



# Magnitude and Factors Associated with Stunting and Wasting among Children aged 1 to 5 years in Rural Rajshahi: An Observational Study

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**Abstract: Background & Objective:** In rural Bangladesh, stunting and wasting in children aged one to five were a serious concern due to childhood malnutrition. The study examined the complicated variables that led to malnutrition, such as socioeconomic inequality, restricted access to healthcare, and inadequate nutrition education. The goals were to determine the determinants, evaluate the prevalence, and provide guidance for focused actions. **Methods:** Conducted in Pythia Upazila, Rajshahi, from August to October 2023, the community-based cross-sectional study focused on 510 children aged 1–5 years. Data collection involved anthropometric measurements, vaccination assessments, and a semi-structured questionnaire. Statistical analyses, employing logistic regressions and chi-square tests, were executed using SPSS and ENA for SMART software. **Results:** The study, involving 510 respondents with an average age of 35.90 months, revealed varied health indicators. Stunting prevalence was 16.1% severe, 24.7% marginal, 25.7% moderate, and 33.9% normal. Wasting prevalence showed 15.7% severe, 23.5% slight, 22.2% moderate, and 38.6% normal. Low birth weight increased the risk of stunting, while hospital delivery reduced it. Male gender raised the risk, and a 'rich-in-protein-diet' lowered it. For wasting, factors like age (24-35 months), gender, birth order (OR: 0.004), early weaning, and a 'rich-in-protein' diet (OR: 0.438) significantly impacted the results ( $p < .008$ ,  $p < .000$ ). **Conclusion:** This study provided important insights for interventions by illuminating the multifaceted causes that drove childhood malnutrition in rural Bangladesh. The intricate relationship between demographic and socioeconomic variables highlighted the necessity of focused interventions. The substantial correlations revealed, notably between stunting and gender, underlined the importance of diverse interventions to successfully combat malnutrition in this population.

**Keywords:** Child malnutrition, Stunting, wasting, Bangladesh, ENA Software.

## Original Researcher Article

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## Article at a glance:

**Study Purpose:** The study aimed to assess the prevalence and factors associated with stunting and wasting among children aged 1 to 5 years in rural Bangladesh, with a focus on exploring socioeconomic inequality, limited healthcare access, and inadequate nutrition education.

**Key findings:** The study on childhood malnutrition in rural Bangladesh, focusing on 1 to 5-year-olds, revealed significant insights. Stunting varied from severe (16.1%) to normal (33.9%), and wasting ranged from severe (15.7%) to normal (38.6%). Notable risk factors included low birth weight, male gender for stunting, and age, male gender, birth order for wasting. The findings stressed the need for targeted interventions and comprehensive healthcare strategies.

**Newer findings:** The study unveiled complex links between demographic factors and childhood malnutrition in rural Bangladesh, emphasizing significant correlations, particularly with stunting and gender. This highlighted the need for diverse interventions to address malnutrition effectively.

**Abbreviations:** ENA Software- ENA (Emergency Nutrition Assessment) software.



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## INTRODUCTION

Malnourished children may face under nutrition, over nutrition, or micronutrient

deficiencies, indicated by stunting, underweight, wasting, and under nutrition. Persistent under nutrition leads to stunting and wasting, reflecting

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their ongoing malnourished state.<sup>1</sup> Childhood under nutrition hampers growth, cognition, and raises risks of infections, mortality, and chronic illnesses into adulthood.<sup>2,3</sup> The 2023 Joint Child Malnutrition Estimates (JME) indicate insufficient progress to reach global nutrition goals by 2025.<sup>4</sup> Under nutrition harms immediate and long-term child health, affecting adult well-being, productivity, development, and susceptibility to diseases.<sup>5,6</sup> Poor nutrition heightens children's illness risk; adequate nutrition supports growth, organ function, immune strength, and cognitive development.<sup>7</sup> Inadequate antenatal care, low socioeconomic status, multiple births, poor feeding practices, insufficient nutritious food contribute to undernutrition.<sup>8,9</sup>

Diseases like HIV, malaria, and respiratory conditions worsen child malnutrition, causing over half of global deaths, especially in low- and medium-income countries.<sup>10</sup> 40% of Bangladeshi under-5 children face growth issues, over 50% of deaths linked to underweight or wasting.<sup>11</sup> Bangladesh, populous and climate-vulnerable, grapples with economic and nutrition challenges, exacerbated by the Rohingya crisis, impacting global child health severely.<sup>13</sup> According to the World Health Organization (WHO), a person is deemed to be a child if their height is fewer than two standard deviations from the median child growth norm for their age and gender.<sup>14</sup> Wasting,

linked to child deaths, declined to 6.4% (2000-2017) but exceeds the 5% WHO target.<sup>15,16</sup> The study on stunting and wasting in rural Bangladeshi children aged 1-5 uncovered a complex interplay of factors, emphasizing the need for targeted interventions, health initiatives, and maternal health awareness.

## MATERIALS AND METHODS

A three-month community-based cross-sectional study in Puthia Upazila, Bangladesh, focused on 1-5-year-old children. About 510 participants were surveyed to assess nutritional status, revealing insights into socio-demographics, health, and dietary practices. Anthropometric measurements indicated stunting and wasting, highlighting chronic and recent nutritional deficiencies. Statistical analysis identified factors linked to malnutrition, forming a basis for targeted interventions. The study highlighted the urgent call to address childhood malnutrition in rural Bangladesh, advocating evidence-based strategies. Rigorous questionnaire development, ethical engagement, and ENA for SMART software were employed.

## RESULTS

The study examined Stunting and Wasting in 1-5-year-olds in Puthia Upazila, Rajshahi, with 510 participants, revealing influencing factors in the data analysis.

**Table 1: Socio-demographic characteristics of the respondents (n=510)**

Variables	Categories	Frequency	Percentage (%)
Age ( $\bar{x} \pm SD$ )=(35.90±16.03) months	12 to 23 months	167	32.7
	24 to 35 months	55	10.8
	36 to 47 months	115	22.9
	48 to 59 months	173	33.9
Gender	Male	264	51.8
	Female	246	48.2
Religion	Muslim	429	84.1
	Hinduism	74	14.5
	Christianity	7	1.4
Education of the Head of the family	Illiterate	109	21.5
	Primary	141	27.6
	Secondary	224	43.9
	Higher secondary	32	6.3
	Graduate and above	4	0.8
Employment status of the Head of the family	Service holder	54	10.6
	Business	34	6.7
	Farmer	224	43.9

	Shop Owner	115	22.5
	Unemployed	55	10.8
	Day laborer	28	5.5
Monthly income	Less than 10,000	183	35.9
	11000 to 20,000	228	44.7
	21,000 to 30,000	72	14.1
	31,000 to 40,000	24	4.7
	41,000 and more	3	0.6
Mean monthly income ( $\bar{x} \pm SD$ )= (16,801±8226.8)			

Table 1 summarized diverse socio-demographics: average age 35.90 months, 51.8% male, 84.1% Muslim, 43.9% 'Shop Owner,' income ranging from 'Less than 10,000' to '41,000 and more'

(44.7%). This exhibited varied demographic aspects, emphasizing nuanced population characteristics.

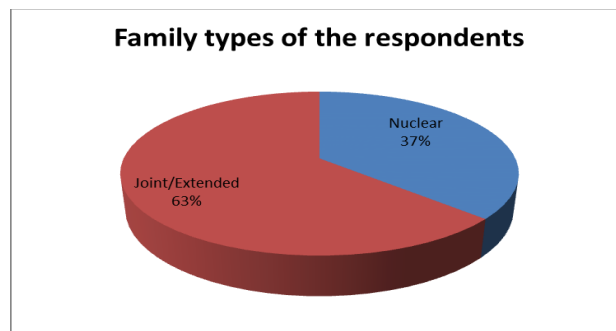


Figure 1: Family Types of the respondents (n=510)

Figure I illustrated the distribution of family types, with 63.3% in joint/extended families and 36.7% in nuclear families.

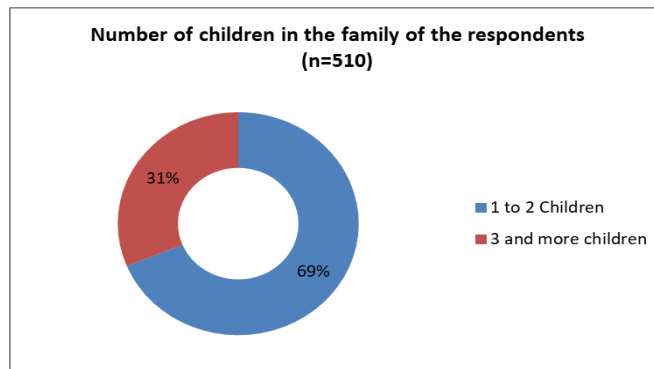


Figure 2: Respondents' family child count (n=510)

Figure 2 demonstrated that 68.8% of families had 1-2 children, impacting resource allocation and healthcare.

Table 2: Birth order distribution (n=510)

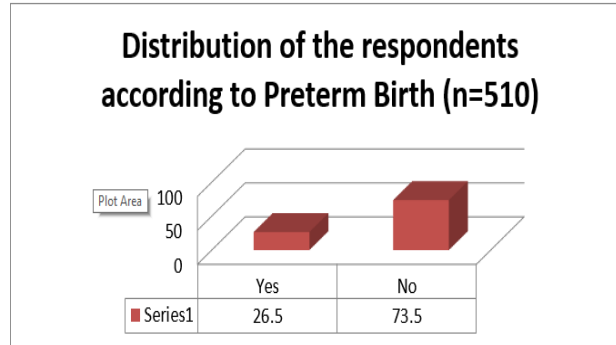
Birth order	Frequency	Percentage (%)
First	214	42.0
Second	208	40.8
Third	73	14.3
Fourth and above	15	2.9

Table 2 revealed family dynamics, with the majority (42.0%) being 'First,' followed by 40.8% as 'Second,' and 2.9% as 'Fourth and above.'

**Table 3: Birth weight distribution (n=510)**

Birth weight	Frequency	Percentage (%)
<2500 gm.	51	10.0
2500-3999 gm.	434	85.1
≥ 4000 gm.	25	4.9

Table 3 showed 10.0% low birth weight, 4.9% high birth weight, and 85.1% within 2500-3999 grams.



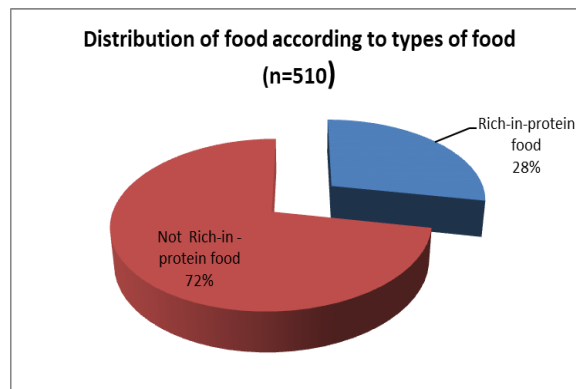
**Figure 3: Preterm birth distribution (n=510)**

Figure-3 illustrated that 26.5% acknowledged preterm births among 510 children, vital for understanding early experiences and growth implications.

**Table 4: Weaning months distribution (n=510)**

Months of weaning	Frequency	Percentage (%)
Before 6 months	67	13.1
At 6 months	240	47.1
More than 6 months or delay	203	39.8

Table 4 denoted that 47.1% followed recommended 6-month weaning, 39.8% introduced later, and 13.1% started earlier.



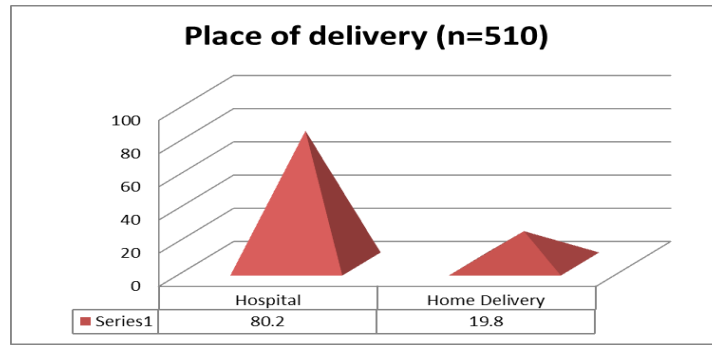
**Figure 4: Food type distribution (n=510)**

Figure 4 revealed that 28% chose high-protein foods, while 72% preferred low-protein meals.

**Table 5: Caregivers' health education: Provider guidance**

Health Education Received?	Frequency	Percentage (%)
Yes	197	38.6
No	313	61.4

Table-5 showed that 38.6% received child care health education, while 61.4% did not.



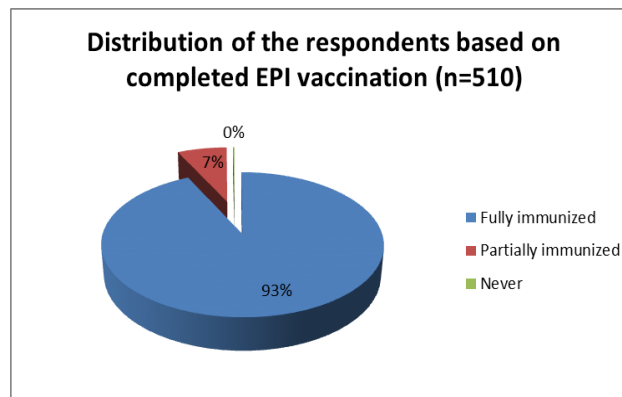
**Figure 5: Delivery place distribution (n=510)**

Figure 5 portrayed 80.2% hospital births and 19.8% home births.

**Table 6: Health problems distribution (n=510)**

Health Problems	Frequency	Percentage (%)
Had diarrhea recently	Yes 63	12.4
	No 447	87.6
Had fever in last two weeks	Yes 268	52.5
	No 242	47.5
Had cough in last two weeks	Yes 146	28.6
	No 364	71.4
Had a Worm Infestation in the Last 2 Weeks	Yes 138	27.1
	No 372	72.9
Had poor appetite	Yes 280	54.9
	No 230	45.1

This table succinctly detailed respondents' recent health issues, including diarrhea (12.4%), fever (52.5%), cough (28.6%), and worm infestation (27.1%).



**Figure 6: Respondent EPI Vaccination Distribution (n=510)**

Figure 6 revealed that 92.9% were fully immunized, 6.9% were partially immunized, and 0.2% were never inoculated.

**Table 7: Distribution of the respondents according to Stunting (n=510)**

Levels of Stunting	Frequency	Percentage (%)
Normal		
-1<HAZ<0	173	33.9
Marginally Stunted		
-2<HAZ<-1	126	24.7
Moderately Stunted		
-3<HAZ<-2	129	25.7
Severe Stunted		
HAZ>-3	82	16.1

Table 7 represented 33.9% normal, 24.7% marginally stunted, 25.7% moderately stunted, and 16.1% severely stunted.

**Table 8: Distribution of the respondents according to Wasting (n=510)**

Levels of Wasting	Frequency	Percentage (%)
Normal		
-1< WHZ <0	197	38.6
Marginally Stunted		
-2< WHZ <-1	120	23.5
Moderately Stunted		22.2
-3< WHZ <-2	113	
Severe Stunted		
WHZ >-3	80	15.7

Table 8 demonstrated 38.6% normal, 23% marginally stunted, 22.2% moderately stunted, and 15.7% severely stunted.

**Table- 9: Stunting and Respondents Age Relationship**

Age of the respondents	Stunting		Total
	Not Stunted	Stunted	
(12-23) months	81(27.1%)	86(40.8%)	167(32.7%)
(24-35) months	34(11.4%)	21(10.0%)	55(10.8%)
(36-47) months	68(22.7%)	47(22.3%)	115(22.5%)
(48-59) months	116(38.8%)	57(27.0%)	173(33.9%)
Total	299(100%)	211(100%)	510(100%)

$\chi^2 = 12, df=3, p<.001$

Table 9 revealed: 40.8% stunted (12-23 months), 22.3% stunted (24-35 months), 22.7% stunted (36-47 months), 38.8% stunted (48-59 months).

**Table 10: Relationship between stunting and gender of the respondents**

Gender of the respondents	Stunting		Total
	Not Stunted	Stunted	
Male	139(52.7%)	125(47.3%)	264(100%)
Female	160(65.0%)	86(35.0%)	246(100%)
Total	299(58.6%)	211(41.4%)	510(100%)

$\chi^2 = 8.05, df=1, p<.05$

The table depicted gender-specific stunting, with an overall rate of 41.4%, and 47.3% among males, showing a significant association ( $p < .001$ ).

**Table 11: Stunting and Respondents' Food Types Relationship**

Types of food consumption of the respondents	Stunting		Total
	Not Stunted	Stunted	
Rich-in-protein food	105(35.1%)	38(26.6%)	143(28.0%)
Not rich-in-protein food	194(64.9%)	173(82.0%)	367(72.0%)
Total	299(100%)	211(100%)	510(100%)

$\chi^2 = 17.94$   $df=1$ ,  $p < .000$

Table 11 underscored the impact of food choice on stunting. 'Not Stunted' individuals favored protein-rich food (35.1%), while 'Stunted'

ones leaned towards non-protein-rich options (82.0%). A significant relationship ( $p < .000$ ) linked food intake to stunting types.

**Table 12: Relationship between Wasting and age of the respondents**

Age of the respondents	Wasting		Total
	Not Wasted	Wasted	
(12-23) months	105(62.95%)	62(37.17%)	167(100%)
(24-35) months	44(80.0%)	11(20.0%)	55(100%)
(36-47) months	61(53.0%)	54(47.0%)	115(100%)
(48-59) months	107(61.8%)	66(38.2%)	173(100%)
Total	317(62.2%)	193(37.8%)	510(100%)

$\chi^2 = 11.548$ ,  $df=3$ ,  $p < .05$

Table 12 showed a significant relationship ( $p < .05$ ) between age groups and wasting. In the (36-

47) months group, 47.0% of children were wasted, compared to 38.2% in the 48-59 months group.

**Table 13: Relationship between Wasting and gender of the respondents**

Gender of the respondents	Wasting		Total
	Not Wasted	Wasted	
Male	167(52.7%)	97(50.3%)	264(51.8%)
Female	150(47.35)	96(49.7%)	246(48.25)
Total	317(100%)	193(100%)	510(100%)

$\chi^2 = 0.28$ ,  $df=1$ ,  $p > .05$

Table 13 showed similar wasting rates in genders (50.3% males, 49.7% females). No

significant link was found, emphasizing the need for gender-inclusive interventions.

**Table 14: Wasting and Respondents' Food Types Relationship**

Types of food consumption of the respondents	Wasting		Total
	Not wasted	Wasted	
Rich-in-protein food	112 (78.3%)	31(21.7%)	143(100%)

Not rich-in-protein food	205(55.9%)	162(44.15)	367(100%)
Total	317(62.2%)	193(37.8%)	510(100%)

$\chi^2 = 22, df=1, p<.000$

Table 14 revealed that rich-in-protein food (21.7%) was linked to lower wasting, while non-

rich-in-protein food (44.15%) correlated significantly with higher wasting rates ( $p<.000$ ).

**Table 15 : Multivariate Rregression analysis showing predictors of Stunting**

Variables of interest	Multivariate analysis	
	Odds Ratio (95% CI of OR)	p-value
Birthweight(2500-3999gm.)	6.74(2.02-22.4)	P<.002
Place of delivery (Hospital)	0.44(0.24-0.81)	P<.008
Types of regular food (Rich -in-protein-diet)	0.55(0.33-0.89)	P<.05
Age category (12-23 months)	2.49(1.45-4.2)	P<.001
Gender (Male)	1.77(1.08-2.92)	P<.02
Birth weight(<2500gm)	4.52(1.10-22.4)	P<.02

Table 15 depicted that birth weight (2500-3999g) increased stunting risk (OR=6.74,  $p<.002$ ). Hospital delivery reduced the risk (OR=0.44,

$p<.008$ ). Male gender raised the risk (OR=2.49,  $p<.001$ ).

**Table 16: Multivariate regression analysis showing predictors of wasting**

Variables of interest	Multivariate analysis	
	Odds Ratio (95% CI of OR)	p-value
Age category (24-35 months)	0.251(.094-.67)	P<.006
Gender of the baby	0.429(0.226-0.818)	P<.0010
Months of weaning (less than 6 months)	12.4(5.1-30.2)	P<.000
Birth order among siblings	.004(.000-.05)	P<.000
Types of regular food (rich-in-protein-food)	0.438(.239-0.80)	P<.008

Table 16 showed strong associations: age group 24-35 months (OR=0.251), gender (OR=0.429), birth order (OR=0.004), weaning, and high-protein diet (OR=0.438). All p-values were significant.

## DISCUSSION

Achieving development goals relies on children's nutrition, a key indicator for community progress.<sup>17</sup>Children's nutrition is crucial for growth, development, and future well-being, underpinning long-term economic progress.<sup>18</sup> Children's nutrition is essential for long-term well-being. Our research shows higher malnutrition in

males (48.2%) than females, influenced by gender, religion, and household education levels. Our study findings are similar to another study where it was found that stunting and underweight are more common in boys than in girls. The variables identified as contributors to children's poor health and nutrition include low socioeconomic position, large families, and ignorance.<sup>19</sup> Diverse education (43.9% 'shop owners,' 10.6% 'service holders') and monthly incomes ('Less than 10,000' to '41,000 and more') underscore economic disparities, averaging Tk.16,801.

Common birth weights 2500-3999g, 26.5% preterm births. Weaning: 47.1% followed



guidelines. In order to meet the nutritional needs of the growing infant at six months of age, the World Health Organization (WHO) recommends early breastfeeding initiation, exclusive breastfeeding for the first six months, and timely and adequate introduction of complementary feeding in terms of amount, frequency, consistency, and variety. Breastfeeding should be continued for a full two years.<sup>20</sup> Underweight linked to insufficient intake, impacting stunted children.<sup>21</sup> Diet choices, e.g., high-protein meals (28%), affect children's nutrition. Research has shown that young children's protein consumption varies depending on the situation. According to one study, young children in low-income countries (LICs) typically eat more protein than one might anticipate, which may be an indication of higher levels of protein intake.<sup>22</sup>

However, a different study emphasized the impact of nutritional status on protein consumption by comparing the protein intakes of stunted and non-stunted students.<sup>23</sup> Undernutrition linked to education, employment, income, technology, culture.<sup>24</sup> Majority born in hospitals (80.2%), impacting early health. Common health issues—fever, cough, diarrhea, worm infestation, low appetite—affect children's well-being. This study reveals global child health insights, highlighting stunting (41.4%, gender correlation  $p < .001$ ) and wasting risk factors ( $p < .000$ ). Rich-in-protein lowers risk significantly.

## CONCLUSION

This study exposed significant stunting and wasting in rural Bangladesh, emphasizing challenges such as restricted nutrient access, socioeconomic disparities, and healthcare gaps. The insights called for comprehensive interventions, providing practical guidance to policymakers and practitioners to combat malnutrition and enhance child health in this specific context.

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62<sup>nd</sup> batch of RMC,

Data cleaning, encoding, entry, analysis & interpretation: FY, ZA

Drafting and final approval: FY, MZA, AKMSA

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