ORIGINAL PAPERS

Gender Inequality and Severe Malnutrition among Children in a Remote Rural Area of Bangladesh

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ABSTRACT

Bangladesh typifies many south-eastern countries where female children experience inferior health and uncertain survival, especially after the neonatal period. This paper attempts to study the gender inequality in nutritional status and the effects of various socioeconomic, demographic, and health-programme factors on gender inequality in a remote rural area of Bangladesh. Measurements of mid-upper arm circumference (MUAC) were taken from 2,016 children aged less than 5 years (50.8% male, 49.2% female) in 1994. Children were characterized as severely malnourished if MUAC was <125 mm. Independent variables included various characteristics of children, households, and mothers. Average MUAC for all children was 130 mm; 33% were severely malnourished. Of the severely-malnourished children, 54.2% were female, and 45.8% were male. The gender gap persisted in the multivariate situation, with female 1.44 times more likely to be severely malnourished. Other variables with a statistically significant relationship included the age of children, acceptance of DPT1, and education of household heads. The persistence of such a gender discrimination now when the country has achieved a lot in terms of child survival is striking. The issue is important and demands appropriate corrective actions.

Key words: Gender issues; Child nutritional status; Child nutrition disorders; Anthropometry; Inequality; Equity

INTRODUCTION

Bangladesh is one of the southeastern countries where female children experience higher mortality, especially after the neonatal period (1,2). Various factors, including discrimination against female children in intra-family food distribution and healthcare, were thought to be a possible mechanism that results in inferior health and less chance of survival for female than male (3-5). Health and development professionals are striving to find ways to deal with the problems of gender inequality in health and survival. While the socioeconomic and health-intervention programmes have shown positive impact on nutritional status and survival, it is largely unknown how effective these factors are in reducing gender inequalities in health. Keeping this in mind, this paper studied the relationship between gender inequality in nutritional status of children aged less than 5 years and various socioeconomic, demographic, and health-programme factors in a remote rural area of Bangladesh.

METHODS AND MATERIALS

Study area

The study area included 5 unions (lowest administrative unit of the government) in Chakaria thana, under Cox's Bazar district, in the southeast coast of the Bay of Bengal.

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The survey covered all villages in Baraitali, Kayerbeel, BM Char, Harbang, and Purbo Bheola unions.

During the study year (1994), the 5 unions had a population of about 120,000. The highway from Chittagong to Cox's Bazar passes through Chakaria. The east side of the area is hilly, while the west side is low and flattens toward the Bay of Bengal.

Chakaria is located in the high-risk area with sporadically occurring cyclones and tidal bores in addition to regular monsoon flooding. The last disastrous cyclone accompanied with a tidal bore hit in 1991, which killed a large number of inhabitants and cattle heads, damaged innumerable houses and other properties (6,7).

The area was typically characterized as one of the most conservative in terms of religion and openness to new ideas. Nearly half of the males and two-thirds of the females aged over 6 years had never been to school. It was also recognized as one of the impoverished areas in terms of health, family planning, and NGO activities (8).

Data collection

Data were collected during October-December 1994 as part of the baseline survey of the Chakaria Community Health Project of ICDDR,B. A systematic random sample of 12% households, considered adequate for most indicators included in the baseline survey, was selected. In total, 2,016 children, aged 6-60 months from different households, were included in the survey. Two separate sets of questionnaire were administered. The first was administered to the heads of households or any other senior persons of the household to collect information on household characteristics, and the second was administered to mothers of children aged less than 5 years.

The locally-recruited female interviewers received special training on interviewing and taking measurements of mid-upper arm circumference (MUAC) using a measuring tape developed by Teaching Aids at Low Cost (TALC), London, U.K. Measurements of MUAC by the field workers were standardized with that of the supervisor before starting the fieldwork each day. Details of the methodology used, along with findings from the survey, have been reported elsewhere (8).

Variables

MUAC of these children was used as an indicator of nutritional status. For analysis, children were categorized into 2 groups: one as 'severely malnourished' with MUAC less than or equal to 125 mm and the other as 'not severely malnourished' with MUAC greater than 125 mm. Three broad categories of independent variables were included in the study. These were: characteristics of children, mothers, and households. Children's characteristics included sex, age (measured in months on the day of interview), immunization status in terms

of obtaining DPT1 and measles vaccine, indicators of healthcare-seeking behaviour, availability of health services, and whether the child had been ill during the 15 days preceding the survey. Mother's characteristics included age and education of mothers measured by years of secular schooling completed. Household characteristics, on the other hand, included educational level and sex of the household head, area of land owned by the members of the household, membership of any non-government organization, ownership of radio (an indicator of socioeconomic status and access to mass media), and total number of living children in the household.

Data analysis

Both univariate and multivariate techniques of data analysis were performed. In univariate analysis, categorized independent variables were cross-tabulated with dichotomized MUAC to examine the association between independent variables and severe malnutrition. Logistic regression analysis was carried out with MUAC as dichotomized dependent variable and all independent variables as categorized variables. A forward stepwise selection method was used for identifying the important variables to arrive at a main effect model. The independent variables in the main effect model were cross-tabulated with sex of children to examine the pattern and extent of gender differentials in the prevalence of severe malnutrition. This was done to assess the modifying effect these independent variables may have on gender inequality in severe malnutrition among children. Subsequently, first order interaction of sex of children and age of children, DPT1, and education of household head were included in the model one at a time to assess the statistical significance of the modifying effect of the independent variables on gender inequality in a multivariate situation.

RESULTS

Of the total children, 49.2% were female, and 50.8% were male. The mean age of the children was 22.6 months with a standard deviation of 15.4 months. Average MUAC was 130.3 mm with a standard deviation of 14.9 mm, and median MUAC was 131 mm. Of the total study children, 33.1% could be classified as severely malnourished with MUAC less than 125 mm. The distribution of MUAC can be seen in Fig. 1.

Table 1-3 present results of univariate analysis of severe malnutrition and various independent variables. Table 4 presents results of multivariate logistic regression analysis.

Characteristics of children and severe malnutrition

Table 1 presents the distribution of severely-malnourished children by their various individual characteristics. Sex and age of children, use of immunization services, and illness within the preceding
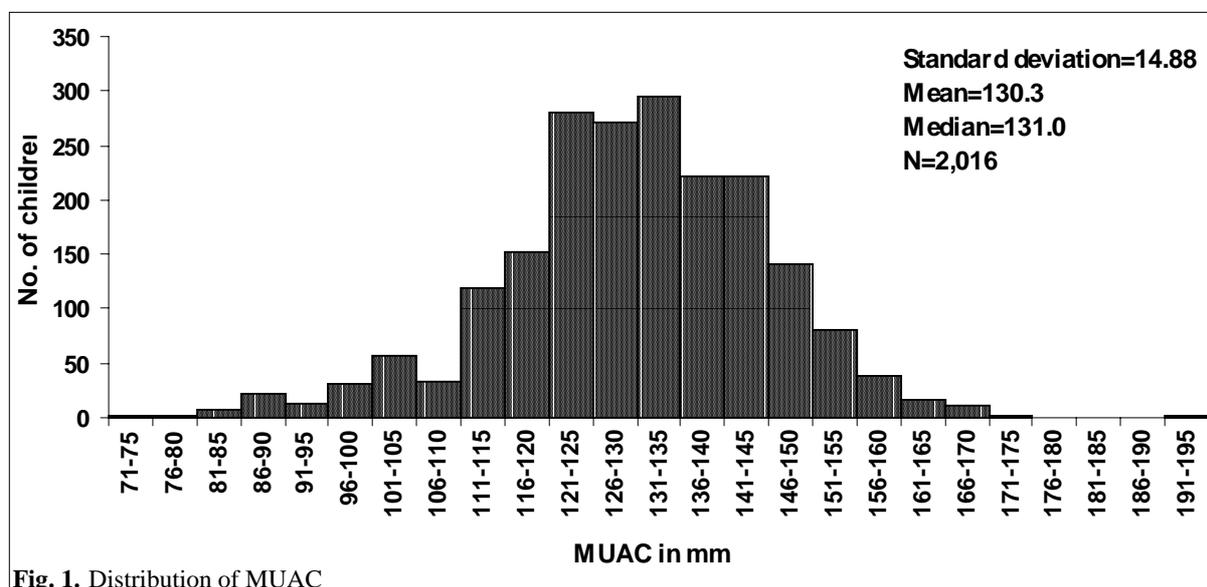
Fig. 1. Distribution of MUAC

Table 1. Percentage of severely-malnourished children by their characteristics

Characteristics	No. of children in the sample	Percentage	Percentage of severely-malnourished children	Remarks
All children	2016	100	33.1	
Sex of children				
Male	1025	50.8	29.9	.001
Female	991	49.2	36.5	
Age of children (in months)				
<12	550	27.3	53.6	.000
12-23	514	25.5	41.1	
24–35	459	22.8	24.4	
36-47	217	10.8	13.4	
48-60	276	13.7	7.6	
Immunization status of children				
Received at least DPT1	1450	74.7	27.7	.000
Did not receive DPT1	492	25.3	40.0	
Received measles vaccine	889	56.4	22.3	.000
Did not receive measles vaccine	687	43.6	32.5	
Sickness within preceding 2 weeks				
Yes	1145	57.0	35.5	.010
No	864	43.0	30.1	
Note: Number of children for various independent variables may differ due to missing data				

2 weeks had statistically significant relationship with severe malnutrition. Girls were more likely than boys to be severely malnourished. Age of children showed a negative relationship with proportion of severely-malnourished children. Children who had at least one shot of DPT, and also those who had measles vaccination were less likely to be severely malnourished than those who were not vaccinated. Children who were sick during

the 2 weeks preceding the survey were also more likely to be severely malnourished than those who were not sick.

Logistic regression analysis (Table 4) revealed that when the effects of other variables were held constant, it is only the sex apnd age of children and DPT1 acceptance that had a statistically significant relationship with severe malnutrition. In relative sense, girls had 44%

higher odds of being severely malnourished than boys. Age of children maintained its negative relationship with severe malnutrition: children aged 48-60 months were lowest in proportion to be severely malnourished. Odds of a child aged 6-12 months to be malnourished were 13 times more than those of 48 months or older. Children

who did not receive DPT1 had 82% higher odds of being severely malnourished than those who received DPT1.

Characteristics of mothers and severe malnutrition

Distribution of severely-malnourished children by mothers' age and education is presented in Table 2. Both the variables showed statistically significant association with severe malnutrition among children. An increase

Table 2.   Percentage of severely-malnourished children by characteristics of mothers

Characteristics	No. of children in the sample	Percentage	Percentage of severely-malnourished children	Remarks
Age of mothers (in years)				
<24	443	22.0	37.5	.017
25-29	610	30.3	33.6	
30-34	432	21.4	34.3	
35+	531	26.3	28.1	
Education of mothers				
No education	1525	75.6	35.5	.000
1-5 year(s)	297	14.7	28.3	
6+ years	194	9.6	21.6	

Note: Number of children for various independent variables may differ due to missing data

Table 3.   Percentage of severely-malnourished children by household characteristics

Characteristics	No. of children in the sample	Percentage	Percentage of severely-malnourished children	Remarks
Sex of household heads				
Male	1986	98.5	33.2	.448
Female	30	1.5	26.7	
Educational level of household heads				
No education	1214	60.2	37.5	.000
1-5 year(s)	447	22.2	28.0	
6+ years	355	17.6	24.8	
Total no. of living children in household				
1–2	633	31.4	30.5	.143
3-5	916	45.5	35.3	
6+	464	23.1	32.8	
Religion				
Muslim	1849	91.7	33.6	.109
Non-Muslim	167	8.3	27.5	
Household land holdings				
Less than 50 decimals	1086	53.9	34.8	.034
50-199 decimals	494	24.5	34.0	
200 decimals	436	21.6	28.0	
NGO membership of target households				
Target non-member	920	45.6	34.9	.226
Target member	166	8.2	34.8	
Non-target	930	46.1	31.2	
Ownership of radio				
Yes	287	14.2	23.3	.001
No	1727	85.8	34.7	

Note: Number of children for various independent variables may differ due to missing data

in mother's age and education was associated with a decrease in the proportion of severely-malnourished children.

The effect of mother's education and age became statistically insignificant in multivariate analysis (Table 4).

persisted in all age groups with the least difference among children aged 48-60 months. Immunization, as measured by having a shot of DPT1, did not show much difference by gender (the difference was somewhat greater among children without DPT1). In case of education of household head, the gender differential

Table 4. Results of logistic regression analysis of severe malnutrition and characteristics of children, mothers, and households

Predictor	Coefficient	Odds ratio	95% CI
Sex of child (c^2=11.99*)			
Female	.37	1.44	1.17-1.77
Male	Reference	-	
Age of children (in months) (c^2=194.73*)			
<12	2.59	13.34	8.22-21.63
12-23	2.17	8.77	5.40-14.26
24-35	1.37	3.95	2.40-6.52
36-47	.63	1.87	1.03-3.40
48-60	Reference	-	
Child received DPT1 (c^2=26.88*)			
Yes	Reference	-	
No	.6	1.82	1.45-2.28
Education of household heads (c^2=14.87*)			
No education	.47	1.59	1.16-2.18
1-5 year(s)	.05	1.05	.73-1.51
6+ years	Reference	-	
Ownership of household radio (c^2=6.46[†])			
Yes	Reference	-	
No	0.43	1.54	1.10-2.14
Constant	-.69*		
Model c^2	351.13*		

* p<.001; † p<.05; CI=Confidence interval

Characteristics of households and severe malnutrition

Of the 7 variables included in the analysis, only education of household head and ownership of land and radio showed statistically significant association with the prevalence of severe malnutrition (Table 3). As in mother's education, education of household head also showed a negative relationship with severe malnutrition. It was also the case with ownership of land. However, owning less than 200 decimals of land did not make any difference.

In the multivariate situation, only education of household head had a significant relationship with severe malnutrition among children. Children from households with illiterate heads had 59% higher odds of being severely malnourished than those from households with heads with more than 5 years of schooling.

Modifying effects of independent variables on gender inequality

Prevalence of severe malnutrition among boys and girls by age of children, ownership of radio, education of household head, and receipt of DPT1 was plotted in Fig. 2-5. The nutritional adversity among female children

persisted in all educational categories with a minimum difference among children from households with heads having 6 or more years of schooling. Similarly, gender differential persisted among children from households irrespective of ownership of radio. None of the above modifying effects was found to be statistically significant when tested as interaction terms in the logistic regression models. This implies that the gender inequality in favour of boys is statistically similar, irrespective of age of children, acceptance of immunization, education of household head, and ownership of radio. None of these variables with significant positive effect on nutritional status of children could alter the pattern of gender inequality in severe malnutrition.

DISCUSSION

We used MUAC as an indicator of nutritional status of a child. MUAC is considered an acceptable indicator of nutritional status of children, because it gives rough estimates of protein (muscle) and energy (subcutaneous fat stores), which correlate with changes in body weight in malnourished children (9). MUAC has an added advantage of operational simplicity and good mortality-predictive power (10-13). Research has shown that
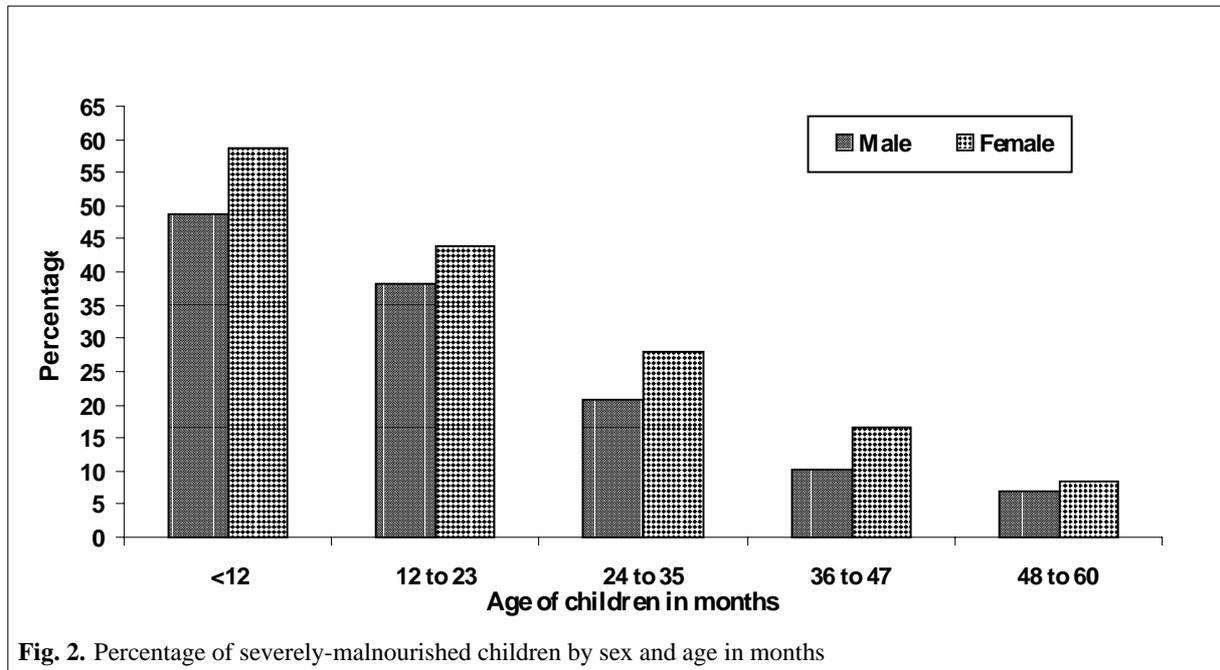
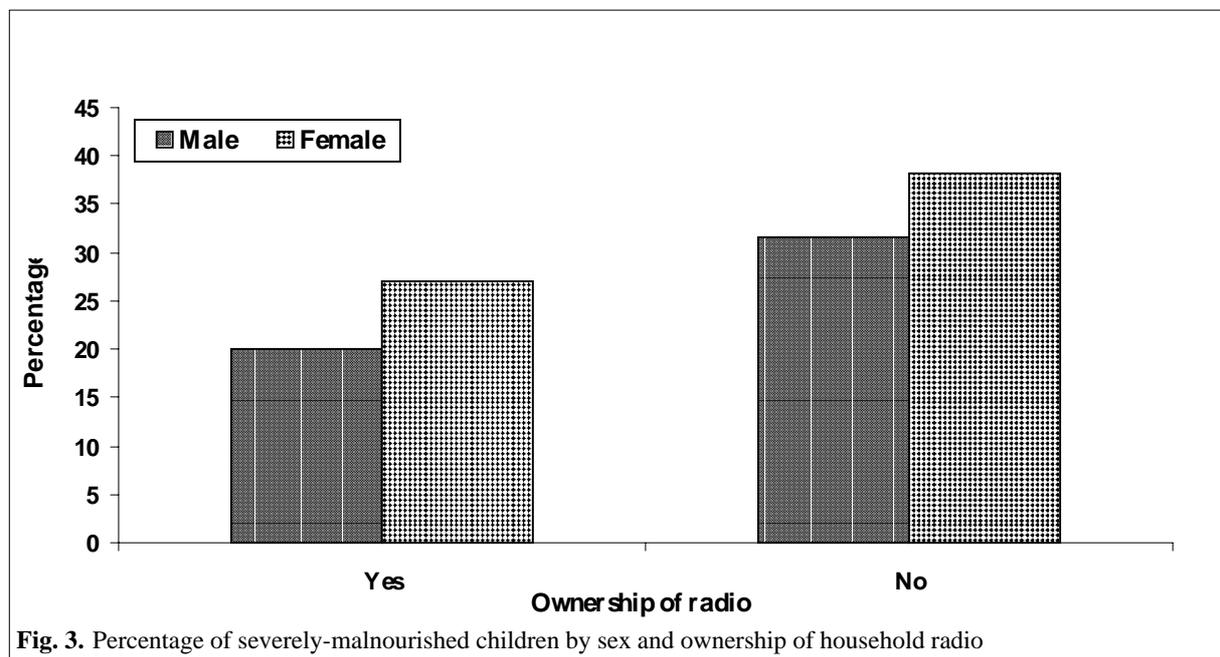**Fig. 2.** Percentage of severely-malnourished children by sex and age in months

Fig. 3. Percentage of severely-malnourished children by sex and ownership of household radio

MUAC is almost as useful as most other pairs of measurements, such as height and weight. The value of upper arm measurement is derived mainly from the fact that circumference changes very little during the age of 1-5 year(s), and that a single cut-off value (12.5 or 13.0 cm) can be used for children aged less than 5 years to divide those with severe malnutrition from others (14).

It must be kept in mind that due to death of severely-malnourished children leaving the better-nourished to be measured, the prevalence of severe malnutrition may actually have been under-estimated. Considering the socioeconomic context of Bangladesh, it would be correct to assume that more female children who are malnourished will have died leaving the better-nourished
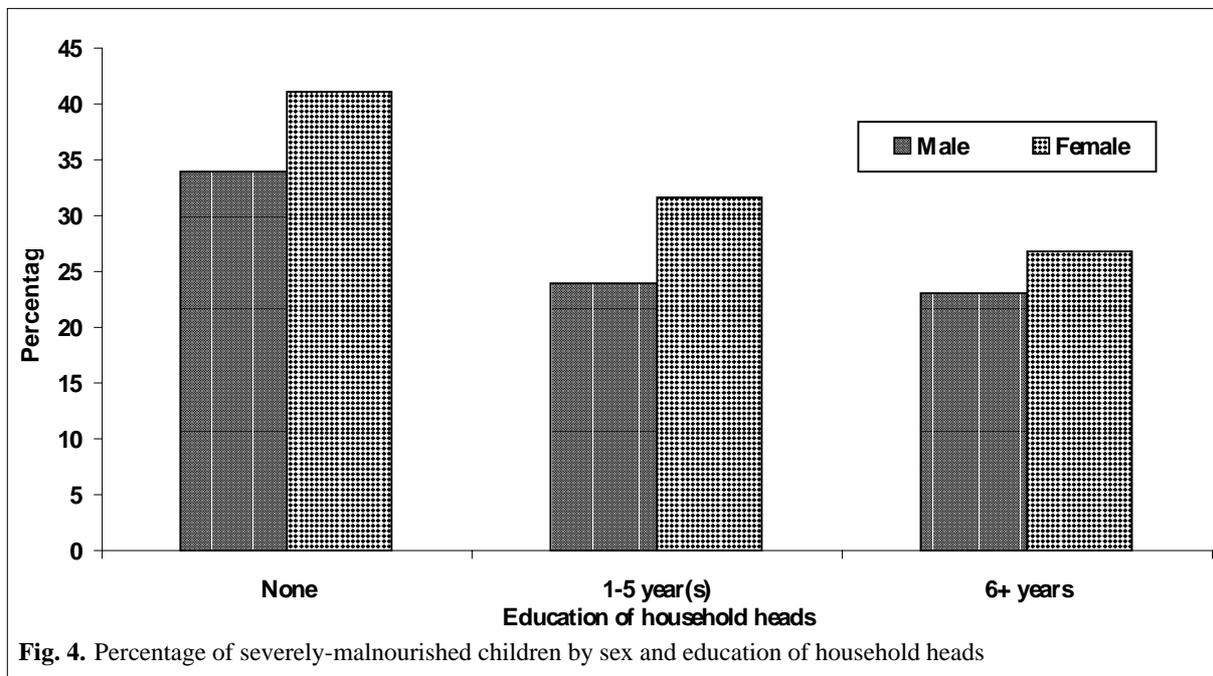
Fig. 4. Percentage of severely-malnourished children by sex and education of household heads
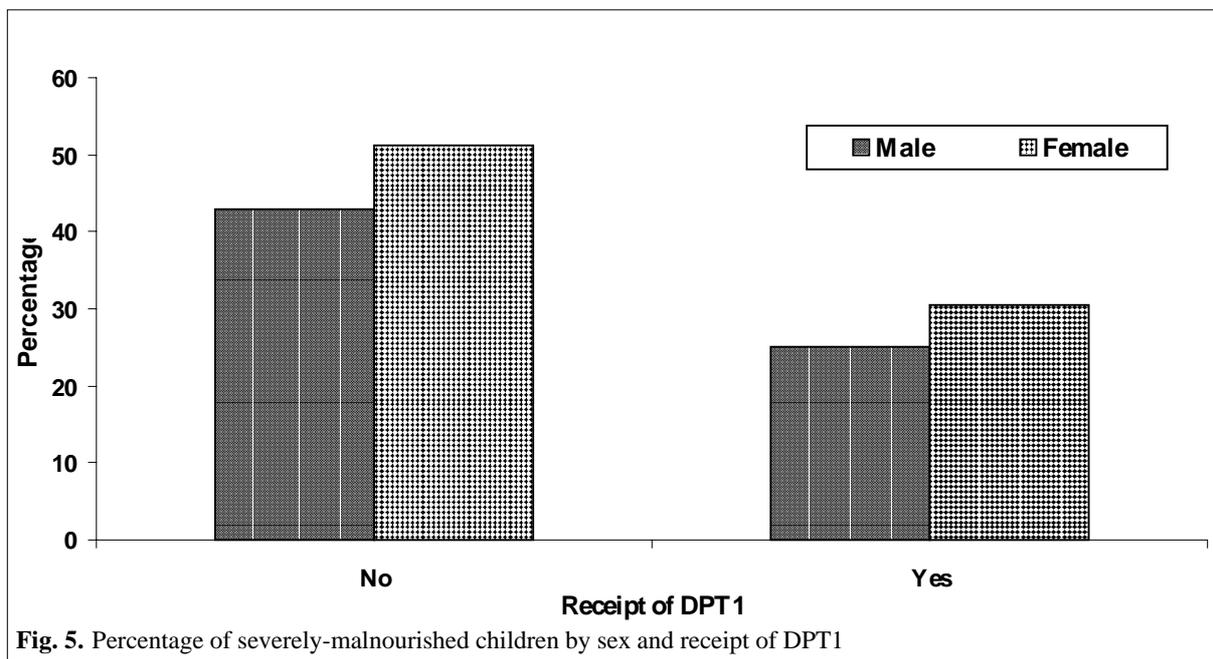

Fig. 5. Percentage of severely-malnourished children by sex and receipt of DPT1

to be measured, in which case, the gender gap between males and females in terms of nutritional status will actually be greater than that observed. However, it is also to be noted the assumption that MUAC is not age- and sex-dependent in young children has been recently questioned (15).

The finding that female children were more likely to be severely malnourished than male is also consistent with higher female childhood mortality than males in Bangladesh (16,17). Discrimination against girls in intra-family food distribution and healthcare were the major determinants in the seventies and eighties (3,18,19).

What was striking is the existence of such a gender discrimination now when the country has achieved a lot in terms of child survival (17,20).

The fact that the socioeconomic and health service factors which had positive impact on nutritional status could not alter the condition of female children was also consistent with earlier studies on mother's education and sex differential in childhood mortality. It was observed that the beneficial effect of mother's education was much greater for boys than girls (21). All these indicate the deep-rooted nature of the inferior position of women in this society in general. Thus, an improvement of girls' health to a level of boys may need broad-based interventions beyond health, aimed at changing value systems and behaviour of the population.

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