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Prevalence and Associated Factors of Stunting among School Going Children (6-13 Years): Survey in Rural Area of Rajshahi District, Bangladesh

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Abstract

Stunting is one of the most serious public health problems among school going children in Bangladesh. It is increase the risk to survival, development, school performance and productivity in adult life, which constitutes a significant obstacle to achieving better child health outcomes. This study aimed to determine the prevalence and risk factors of stunting among school going children aged 6–13 years in rural area of Rajshahi district, Bangladesh. It was a cross-sectional study with a sample size of 500 school going children aged 6-13 years in high Barind tract area in Rajshahi district of Bangladesh. Data were collected from the field survey conducted from January to March, 2019. Multistage cluster sampling was used for selecting our sample from the population. A standard questionnaire was prepared for collecting information regarding child nutritional status and others variables. Chi-square (χ^2)-test and binary logistic regression were used to find the effects of socio-demographic and physical activities factors on children stunting. Statistical significance was measured using adjusted odds ratio (AOR) at 95% CI and P value less than 0.05. This study revealed that the prevalence of stunting was 28.4%. Younger mother's (age ≤30 years) children were more like to suffer with stunting than others (AOR= 0.571; 95%, CI: 0.338-0.964, p< 0.05). Similarly found that mothers' those weight <45 kg were more likely to have stunting children than mother those weight were more 45 kg (AOR= 0.518; 95%, CI: 0.274-0.981, p<0.05). Findings suggest that maternal nutrition, nutritional intervention in school for rural school going children should ensure for reducing stunting.

Keywords: School going children aged 6-13, stunting, socio-demographic, logistic regression.

AMS Classification: 97K40.

1. Introduction

Stunting is one of the most serious public health problems among school going children in the developing countries like in Bangladesh. It is evidence that long inadequacy nutrition creates a huge public health concern especially in developing countries (Mazengia, 2018). Stunting is the result of long-term nutritional deprivation and often results in delayed mental development, poor school performance and reduced intellectual capacity. Stunting is increase the risk to survival, development, school performance and productivity in adult life, which constitutes a significant obstacle to achieving better child health outcomes (Black 2013; Victoria 2008). Stunting is defined height-for-age shorter than 5th percentile or 2 SD below the median of the National Center for Health Statistics/WHO growth reference (WHO, 2006). Stunting children are most vulnerable because of low dietary intakes, lack of appropriate care, and inequitable distribution of food within the household. Stunting increases the risk of illness and death throughout childhood. Stunting children have an increased risk of becoming overweight or obese later in life. Young children who were stunted were 33% less likely to escape poverty as adults. However, under-nutrition during the school-age period has been shown to significantly impact on both the physical and mental capacity of children (De Onis M, 2016; Adedeji I, 2017). Factors associated with the condition include poor maternal nutrition, low birth weight (LBW), severe food insecurity, inappropriate complementary feeding, poverty, illiteracy, poor sanitation, and hygiene practices (Singh, A. 2020; Ahmed et al, 2016). In 2016, approximately 23% of school age children (5-14 years) were stunted worldwide (Bank UWW, 2017). The estimated prevalence of stunting among school-age children aged 5–18 years of age in Africa in 2015 was 37% as compared to the next highest prevalence rate of 23% in Asia (De Onis, 2012). Prevalence of stunting was 37% in rural area of Central India among the school children (Patil et al., 2017). Stunting in Bangladesh is averagely high (31%) among under five children compare to other south Asian countries (NIPORT, 2020). Children stunted at school-age are likely to have been exposed to poor nutrition since early childhood and the degree of stunting tends to increase throughout the school-age years. Most global and national nutritional surveys focus on children under the age of five years (WHO, 2018). The prevalence of stunting of school-age children is largely unknown. There is also variation across studies regarding the underlying factors associated with childhood stunting. Besides, to the best of our knowledge, no study has been done to identify factors associated with stunting among school children in the study area. Therefore, the purpose of this study was to determine the prevalence and factors associated with stunting among school going children aged 6–13 years in rural area of Rajshahi district, Bangladesh.

2. Materials and Methods

2.1 Study area and population

The target research area of this study was high Barind tract area (HBTA) in Rajshahi district of Bangladesh. Barind, also called Barind Tract, geographic region in parts of north western Bangladesh and north-central West Bengal state, India. Barind is a comparatively high, undulating region, with reddish and yellowish clay soils. It is cut by ravines and is divided into separate sections by the Atrai River and one of its tributaries to the east. In this study focus on the HBTAs which mostly cover the Rajshahi and Naogaon district. Barind tract is the one of the low literature rate and high poverty zones in Bangladesh. Around 2.3% ethnic minority representative whom is most deprived population (BBS, 2011). The population of this study was school going children aged 6-13 years in HBTA in Rajshahi district of Bangladesh.

2.2 Type of study

It was a cross-sectional study conducted among 6-13 years old school going children.

2.3 Sample Size determination

The following mathematical formula was used to calculate sample size for this project:

$N = z^2p\ (1\text{-}p)/d^2$……. (Javed, 2016)

Where, N is the number of required samples, z=1.96 for 95% confidence interval (CI), p is the proportion of stunting children, here we considered p=0.50 (the prevalence of stunting school going children aged 6-13 has been considered as 50%), d is the margin of error, here we considered d=0.05. Formula (1) provided that 385 was the adequate sample size for this study. For getting more accurate results we considered 500 samples but initially we considered 550 samples (10% non-respondent rate).

2.4 Study Design and Sampling technique

Multistage cluster sampling was used for selecting sample from our population. After selecting sample, we contacted with their school authorities. The information about the school was gathered from education office in Rajshahi. We organized training for our four field workers. Before collecting/measuring variables we arranged a meeting with selected students, their teachers and their parents for each selected school. In that meeting, we discussed in details about the objective of our project and we took their written consent. The data were collected from selected students, their parent and respective school. The samples selection procedure was described in Fig.1.

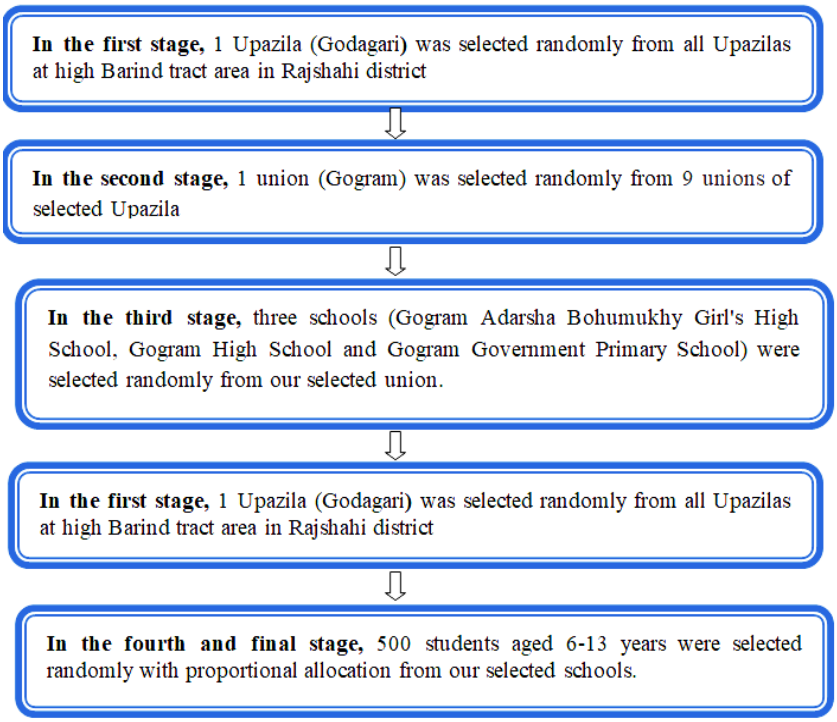

Figure 1: Sample selection procedure

2.5 Major variables and indicators

2.5.1 Outcome variable

Stunting was the outcome variable in this study. It is defined height-for-age in percentile. Stunting status was classified into three classes on the basis of percentile/z-scores, (i) shorter height ($<5^{th}$ percentile), (ii) normal height ($\geq 5^{th}$ to <95 percentile), and (iii) taller height (≥95 percentile). The stunting status was finally classified into two groups, (i) stunting and (ii) normal height (WHO 2006). Anthropometric measurement done through height measuring scale (standiometer), weight measuring balance (Seca digital) and age information was collected by recall of students mother and verified from the school records.

2.5.2 Independent variables

Some independent variables were considered such as socio-demographic: children age, children sex, parent's age, parents' height, weight, education, income, physical activities of student: play regular in hours, watching TV in hours.

2.6 Questionnaire developing and pre-testing

A standard questionnaire was prepared for collecting information regarding child stunting status. After completing questionnaire it was sent to three experts in this area for giving their opinion on this questionnaire (Pre-test). We did a pilot survey (small study) for the validity of questionnaire (post-test). After proper modification questionnaire was finalized and made ready for data collection.

2.7 Data processing and management

Completed questionnaires were checked on a daily basis for accuracy and completeness in recoding of responses. Editing and coding were done before data entry. Data were entered and analyzed using SPSS (IBM version 20). The presence of abnormal point in data set, can affect the interpretation of results. The present author checked the outlier of the data set.

2.8 Statistical analysis

Qualitative variables were presented by frequency and percentage distributions. Chi-square (χ^2)-test was used in this study to examine the association between children and their mothers' nutritional status and other selected independent variables. Significance associated variables were considered as independent factors for binary logistic regression analysis. Binary multiple logistic regression model was used to find the effects of socio-economic, demographic, and health factors on children stunting status. The results of the multiple logistic regression model were presented by adjusted odds ratio (AOR) with 95% CI. In this study, statistical significance was accepted at $p<0.05$.

3. Results

3.1 Socio-demographic characteristic of children and their parents

The total number of children who participated in the study was 500. Among them 48.4% were boys and 51.6% were girls. Out of total children, 15% aged were 6 year, respectively age wise children were 7 years (14.8%), 8 years (17.2%), 9 years, 11.6%, 10 years (11.8%), 11 years (15.6%), 12 years (11.2%) and 13 years (2.8%). Majority of the parents' educational level were at primary and secondary stage (father 68.4% mother 87.4%). Comparatively, the numbers of higher

educated fathers were more (11.6%) than mothers (6.2%). More than 68.8% household average monthly income was ≤10,000 Taka.

3.2 Prevalence of stunting:

The prevalence of the short stature among the children was 28.4% (< 5th percentile), normal 67.2% (≥5th to <95 percentile) and 4.4% taller (≥95 percentile). Finally, it was found that the prevalence of stunting school going children were 28.4% in HBTA in Rajshahi district, Bangladesh (Table 1 and 2).

Table 1: Stunting status of children

	Number	**Percent**
Shorter	142	28.4
Normal	336	67.2
Taller	22	4.4
Total	500	100.0

Table 2: Stunting status of student

	Number	**Percent**
Stunting	142	28.4
Normal height	358	71.6
Total	500	100.0

3.3 Factors associated with stunting

Chi-square test demonstrated that comparatively younger mothers' (≤30 years) children were more suffering (39.6%) from stunting than their counterparts and association between students stunting status and mother age was statistically significant ($p < 0.05$). Comparatively less weighted mothers' (<45 kg) children were more suffering from stunting (43.5%) than others mothers' children, association between students stunting status and mother weight was statistically significant ($p < 0.05$). Short stature mothers' (≤147 cm) children were more suffering (40.0%) from stunting than their counterparts and association between students stunting status and mothers' height was statistically significant ($p < 0.05$). Children were watching television more than 4 hours who were suffering more stunting (39.8%) than their counterparts and association between students stunting status and TV watching was statistically significant ($p < 0.05$). Those children who were play regularly more than 4 hours were more suffering stunting (56.2%) than others and association between students stunting status and regularly playing more than 4 hour was statistically significant ($p < 0.05$) (Table 3).

Table 3: Association between stunting status of school going children and socio-demographic and physical activities factors

Variables	Group N (%)	Students Stunting Percentile		$\chi 2$ value	*p*- value
		Normal (BMI≥5th percentile)	Stunting (BMI<5th percentile)		
Gender of the student	Boys 242 (48.4)	166 (68.6%)	76 (31.4%)	2.083	0.149
	Girls 258 (51.6)	192 (74.4%)	66 (25.6%)		
Student's age	6 years 75 (15.0)	53 (70.7%)	22 (29.3%)	5.741	0.570
	7 years 74 (14.8)	47 (63.5%)	27 (36.5%)		
	8 years 86 (17.2)	62 (72.1%)	24 (27.9%)		
	9 years 58 (11.6)	40 (69.0%)	18 (31.0%)		
	10 years 59 (11.8)	43 (72.9%)	16 (27.1%)		
	11 years 78 (15.6)	62 (79.5%)	16 (20.5%)		
	12 years 56 (11.2)	42 (75.0%)	14 (25.0%)		
	13 years 14 (2.8)	9 (64.3%)	5 (35.7%)		
Father's height	≤160 cm 179 (36.8)	125 (69.8%)	54 (30.2%)	5.315	0.070
	161-172 cm 277 (57.0)	197 (71.1%)	80 (28.9%)		
	>172 cm 30 (6.2)	27 (90.0%)	3 (10.0%)		
Mother's age	≤30 year 111 (22.2)	67 (60.4%)	44 (39.6%)	8.978	0.030
	31-35 year 222 (44.5)	166 (74.8%)	56 (25.2%)		
	36-40 year 100 (20.0)	76 (76.0%)	24 (24.0%)		
	>40 year 66 (13.2)	48 (72.7%)	18 (27.3%)		
Mother's weight in kg	<45 kg 69 (13.8)	39 (56.5%)	30 (43.5%)	9.155	0.027
	45-54 kg 201 (40.3)	147 (73.1%)	54 (26.9%)		
	55-64 kg 165 (33.1)	122 (73.9%)	43 (26.1%)		
	≥65 kg 64 (12.8)	49 (76.6%)	15 (23.4%)		
Mother's height in cm	≤147 cm 85 (17.0)	51 (60.0%)	34 (40.0%)	7.610	0.022
	148-160 cm 391 (78.4)	287 (73.4%)	104 (26.6%)		
	>160 cm 23 (4.6)	19 (82.6%)	4 (17.4%)		
Father education	Uneducated 100 (20.0)	66 (66.0%)	34 (34.0%)	3.842	0.279
	Primary 214 (42.8)	159 (74.3%)	55 (25.7%)		
	Secondary 128 (25.6)	88 (68.8%)	40 (31.2%)		
	Higher 58 (11.6)	45 (77.6%)	13 (22.4%)		
Mother education	Uneducated 32 (6.4)	25 (78.1%)	7 (21.9%)	1.379	0.710
	Primary 182 (36.4)	128 (70.3%)	54 (29.7%)		
	Secondary 255 (51.0)	181 (71.0%)	74 (29.0%)		
	Higher 31 (6.2)	24 (77.4%)	7 (22.6%)		
Household income in BDT	≤7,500 BDT 67 (13.4)	42 (62.7%)	25 (37.3%)	3.699	0.296
	7,501-10,000 BDT 173 (34.6)	124 (71.7%)	49 (28.3%)		

Variables	Group N (%)	Students Stunting Percentile		χ^2 value	*p*- value
		Normal (BMI≥5th percentile)	Stunting (BMI<5th percentile)		
	10,001-15,000 BDT 171 (34.2)	124 (72.5%)	47 (27.5%)		
	>15,000 BDT 89 (17.8)	68 (76.4%)	21 (23.6%)		
Watching TV	≤1 hour 34 (6.8%)	24 (70.6%)	10 (29.4%)	13.407	0.004
	2 hour 207 (41.4%)	164 (79.2%)	43 (20.8%)		
	3 hour 146 (29.2%)	102 (69.9%)	44 (30.1%)		
	≥4 hour 113 (22.6)	68 (60.2%)	45 (39.8%)		
Play regular	≤1 hour 178 (35.6)	136 (73.1%)	50 (26.9%)	8.214	0.042
	2 hour 228 (45.6)	160 (70.2%)	68 (29.8%)		
	3 hour 70 (14.0)	55 (78.6%)	15 (21.4%)		
	≥4 hour 16 (3.2)	7 (43.8%)	9 (56.2%)		

3.4 Effect of parent's socio-demographic and physical activities factors on children stunting

Only the associated factors were considered as independent variables for the binary logistic regression model. Table 4 represents the binary logistic regression analysis, the model showed that younger mothers' (age ≤30 years) children were more vulnerable to have stunting than older mothers' children (AOR= 0.571; 95%, CI: 0.338-0.964, p< 0.05). It was noted that less weighted mothers' (weight <45 kg) children were more likely to get stunting than weighted mothers' children (AOR= 0.518; 95%, CI: 0.274-0.981, p<0.05) (Table 4).

Table 4: Effects of stunting status and socio-demographic and physical activities factors

Independent variables	Coefficient (β)	SE of (β)	p-value	Adjusted Odds Ratio (AOR)	95% CI of AoR
Mother's age					
≤30 yr®			0.154	1.00	
31-35 yr	-0.560	0.267	0.036	0.571	0.338-0.964
36-40 yr	-0.596	0.329	0.070	0.551	0.289-1.051
>40 yr	-0.504	0.351	0.151	0.604	0.304-1.203
Mother's weight					
<45 kg ®			0.231	1.00	
45-54 kg	-0.657	0.326	0.044	0.518	0.274-0.981
55-64 kg	-0.594	0.354	0.094	0.552	0.276-1.106
≥65 kg	-0.434	0.437	0.321	0.648	0.275-1.525
Mother's height					
≤147 cm ®			0.439	1.00	
148-160 cm)	-0.324	0.298	0.277	0.724	0.404-1.297
>160 cm	-0.713	0.657	0.278	0.490	0.135-1.778
Watching TV in hours					

Independent variables	Coefficient (β)	SE of (β)	p-value	Adjusted Odds Ratio (AOR)	95% CI of AoR
≤1 hour ®			0.059	1.00	
2 hour	-0.510	0.436	0.242	0.600	0.255-1.412
3 hour	-0.038	0.439	0.931	0.963	0.408-2.274
≥4 hour	0.227	0.444	0.610	1.254	0.525-2.996
Play regular in hours					
≤1 hour ®			0.098	1.00	
2 hour	0.070	0.230	0.759	1.073	0.684-1.684
3 hour	-0.428	0.357	0.231	0.652	0.324-1.313
≥4 hour	1.118	0.584	0.056	3.059	0.974-9.611
Constant	0.419	0.548	0.445	1.520	

4. Discussion

The prevalence rate of stunting among school going children is high (31%) in Rajshahi district of Bangladesh. This prevalence is similar among under five children status (31%) in Bangladesh (NIPORT, 2020). In southern Ethiopia, the prevalence of stunting was found to be 41.9% among school children (Tariku, 2018). However, the prevalence in this study is lower than the prevalence reported from Volta region of Ghana (42.5%) (Orish, 2019). When compared with the result from China (11.68%) (Wang, 2013), India (18.5%), and Mexico (22.3%) (Monarrez-Espino, 2004), the prevalence of stunting in this study was much higher in Bangladesh. The prevalence of stunting in children of the primary school in the region of North Sumatra was 38.8% (Lestari, 2018). The associated factors found in this study are consistent with many others studies such as mothers' low height (Yasmin, 2014) in Indonesia, mothers' age (Mesfin, 2015) in Ethiopia, and mothers' nutritional status (Dekker, 2010) in Colombia.

The study could have the following limitations. Firstly, this cross sectional study could not establish the cause-effect relationship between the outcome variable and the covariates. Secondly, the information obtained from mother might be subject to recall bias. Thirdly, some other relevant variables were not considered in this study and finally data was collected from rural area only that didn't represent whole Bangladesh.

5. Conclusion

This study revealed high rate of stunting among school going children aged 6-13 years in Rajshahi district of Bangladesh. Mothers' age, weight and height were significantly associated with the stunting status of children. Since stunting is resulted from a long run inadequate of nutrition and other multifactorial contributions, findings of this study suggest that maternal nutrition, nutritional intervention for school going children should be ensured for reducing stunting.

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