stunting, highlighting the importance of maternal nutritional status in child linear growth (Subramanian et al., 2010; Porwal et al., 2021). Higher maternal education and household wealth were associated with greater reductions in stunting than either factor alone. Children

belonging to marginalized social groups continued to have higher likelihoods of stunting. Urban residence was associated with higher odds of stunting. Children from marginalised social groups and male children experienced higher odds of stunting. Girls had lower odds of stunting than boys (Rao et al., 2023). The likelihood of stunting increased with child age and higher birth order, with older and higher-order children experiencing a greater risk of stunting (Das, 2022).

Globally, the prevalence of child stunting declined from 26.4% in 2012 to 23.2% in 2024, but progress remains insufficient to meet the original target of a 40% reduction by 2025 (UNICEF, WHO, & World Bank, 2025). Recognizing the need for accelerated action, WHO Member States at the 78th World Health Assembly extended the target to 2030, emphasizing greater investment and intensified interventions to reduce childhood stunting (WHO, 2025).

In India, childhood stunting remains an important public health concern, although substantial improvements have been observed over successive rounds of the National Family Health Survey (NFHS). In Odisha, the prevalence of stunting among children under five declined from 45.0% in NFHS-3 (2005–06) to 34.1% in NFHS-4 (2015–16), 31.0% in NFHS-5 (2019–21), and further to 26.8% in NFHS-6 (2023–24). Nevertheless, more than one in four children under five in Odisha remained stunted in NFHS-6, indicating that chronic undernutrition continues to be a significant public health challenge despite considerable progress.

Against this background, the present study aims to examine the prevalence and socioeconomic and demographic correlates of childhood stunting among children under five years of age in Odisha.

Data Source and Methodology

Data Source

The study used unit-level data from the fifth round of the National Family Health Survey (NFHS-5, 2019–2021) to examine the socioeconomic and demographic correlates of stunting among children aged 0–59 months in Odisha. Data from NFHS-3, NFHS-4, NFHS-5, and NFHS-6 were used to describe the temporal trend in the prevalence of stunting. NFHS-6 was used only for reporting prevalence trends, as unit-level NFHS-6 data were not available for the present analysis. The NFHS is a nationally representative, large-scale household survey designed to provide reliable information on population, health, nutrition and related socioeconomic and demographic characteristics in India. For the present analysis, the study focuses on children aged 0–59 months in Odisha. The individual-level records were used to examine the prevalence and correlates of childhood stunting and severe stunting.

The NFHS-5 data contain information on children's anthropometric characteristics, maternal and household characteristics, socioeconomic conditions, demographic characteristics, and access to and exposure to selected health and information-related services. The analysis was restricted to eligible children for whom the required information on height-for-age and relevant explanatory variables was available.

Outcome Variables

The study examines childhood stunting and severe stunting as the primary outcome variables. Stunting was assessed using the height-for-age (HAZ) indicator, based on the WHO Child Growth Standards. Children with a height-for-age Z-score below −2 standard deviations (SD) from the WHO reference population were classified as stunted, while those with a height-for-age Z-score below −3 SD were classified as severely stunted.

For the regression analysis, both outcomes were converted into binary variables:

- Stunting: 1 = stunted, 0 = not stunted
- Severe stunting: 1 = severely stunted, 0 = not severely stunted

Explanatory Variables

The analysis considered a range of socioeconomic, demographic, maternal and household characteristics. The socioeconomic variables included social group/caste, religion, maternal education, household wealth index, place of residence, media exposure and women's work status. Demographic and child-related characteristics included child's sex, age in months and birth order. Maternal nutritional status was represented by maternal body mass index (BMI). A regional variable was also included to capture geographical differences within Odisha.

Categorical explanatory variables were appropriately recoded into meaningful groups, with one category designated as the reference category for regression analysis. The household wealth index was categorized into five groups ranging from poorest to richest, while maternal education was classified as no education, primary, secondary and higher education.

Statistical Analysis

Statistical techniques, including bivariate and multivariable analyses, were employed for the study. Bivariate analysis was undertaken to examine the unadjusted relationship between the outcome variables and individual explanatory variables. This provided an initial assessment of differences in the prevalence of stunting and severe stunting across socioeconomic and demographic groups.

Third, multivariable binary logistic regression analysis was performed separately for stunting and severe stunting to identify factors independently associated with the two outcomes after controlling for the influence of other covariates. Since both dependent variables were dichotomous, binary logistic regression was considered appropriate. The results are presented as odds ratios (ORs) with 95% confidence intervals (CIs) and corresponding p-values.

An odds ratio greater than one indicates higher odds of the outcome compared with the reference category, whereas an odds ratio less than one indicates lower odds. Statistical significance was assessed at the 5% level ($p<0.05$).

The general form of the logistic regression model can be expressed as:

$$\log\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k$$

where Prepresents the probability of a child being stunted (or severely stunted), $\beta_0$is the intercept, and $X_1, \ldots, X_k$represent the selected socioeconomic, demographic, maternal and household characteristics.

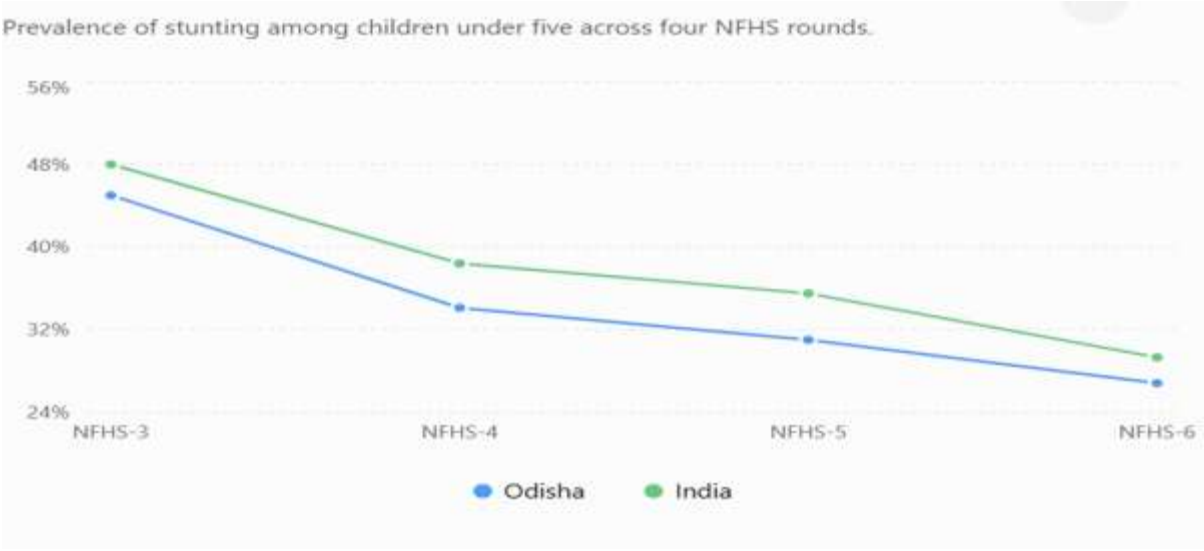
Results

Prevalence of child stunting in Odisha

The prevalence of childhood stunting in Odisha declined progressively across successive rounds of the National Family Health Survey. The prevalence decreased from 45.0% in NFHS-3 (2005–06) to 34.1% in NFHS-4 (2015–16), representing a reduction of 10.9 percentage points. It further declined to 31.0% in NFHS-5 (2019–21) and 26.8% in NFHS-6 (2023–24). Overall, the prevalence of stunting declined by 18.2 percentage points, from 45.0% in NFHS-3 to 26.8% in NFHS-6, corresponding to a 40.4% relative

reduction. The largest decline was observed between NFHS-3 and NFHS-4 (10.9 percentage points), while the decline was relatively smaller between NFHS-4 and NFHS-5 (3.1 percentage points). A further reduction of 4.2 percentage points was observed between NFHS-5 and NFHS-6. Odisha consistently recorded a lower prevalence than the national average.

Figure 1: Child Stunting in Odisha and India



Stunting Prevalence by background Characteristics

Table 1 shows substantial variation in the prevalence of stunting and severe stunting among children in Odisha across socioeconomic, demographic, maternal and geographic characteristics. Overall, 30.96% of children were stunted, while 11.40% were severely stunted.

Stunting prevalence was considerably higher among ST children (42.06%) than among SC (35.19%) and OBC/Other children (22.42%). A similar pattern was observed for severe stunting, which was highest among ST children (17.04%). By religion, the prevalence of stunting was highest among children belonging to the Christian and Other groups (39.71%), followed by Hindus (30.82%), whereas Muslim children had the lowest prevalence (17.50%). Severe stunting showed a comparable pattern, ranging from 5.53% among Muslim children to 16.88% among Christian and Other children.

Children residing in rural areas had a higher prevalence of both stunting (31.97%) and severe stunting (11.68%) than their urban counterparts (24.83% and 9.72%, respectively). A pronounced inverse gradient was observed with maternal education. Stunting declined progressively from 47.88% among children whose mothers had no formal education to 14.50% among those whose mothers had higher education. Similarly, severe stunting declined from 18.72% to 5.20%. A substantial difference was also observed according to media exposure, with stunting being much higher among children with no media exposure (42.84%) than among those with any media exposure (27.26%); severe stunting showed a similar difference (17.57% vs. 9.48%).

Household economic status demonstrated one of the strongest gradients in nutritional outcomes. Stunting decreased consistently from 43.20% among children in the poorest households to 11.10% among those in the richest households. Severe stunting declined from 17.35% to 3.96% across the same wealth categories. Maternal employment showed a relatively modest difference, with stunting prevalence of 33.79% among children of working women compared with 30.90% among children of non-working women.

The prevalence of stunting also varied by age, increasing from 23.54% among children below six months to 35.94% among those aged 12–35 months, before declining to 29.79% among children aged 36–59 months. Severe stunting was similarly highest among children aged 12–35 months (13.93%). A marked gradient was observed by birth order, with stunting increasing from 26.58% among first-order children to 57.34% among children of sixth or higher birth order. Severe stunting followed the same pattern, increasing from 10.01% to 24.11%.

Maternal nutritional status was also associated with substantial differences in child nutritional outcomes. Stunting prevalence was higher among children of underweight mothers (40.56%) than among those of mothers with normal BMI (32.02%), while it was lowest among children of overweight mothers (17.81%). Severe stunting showed a similar pattern. Geographical variation was also evident, with stunting prevalence being highest in the Southern region (35.75%) and Northern region (34.85%), compared with 22.19% in the Coastal region. Severe stunting was likewise higher in the Northern and Southern regions than in the Coastal region.

Overall, the findings indicate that child undernutrition in Odisha is disproportionately concentrated among socially and economically disadvantaged groups. The particularly large differences by maternal education, household wealth, social group, birth order and maternal BMI suggest the importance of addressing both socioeconomic disadvantage and intergenerational determinants of child nutrition. Nevertheless, these findings represent unadjusted prevalence differences; therefore, the independent contribution of these characteristics should be assessed through multivariable analysis.

Table 1. Prevalence of Stunting and Severe Stunting among Children by Selected Background Characteristics, Odisha, NFHS-5

Background Characteristics	Stunting	Severe Stunting
Social Group		
SC	35.19	12.19
ST	42.06	17.04
OBC/Others	22.42	7.70
Religion		
Hindu	30.82	11.26
Muslim	17.5	5.53
Christian & Others	39.71	16.88
Place of Residence		
Urban	24.83	9.72
Rural	31.97	11.68
Mother's Education		
No education	47.88	18.72
primary	35.64	14.38
secondary	26.34	9.04
higher	14.5	5.20
Exposure to Media		
No Exposure	42.84	17.57
Any Exposure	27.26	9.48

Work Status of Women		
Not Working	30.90	11.36
Working	33.79	13.17

Wealth Index		
poorest	43.2	17.35
poorer	31.76	11.23
middle	22.02	6.90
richer	17.41	4.89
richest	11.1	3.96
Sex		
Male	30.10	11.97
Female	31.92	10.78
Age in Months		
< 6 months	23.54	12.86
6-11 months	23.38	12.37
12-35 months	35.94	13.93
36-59 months	29.79	8.37
Birth Order		
1st order	26.58	10.01
2nd-3rd order	32.58	11.51
4th-5th order	42.68	17.61
6 or more	57.34	24.11
Mother's BMI		
Normal BMI 18.5-24.9	32.02	12.20
Underweight BMI<18.5	40.56	14.91
Overweight >=25	17.81	5.47
Region		
Northern	34.85	12.97
Southern	35.75	12.83
Coastal	22.19	8.97
Total	30.96	11.40

Results from Binary Logistic Regression

Table 2 presents the results of multivariable binary logistic regression examining factors associated with stunting and severe stunting among children in Odisha. After adjustment for other covariates, household wealth, maternal education, child age, birth order, maternal BMI, place of residence, social group, sex, and region showed statistically significant associations with either stunting or severe stunting.

For stunting, children from the OBC/Other social groups had lower odds than SC children (AOR=0.79; 95% CI: 0.69–0.90). Rural residence was associated with lower odds of stunting (AOR=0.78; 95% CI: 0.64–0.94). A clear inverse gradient was observed with maternal education, with lower odds among children of mothers with primary (AOR=0.84; 95% CI: 0.71–0.99), secondary (AOR=0.76; 95% CI: 0.66–

0.89), and higher education (AOR=0.62; 95% CI: 0.46–0.83). Household wealth showed the strongest gradient, with the odds of stunting declining from the poorer (AOR=0.77; 95% CI: 0.67–0.87) to the richest households (AOR=0.34; 95% CI: 0.24–0.49). Children aged 12–35 months (AOR=1.95; 95% CI: 1.62–2.34) and 36–59 months (AOR=1.50; 95% CI: 1.24–1.81) had higher odds of stunting than those below six months. Children of sixth or higher birth order had higher odds of stunting (AOR=1.87; 95% CI: 1.26–2.77). Maternal underweight was associated with higher odds of stunting (AOR=1.19; 95% CI: 1.06–1.34), whereas maternal overweight was associated with lower odds (AOR=0.70; 95% CI: 0.60–0.82). Children in the Coastal region had lower odds of stunting than those in the Northern region (AOR=0.67; 95% CI: 0.57–0.78).

For severe stunting, significant associations were observed for rural residence (AOR=0.67; 95% CI: 0.51–0.88), secondary maternal education (AOR=0.76; 95% CI: 0.62–0.94), higher maternal education (AOR=0.59; 95% CI: 0.37–0.94), household wealth, female sex (AOR=0.82; 95% CI: 0.71–0.94), maternal overweight (AOR=0.67; 95% CI: 0.52–0.86), and age 36–59 months (AOR=0.64; 95% CI: 0.50–0.81). The wealth gradient was particularly pronounced, with the odds of severe stunting decreasing progressively across wealth categories, reaching AOR=0.37 (95% CI: 0.21–0.64) among children from the richest households.

Overall, household wealth and maternal education were the most consistent correlates of both stunting and severe stunting, while child age, high birth order and maternal BMI were important correlates of stunting.

Table 2. Multivariable Binary Logistic Regression Analysis of Factors Associated with Stunting and Severe Stunting among Children Aged 0–59 Months in Odisha, NFHS-5

Background Characteristics	Stunting			Severe Stunting		
	Odds Ratio	CI(95%)		Odds Ratio	CI(95%)	
Social Group						
SC(Ref)						
ST	0.91	0.79	1.05	1.17	0.96	1.42
OBC/Others	0.79***	0.69	0.90	0.90	0.73	1.10
Religion						
Hindu (Ref)						
Muslim	0.62	0.31	1.26	0.95	0.37	2.43
Christian & Others	0.89	0.72	1.11	0.91	0.68	1.22
Place of Residence						
Urban (Ref)						
Rural	0.78***	0.64	0.94	0.67***	0.51	0.88
Mother's Education						
No education (Ref)						
primary	0.84**	0.71	0.99	1.03	0.83	1.27
secondary	0.76***	0.66	0.89	0.76	0.62	0.94
higher	0.62***	0.46	0.83	0.59**	0.37	0.94
Exposure to Media						
No Exposure (Ref)						

Any Exposure	0.94	0.83	1.07	0.90	0.76	1.07
Work Status of Women						
Not Working (Ref)						
Working	1.01	0.74	1.36	1.04	0.69	1.57
Wealth Index						
poorest (Ref)						
poorer	0.77***	0.67	0.87	0.79**	0.66	0.95
middle	0.60***	0.51	0.72	0.52***	0.40	0.67
richer	0.49***	0.39	0.61	0.41***	0.28	0.58
richest	0.34***	0.24	0.49	0.37***	0.21	0.64
Sex						
Male (Ref)						
Female	1.01	0.91	1.11	0.82***	0.71	0.94
Age in Months						
< 6 months (Ref)						
6-11 months	1.05	0.82	1.34	0.92	0.67	1.25
12-35 months	1.95***	1.62	2.34	1.07	0.85	1.35
36-59 months	1.50***	1.24	1.81	0.64***	0.50	0.81
Birth Order						
1st order (Ref)						
2nd-3rd order	1.11*	0.99	1.23	0.99	0.84	1.15
4th-5th order	1.09	0.89	1.33	1.12	0.86	1.46
6 or more	1.87***	1.26	2.77	1.52*	0.97	2.39
Mother's BMI						
Normal BMI 18.5-24.9(Ref)						
Underweight BMI<18.5	1.19***	1.06	1.34	1.01	0.86	1.18
Overweight >=25	0.70***	0.60	0.82	0.67***	0.52	0.86
Region						
Northern(Ref)						
Southern	1.11	0.98	1.25	0.99	0.83	1.18
Coastal	0.67***	0.57	0.78	0.87	0.72	1.06

Discussion

This study identified household wealth, maternal education, child age, birth order and maternal BMI as the major socioeconomic, demographic and maternal correlates of childhood stunting in Odisha. The findings broadly support previous evidence from India while also highlighting some context-specific patterns.

A strong wealth gradient was observed, with the odds of stunting progressively declining across increasing wealth categories. Children from the richest households had 66% lower odds of stunting than those from the poorest households. This finding is consistent with previous studies identifying household wealth as one of the strongest correlates of child stunting in India (Fenske et al., 2013; Corsi et al., 2016; Prasad et

al., 2021). Evidence from EAG states has similarly shown that household wealth contributes substantially to socioeconomic inequalities in stunting (Kumar et al., 2021).

Maternal education showed a clear protective gradient. Children of mothers with higher education had 38% lower odds of stunting than those whose mothers had no education. This is consistent with earlier evidence demonstrating the importance of maternal education for child linear growth (Fenske et al., 2013; Corsi et al., 2016; Prasad et al., 2021). The association may reflect better health knowledge, childcare practices and utilisation of health and nutrition services.

Child age and birth order were also important. Children aged 12–35 months had nearly twice the odds of stunting, while those aged 36–59 months had 50% higher odds than children below six months. This pattern is consistent with evidence showing increasing vulnerability to stunting with age (Das, 2022). Children of sixth or higher birth order had 87% higher odds of stunting than firstborn children, supporting previous evidence linking higher birth order with increased nutritional disadvantage (Prasad et al., 2021; Das, 2022). The relationship may partly reflect competition for maternal care and household resources and short birth intervals.

Maternal BMI was significantly associated with stunting. Children of underweight mothers had 19% higher odds, whereas children of overweight mothers had 30% lower odds of stunting compared with those of mothers with normal BMI. These findings are consistent with evidence demonstrating the intergenerational association between maternal nutritional status and child growth (Subramanian et al., 2010; Porwal et al., 2021).

The associations with social group, religion, media exposure and maternal employment were comparatively weak after adjustment. Although ST children had a higher prevalence of stunting descriptively, ST status was not independently associated with stunting after adjustment. Similarly, media exposure and maternal employment showed no significant independent association. In contrast, rural residence was associated with lower adjusted odds of stunting in the present study, consistent with findings from some previous studies (Rao et al., 2023). Although this association has not been consistently observed across India and differs from studies reporting greater nutritional disadvantage among children in rural areas (Prasad et al., 2021). This may reflect the specific socioeconomic and demographic context of Odisha.

Overall, the findings indicate that socioeconomic conditions, particularly household wealth and maternal education, remain central to inequalities in childhood stunting in Odisha, alongside child age, birth order and maternal nutritional status. Given the cross-sectional design, these findings should be interpreted as associations rather than causal effects.

Conclusion

Childhood stunting in Odisha has declined substantially over successive NFHS rounds; however, it remains an important public health concern, with more than one-quarter of children under five still affected in NFHS-6. The present study highlights household wealth and maternal education as the strongest socioeconomic correlates of stunting, with higher child age, higher birth order and maternal underweight also associated with increased odds of stunting. The findings underscore the need for continued efforts to address socioeconomic inequalities, improve maternal nutrition and education, and strengthen nutrition interventions during the early years of life. Targeted approaches focusing on economically disadvantaged households and vulnerable maternal and child groups may be important for further reducing the burden of stunting in Odisha.

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