

Assessment of Nutrition Status of Mid Day Meal Beneficiaries and Pattern of its Utilization in Three Districts of Bihar: A State in Eastern India

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Abstract

Background: The Mid-Day Meal Program plays a pivotal role in enhancing the nutritional status and educational outcomes of primary school children in India. This study investigates the program's impact on the nutritional well-being of children across three districts in Bihar.

Methods: A community-based cross-sectional study was conducted, involving 1,070 primary school children from Saran, Muzaffarpur, and Patna districts. The assessment of nutritional status was based on indicators such as BMI for age, weight for height, and weight for age. Data related to children's participation in the Mid-Day Meal Program was collected through relevant questionnaire and analysed using descriptive statistics.

Results: Patna has the highest percentage of children receiving mid-day meal (89.86%) with lowest prevalence of wasting and severe wasting. The prevalence of stunting or wasting were more common in children aged greater than 10 years. The analysis revealed substantial challenges in nutritional status, with a high prevalence of stunting, underweight, and wasting among primary school children in the surveyed districts. In contrast, promising trends were observed in terms of menu changes and vegetable inclusion within the Mid-Day Meal Program.

Conclusion: The study highlights the pressing need for targeted interventions to address prevalent nutritional issues and improve the program's impact. These findings provide valuable insights for policymakers and stakeholders to enhance the well-being of primary school children in the region through the Mid-Day Meal Program.

Keywords: Mid-Day Meal Program (MDM), Nutritional Status, Undernutrition, Stunting, Weight for Height, BMI for Age, Wasting, Malnutrition

Introduction

More than fifty percent of the 149 million children who are underweight as per their age group live in

Asia. ¹ In the period between 2015 and 2016, 38% of children in India were malnourished.² The term "stunting syndrome" refers to a group of pathological abnormalities and chronic undernutrition that are

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linked to linear growth failure.³ Because stunted children are less likely to realize their full potential as adults, stunting has a significant impact on human resources and the overall economic output of civilizations.⁴⁻⁶ The World Health Assembly set an ambitious goal that is unlikely to be accomplished: a 40% reduction in childhood stunting between 2010 and 2025.^{4,7} Therefore, it is crucial to comprehend how nations might quicken their success in reducing stunting.

The provision of school meals is a well-established intervention aimed at improving the health and nutritional status of school-going children, particularly in developing countries. In India, the Mid-Day Meal Program (MDM) has been a flagship initiative that seeks to address the dual challenge of childhood malnutrition and educational access.⁸ This program, serving hot, cooked meals to millions of primary school children, plays a pivotal role in bridging nutritional gaps and enhancing enrolment and attendance in schools.⁹

The MDM program has been extolled for its potential to not only alleviate hunger but also to contribute to improved cognitive development, educational outcomes, and overall health of children.^{10, 11} Its impact on nutritional status, however, remains a topic of significant interest and research. This study aims to assess the influence of the Mid-Day Meal Program on the nutritional status of primary school-going children in three districts of Bihar, India, a region marked by its unique socio-economic and cultural attributes.

As the scope of the MDM program extends far beyond providing nourishment, this research also delves into the satisfaction of school children with meal quality and the program's nutritional content. Specifically, the study explores menu changes and the inclusion of vegetables in school meals, as these factors not only have implications for health but also influence children's preferences, dietary habits, and future food choices.

The importance of this research is underscored by the global commitment to sustainable development goals, particularly Goal 2, which seeks to end hunger, achieve food security, and improve nutrition.¹² Investigating the effectiveness of school meal

programs, like the MDM, in enhancing children's nutritional status is critical for shaping evidence-based policies and strategies that can have a lasting impact on the health and well-being of the youngest members of community.

In this pursuit, this study adopts a community-based, cross-sectional approach, collecting data from three districts in Bihar, India. The findings of this research are expected to provide insights into the nutritional dynamics of primary school children in the context of the Mid-Day Meal Program. These insights, in turn, can inform policy recommendations and practices that foster the nutritional well-being of children and promote their holistic development.

Materials and Methods

Study Design: This research employs a community-based, cross-sectional study design to assess the impact of the Mid-Day Meal Program (MDM) on the nutritional status of primary school-going children in three districts of Bihar, a state in eastern India.

Study Area: The study was conducted in three districts of Bihar, namely Saran, Muzaffarpur, and Patna.

Study Period: Data collection occurred between July 2022 and June 2023 to ensure the inclusion of seasonal variations.

Study Population: The primary study population consisted of children attending government primary schools in the selected districts. This included both boys and girls in the age group of 5 to 15 years.

Ethics: The study was started after taking approval from institutional ethics committee. Written informed consent was taken from parent/legal representative of the children after taking written permission from principal/legal authorities of consent. Verbal consent was also taken from children before the process of data collection.

Data Collection:

1. Anthropometric Measurements:

- **Weight Measurement:** Weight measurements were collected using

calibrated mechanical bathroom scales. Children were instructed to stand still on the scales with a straight gaze.

- **Height Measurement:** Heights were measured using a wall-mounted “drop-down” tape measure. Children were requested to remove their shoes, stand with their backs against the wall, and look directly forward.
- **Body Mass Index (BMI):** BMI was calculated as the weight in kilograms divided by the square of the height in meters.

2. Questionnaires:

- **Dietary Pattern Questionnaire:** A structured dietary pattern questionnaire was administered to the children to collect data on their food consumption habits, including meal frequency, types of food consumed, and sources of food.¹³
- **MDM Program Evaluation Questionnaire:** A separate questionnaire assessed children’s satisfaction with the MDM program, including perceptions of meal quality, preferences, and the inclusion of vegetables.¹⁴

Statistical Analysis:

Data collected from all the districts were presented in tabular form using Microsoft Excel 365. Descriptive analysis was used to calculate percentage of study parameters and to estimate association between variables.

Results

The analysis of nutritional status among 865 primary school-going children in Saran, Muzaffarpur, and Patna districts of rural Bihar offers significant insights into the well-being of these young individuals. When examining the data by district, distinct patterns emerge. In Saran, 20.74% of children were categorized as “Stunted,” signifying issues related to linear growth, while 44.15% were classified as “Underweight,” indicating concerns about overall weight. Surprisingly, only a small percentage falls under the categories of “Overweight” (1.67%) and “Obesity” (0.67%), suggesting that excessive weight is not a widespread concern in this district.

Nevertheless, there is a notable presence of “Wasting” (21.40%) and “Severe Wasting” (11.37%), highlighting the prevalence of acute undernutrition. [Table 1]

Similarly, in Muzaffarpur, there is a shared concern regarding stunting (18.62%) and underweight (53.79%). However, the low percentages of children classified as “Overweight” (1.03%) or “Obese” (0%) indicate that these districts are not grappling with the challenges of excessive weight. Additionally, “Wasting” (16.55%) and “Severe Wasting” (10%) continue to be noteworthy nutritional concerns in this district.[Table 1]

Patna, the third district under consideration, exhibits a higher prevalence of stunting (23.24%), suggesting issues with linear growth. The percentage of children classified as “Underweight” (50.72%) is consistent with the previous districts. Notably, there are some cases of “Overweight” (2.17%) and “Obesity” (0.36%) among children in Patna, although these percentages remain low. “Wasting” (11.23%) and “Severe Wasting” (4.71%) persist as concerns in this district as well. [Table 1]

When analysing the data by age range, it becomes evident that nutritional challenges vary across the developmental stages of these children. In the 5-6 years age group, a substantial proportion of children face stunting (17.07%), underweight (42.93%), and wasting (25.37%). Additionally, 11.71% of children are severely wasted in this age range. The older age groups, particularly the 10-12 years category, exhibit higher percentages of stunting (28.01%), underweight (54.79%), and wasting (10.07%), emphasizing the need for early intervention to address these nutritional concerns. It’s noteworthy that the 13-15 years age group shows a relatively healthier nutritional status, with significantly lower instances of stunting, or wasting. [Table 2]

In terms of the Mid-Day Meal Program, Muzaffarpur had the highest percentage of children consuming the meals (87.93%), followed closely by Saran (84.95%) and Patna (89.86%). Children in Patna reported the highest agreement (76.09%) regarding menu changes. Additionally, Patna showed the highest percentage of children receiving green vegetables in their meals (82.97%). Overall, most students across districts consumed the mid-day meals six days a week, with some variations in frequency.[Table 4]

Table 1: Assessment of nutritional status of children (n=865)

District		Stunted	Under-weight	Over-weight	Obesity	Wasting	Severe wasting	Total
Saran	n	62	132	5	2	64	34	299
	%	20.74	44.15	1.67	0.67	21.40	11.37	100.00
Muzaffar-pur	n	54	156	3	0	48	29	290
	%	18.62	53.79	1.03	0.00	16.55	10.00	100.00
Patna	n	85	140	6	1	31	13	276
	%	30.80	50.72	2.17	0.36	11.23	4.71	100.00
Total	n	201	428	14	3	143	76	865
	%	23.24	49.48	1.62	0.35	16.53	8.79	100.00

n: Number of children; %: Percentage of Children

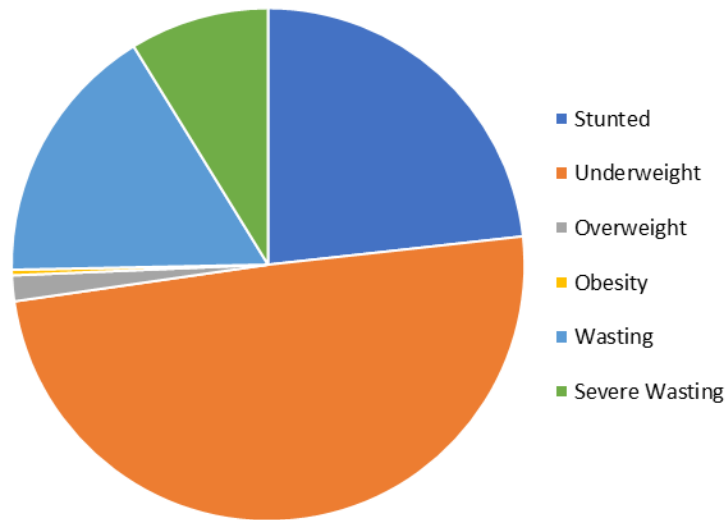


Figure 1: Distribution of Children with respect to Body Mass Index

Table 2: Age distribution of children with different nutritional status

Age Range		Stunted	Underweight	Overweight	Obesity	Wasting	Severe Wasting	Total
5-6 years	n	35	88	5	1	52	24	205
	%	17.07	42.93	2.44	0.49	25.37	11.71	100.00
7-9 years	n	38	86	3	2	50	27	206
	%	18.45	41.75	1.46	0.97	24.27	13.11	100.00
10-12 years	n	114	223	4	0	41	25	407
	%	28.01	54.79	0.98	0.00	10.07	6.14	100.00
13-15 years	n	14	31	2	0	0	0	47
	%	29.79	65.96	4.26	0.00	0.00	0.00	100.00
Total	n	201	428	14	3	143	76	865
	%	23.24	49.48	1.62	0.35	16.53	8.79	100.00

n: Number of children; %: Percentage of Children

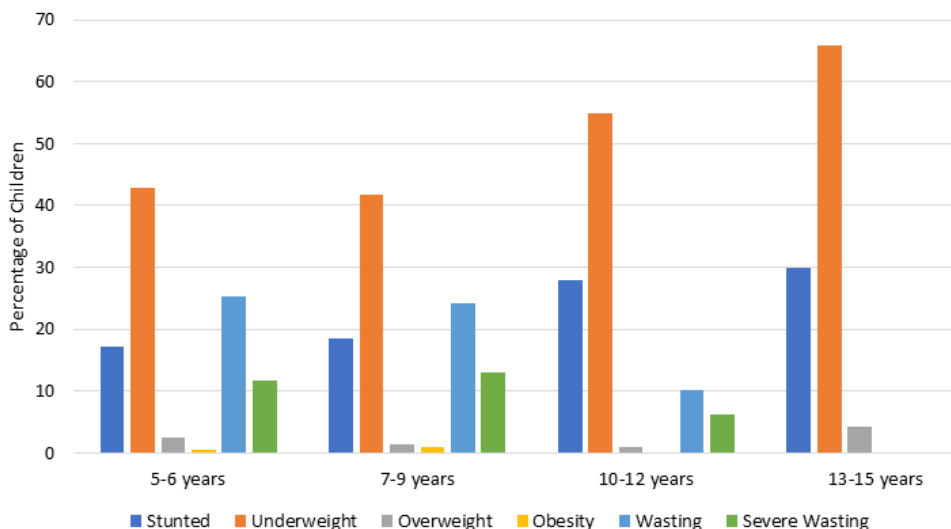


Figure 2: Assessment of Nutritional Status in Various Age Groups

Table 3: Sex distribution of children with different nutritional status

Sex		Stunted	Underweight	Overweight	Obesity	Wasting	Severe wasting	Total
Female	n	127	231	3	1	81	47	490
	%	25.92	47.14	0.61	0.20	16.53	9.59	100.00
Male	n	74	197	11	2	62	29	375
	%	19.73	52.53	2.93	0.53	16.53	7.73	100.00
Total	n	201	428	14	3	143	76	865
	%	8.55	22.77	1.27	0.23	7.17	3.35	43.35

n: Number of children; %: Percentage of Children

Table 4: Assessment of Mid-Day Meal Programme

Parameters	Saran District	Muzaffarpur District	Patna District
	n (%)	n (%)	n (%)
Children eating mid-day meal	254 (84.95)	255 (87.93)	248 (89.86)
Students who agree that the menu changes	185 (61.87)	197 (67.93)	210 (76.09)
Children report receiving green vegetables	233 (77.93)	218 (75.17)	229 (82.97)
Satisfaction with the taste and quality	206 (68.9)	212 (73.1)	210 (76.09)
Number of days meal is consumed			
6 days a week	81 (27.09)	110 (37.93)	80 (28.99)
5 days a week	75 (25.08)	64 (22.07)	72 (26.09)
4 days a week	54 (18.06)	23 (7.93)	52 (18.84)
3 days a week	27 (9.03)	32 (11.03)	8 (2.9)
2 days a week	12 (4.01)	15 (5.17)	6 (2.17)
1 day a week	6 (2.01)	12 (4.14)	8 (2.9)

n: Number of children; %: Percentage of Children

Discussion

The analysis of nutritional status among primary school-going children in the Saran, Muzaffarpur, and Patna districts of rural Bihar brings to light critical insights into the health and well-being of these young individuals. Notably, each district exhibits a common challenge of stunting and underweight, suggesting that issues related to linear growth and overall weight persist. This points to the need for comprehensive nutritional interventions to address these concerns. The relatively low percentages of children classified as "Overweight" or "Obese" in all three districts indicate that excessive weight is not a widespread problem. However, the presence of "Wasting" and "Severe Wasting" remains a noteworthy nutritional issue, underlining the prevalence of acute undernutrition in these areas. The NNMB research states that in rural parts of India, the prevalence of under-nutrition amongst children aged 5 to 9 was thirty-six percent for boys and thirty-one percent for girls, respectively. In Kerala, the prevalence of under-nutrition was 27% and 22% for male and female children respectively.¹⁵

Examining the data by age range reveals variations in nutritional challenges across different developmental stages. The 5-6 years age group, while predominantly affected by stunting, underweight, and wasting, also shows a concerning percentage of children experiencing severe wasting. This underscores the need for early and effective interventions to tackle these nutritional concerns in the younger age group. In contrast, the 13-15 years age group exhibits a relatively healthier nutritional status, with significantly lower instances of stunting, underweight, or wasting. This may suggest that nutrition-related interventions have a more pronounced impact in the later years.

Additionally, two studies from West Bengal and Uttar Pradesh, respectively, revealed that 9-year-old children had a greater prevalence of undernutrition.^{16, 17} Although the precise cause of these disparities between age groups is unknown, dietary differences and varying levels of physical activity intensity may be the culprits.^{18, 19}

Moreover, the findings regarding the Mid-Day Meal Program (MDM) in the three districts are

crucial. The MDM program is a vital initiative aimed at enhancing the nutritional status of school children. The higher percentage of children consuming these meals in Muzaffarpur, followed by Saran and Patna, reflects the program's reach. The fact that most students across districts consume the mid-day meals six days a week is an encouraging sign. The data from Patna, where children reported higher satisfaction and the inclusion of green vegetables, could serve as a model for program improvement in other districts. This suggests that enhancing the quality and variety of meals may contribute to improved child nutrition.

Conclusion

The assessment of nutritional status among primary school-going children in Saran, Muzaffarpur, and Patna districts of Bihar, India, provides vital information for public health interventions. These findings highlight the persistent concerns of stunting, underweight, wasting, and severe wasting among children, emphasizing the urgent need for focused nutritional support and intervention programs. It is clear that efforts should not only target the very young but also address nutritional challenges throughout childhood.

The Mid-Day Meal Program proves to be a valuable resource for improving child nutrition, with higher consumption rates in Muzaffarpur, Saran, and Patna. The success in Patna, with children's reported satisfaction and the inclusion of green vegetables, could serve as a model for enhancing the program in other districts. To ensure the well-being of primary school-going children, addressing nutritional concerns and optimizing the Mid-Day Meal Program are pivotal steps towards a healthier and brighter future for these young individuals.

These insights serve as a foundation for policy decisions and targeted interventions, ultimately contributing to the improved nutritional well-being of children in these districts and, potentially, as a model for other regions with similar nutritional challenges.

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