Anthropometric Failure among Children Aged 6-23 Months in India: A Study on Gender Differentials and Dietary Diversity across Geographical Regions

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Introduction:

Child Undernutrition is a serious public health concern in developing countries of the world. However, even though sex and gender differentials in other public health aspects are widely studied, they have not been explored much with regard to nutrition (Thurstans et al., 2020). In developing countries like India, girls are widely perceived to be in a disadvantageous position due to the persistence of adverse gender norms. However, the evidences on gender differentials in undernutrition are mixed in nature.

India has a high burden of child undernutrition, with 32.1% of children under five years of age being underweight, 35.5% stunted, and 19.3% wasted, which demands extensive and in-depth research (IIPS & ICF, 2021). Moreover, India has a huge population spread across several geographical regions each having their own socio-cultural characteristics. Indian society is still largely characterised by the presence of adverse gender norms, son preference, and gender-based discrimination. Coupled with that, widespread poverty and illiteracy hinder families from providing their children with proper diets. Interestingly, traditional cultural preferences often place higher value on male children, but a paradox in their nutritional outcomes has been observed in the literature.

The aim of this study is to assess gender-wise differential in anthropometric status of young children aged 6-23 months across geographical regions of India and examine the determinants of anthropometric failure among them.

Data and Methods:

Data Source - The present study is based on secondary data from the 'Kids Recode' of National Family Health Survey (NFHS-5) dataset, which was conducted from 2019-21. The effective sample size was 57519 children aged 6 to 23 months.

Outcome Variable - The outcome variable for this study is 'anthropometric failure' based on the *Composite Index of Anthropometric Failure* (CIAF) for children under five years of age. The CIAF provides the overall burden of undernutrition as a single measure.

Explanatory Variables – The main explanatory variable for this study is sex/gender of the child (used interchangeably) categorised as 'male' and 'female'. The two other important explanatory variables are – dietary diversity and region, indicating feeding/dietary practices and region-specific cultural contexts, respectively. Dietary diversity was computed as a categorical variable – zero, low, and high based on information of food groups consumed in the last 24 hours. Other maternal, child, and household characteristics like age, education, wealth, religion, place of residence, etc. were controlled.

Statistical Analysis – The study used bivariate analyses and multivariable logistic regressions. All the analyses were performed in Stata 16 software.

Results:

The study finds the prevalence of 'any type of anthropometric failure' to be higher among male children (52.0%) than female children (47.0%) in the age group 6-23 months. In all the geographical regions of India, the prevalence of any type of anthropometric failure is higher among males than females. The regions with the highest gender gap in prevalence of anthropometric failure are the Northern (6.98%) and Central (6.53%) regions. The least gender gap in anthropometric failure is observed in the Eastern Region. States like West Bengal, Andhra Pradesh, Uttarakhand, and New Delhi have the least male-female gap in child undernutrition, whereas Chandigarh, Kerala, Goa, Punjab, Jharkhand, Madhya Pradesh etc, have more than 5% gap in CIAF prevalence. Similarly, the mean dietary diversity score also varied across regions, with West, Central, and North India being the least diverse and East being the most diverse with the highest score.

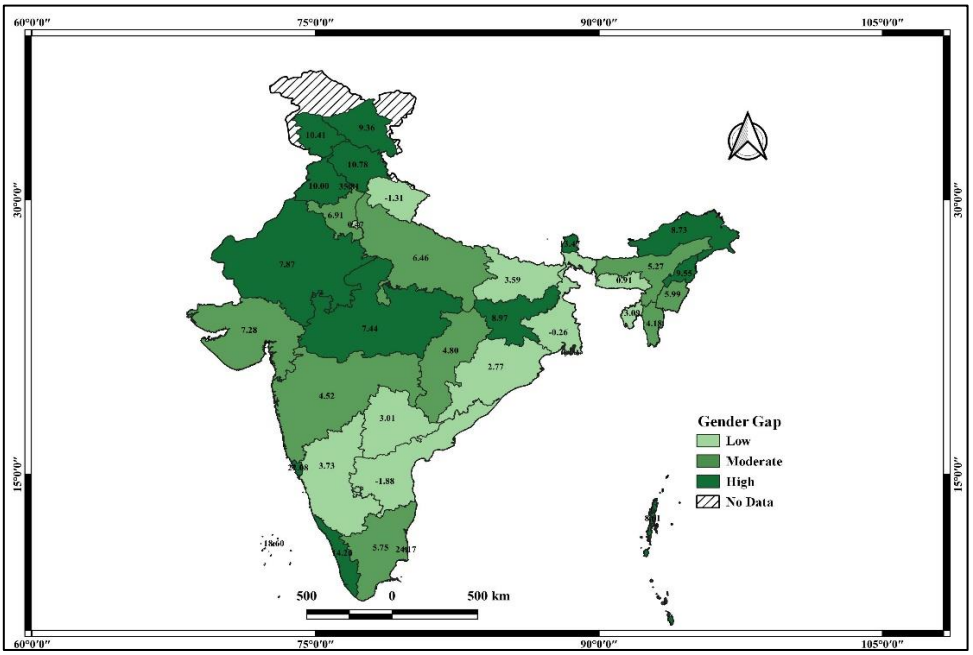

Figure 1 Gender gap has been calculated from NFHS data by taking the difference between the prevalence of anthropometric failure in male and female children aged 6-23 months.

The multivariable logistic regression shows that even after controlling several child, maternal, and household characteristics, gender remains a significant predictor of anthropometric failure among children aged 6-23 months. A female child aged 6-23 months is at lesser risk of having any type of anthropometric failure compared to her male counterpart [AOR:0.76, p-value <0.001, CI: 0.74,0.79]. Another significant predictor is dietary diversity, compared to children having a zero dietary diversity score, others have a significantly lesser likelihood of experiencing any type of anthropometric failure.

Other significant predictors of anthropometric failure are – child characteristics like age, birth order, birth weight, and birth size. Children in relatively higher age group, higher birth order, and those who had low birth weight and smaller birth size are less likely to experience anthropometric failure. Maternal characteristics like mother's age, education, BMI are also significantly associated with child's anthropometric status. Children of younger mothers, those whose mothers are less educated and are underweight, are at greater likelihood of having any

type of anthropometric failure. Other than that, factors like religion, caste and place of residence too are significantly associated with anthropometric failure (Table 1).

Discussion:

The findings of this study reveal a significant gender differential in anthropometric failure among children aged 6-23 months in India, with male children exhibiting a higher prevalence of undernutrition compared to their female counterparts. This trend is consistent across various geographical regions, suggesting that the higher burden of anthropometric failure among males is a pervasive issue rather than a localized anomaly. Our results align with existing literature that indicates a paradoxical trend where male children, despite being culturally preferred, are not necessarily shielded from nutritional deficiencies (Thurstans et al., 2020; Haq et al., 2021). This could be attributed to several factors, including the allocation of resources, feeding, and dietary practices (Sewenet et al., 2022). Traditional cultural preferences often place higher value on male children, but this can paradoxically lead to neglect of their nutritional needs. Studies argue that male children are breastfed for prolonged duration and are not always provided with age-appropriate solid food (Rajan & Morgan, 2018).

Furthermore, dietary diversity emerged as a crucial determinant of anthropometric failure, with lower dietary diversity strongly associated with a higher likelihood of undernutrition. This underscores the importance of a varied diet in mitigating the risk of anthropometric failure, which has been corroborated by previous research demonstrating that diversified diets improve child health outcomes by providing essential nutrients necessary for growth (Perkins et al., 2018; Xu et al., 2023). Regional disparities in dietary diversity, with Eastern India exhibiting higher scores compared to other regions, highlight the need for region-specific nutritional interventions and policies that address local dietary practices and the availability of diverse food sources. Overall, these findings emphasize the need for targeted strategies that address both gender and dietary diversity to combat child undernutrition effectively.

Appendix-

Table 1: Adjusted odds ratio of anthropometric failure among children aged 6-23 months by background characteristics

Background Characteristics	Odds Ratio	[95% CI]	
		Lower Limit	Upper Limit
Child Sex/Gender			
Male®			
Female	0.76***	0.74	0.79
Dietary Diversity Score			
Zero®			
Low (Less than 4)	0.90***	0.86	0.94
High (4 or more)	0.92**	0.87	0.97
Child Age			
Up to 12 months®			
13-23 months	1.43***	1.38	1.49
Birth Order			
1-2®			
3-4	1.12***	1.07	1.18
5 or more	1.29***	1.14	1.46
Birth Weight			

≤2500gms®			
>2500gms	0.67***	0.64	0.70
Size of child			
Very large®			
Larger than average	0.91*	0.83	0.99
Average	1.03	0.96	1.10
Smaller than average	1.14**	1.04	1.25
Very small	1.39***	1.21	1.60
Mothers' age group			
Less than 20®			
20-29	1.02	0.93	1.12
30-39	1.01	0.91	1.11
40-49	0.76*	0.60	0.94
Mothers' education			
Not educated®			
Primary	0.93*	0.86	1.00
Secondary	0.85***	0.80	0.89
Higher	0.72***	0.67	0.77
Mothers' BMI			
Underweight®			
Normal	0.79***	0.75	0.83
Overweight/Obese	0.49***	0.46	0.52
Wealth Quintile			
Poorest®			
Poorer	0.83***	0.78	0.87
Middle	0.70***	0.66	0.74
Richer	0.62***	0.58	0.66
Richest	0.50***	0.46	0.54
Religion			
Hindu®			
Muslim	1.21***	1.14	1.28
Christian	0.91*	0.83	0.99
Others	0.84***	0.76	0.92
Social Group			
SC®			
ST	1.00	0.94	1.07
Others	0.89***	0.85	0.93
Residence			
Urban®			
Rural	0.96	0.91	1.01
Region			
North®			
Central	1.15***	1.09	1.22
East	1.32***	1.24	1.40
North-east	1.07	0.99	1.16
West	1.73***	1.61	1.86
South	1.36***	1.27	1.45
$p < 0.001$*** $p < 0.01$** $p < 0.05$*			

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