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EFFECTS OF EPI ON NUTRITION OF UNDER-FIVE CHILDREN IN RURAL BANGLADESH: THE MATLAB EXPRRIENCE

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Effects Of EPI On Nutrition Of Under-Five Children In Rural Bangladesh: The Matlab Experience

by

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EXECUTIVE SUMMARY

Objectives: This study was done to explore the effect of immunization (as specified in EPI) on under-five children's nutritional status in a rural area of Bangladesh.

Methods: The data for this study originated from a sub-sample of a baseline survey conducted in 60 DSS villages of Matlab thana during 1992. MUAC, height and weight of 992 children between the age of one to five years were measured using standard technique and socioeconomic information were collected from their mothers using a set of pre-tested structured questionnaire. The level '-2 Z score' was taken as the cut-off point for "stunting" and the value of less than 125 mm of MUAC for "severely malnourished" children.

Results: Both bi-variate and multi-variate analyses revealed the significant role of immunization status in affecting less severe acute malnutrition (MUAC) in poor households which was not seen in the better-off households. Again, immunization status appeared not to have any effect on 'stunting' i.e., long-term nutrition. When considering long-term nutrition (Ht/age), both bi-variate and multi-variate analyses identified mother's education and number of dwellings in the household to be significant influencing factors for the BRAC eligible children. Also, completely immunized children from BRAC non-eligible households were found to have significantly better anthropometric indices than their counterparts. Another interesting finding was the sex difference seen among the better-off households. Girls in these households were much less likely to be completely immunized, and more likely to be acutely malnourished. This issue needs further exploration for a better understanding of the households' gender dynamics.

Conclusions: EPI immunization has some beneficial, if only marginal, impact on the acute nutritional status of the poor children only. It has no effect on chronic nutrition, for which socioeconomic factors seems to play a greater role. Differences exist across socioeconomic status of the household and sex of the children.

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INTRODUCTION

Life of children in Bangladesh, one of the poorest and least developed countries in the world, is disheartening. More than 875,000 under-five children die each year --- about 5 in every three minutes (1). Children under five make up less than 18.7% of the population but account for 57.5% of the deaths (2). It is estimated that around one out of every five deaths is caused by an immunizable disease (3). Immunization is recognized as a cost-effective, convenient and easy way of improving under-five child survival throughout the world. In Bangladesh, thanks to the Government's Expanded Programme on Immunization (EPI), immunization coverage against six major childhood diseases (tuberculosis, diphtheria, pertussis, tetanus, polio, and measles) reached 80% by 1993 (4).

Undernutrition is a major risk factor for under-five child mortality in Bangladesh (5). A recent survey found that about 8% of children were severely malnourished (weight/age<60% of NCHS median) and 55% are moderate-to-severely malnourished (weight/age<75%) (6). A high incidence of infectious diseases is the most common cause of growth faltering in children (7,8). Also, infectious diseases are more common and run a more severe course in children who are nutritionally deprived. Since undernutrition is closely related to infection, programmes like EPI and improvement of environmental sanitation will inevitably have a beneficial effect on nutrition. Koenig et al. singled out vaccination for measles as the most effective intervention in reducing the mortality of children aged 1-4 yrs (9). Barus et al. in a retrospective study found that, of the 312 severely malnourished under-five children, 50.6% received BCG, 13.7% DPT-3, 10.5% OPV-3 and only 0.64% had measles vaccine (10). Another study was conducted in India to see the effectiveness of immunization against measles on diarrhoea and malnutrition-related mortality. At the end of 2 years after 2nd round of immunization against measles, child mortality reduced significantly among 1-4 years age group in the study area in contrast to the control areas (11).

The beneficial effects of immunization in reducing child mortality have been well documented. But no published report is available as yet on the role of immunization (as specified in EPI) on nutrition of under-five children in Bangladesh. This type of information will be much useful to policy-makers and programme planners for planning future projects to improve the health and nutrition of children of this age group. This paper aimed to provide information on this relatively unexplored field from a set of cross-sectional baseline data.

MATERIALS AND METHODS

Background

Founded in 1972, BRAC is a large development organization working for the alleviation of poverty and empowerment of the poor (12). The Rural Development Programme (RDP) is BRAC's major front-line activity (13). This programme targets the poorest of the poor with a special emphasis on improving the socioeconomic condition of women and children. In 1992, BRAC extended its RDP to 100 villages of Matlab thana where the International Center for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) has been operating a Demographic Surveillance System (DSS) since early 1960's (14). A research collaboration between BRAC and ICDDR,B was established in 1992 to examine prospectively the relationship between socioeconomic development and health and well-being of the rural poor. A baseline survey was conducted on 12,000 households in a sample of BRAC and non-BRAC villages in ICDDR,B's DSS area (15). The present study draws on data from a sub-sample of this baseline survey.

The data

Anthropometry was done on a sub-sample of 992 children between the age of one to five years. These children came from 860 households distributed in 25 villages. Around 140 households had two or more children of this age group. The exact date of birth was easily available from the DSS record of ICDDR,B. The weight of the child either with light or no clothing was obtained using a Salter scale with a precision of 100 g. The recumbent height of children older than two years was measured using a locally constructed, two-track length board with a precision of 1 mm. Mid-

upper-arm-circumference (MUAC) was measured using TALC numeral insertion tape to the nearest millimeter. Anthropometric measurements were converted to standard deviation scores ("Z score") using NCHS standards; from these the nutritional indicator 'height-for-age (Ht/age)' was constructed. The level "-2 Z scores" selects children below the generally accepted normal range and is used internationally as a cut-off point as recommended by WHO (16).

Simple MUAC without regard to age or height has a satisfactory sensitivity and specificity for detecting low Wt/age and Wt/ht (17). A value of less than 125 mm is a good predictor of the risk of dying in Bangladesh and selects 'severely malnourished' children. On the other hand, Ht/age is most appropriate to measure long term nutritional depletion. Children with "Ht/Age< -2 Z scores" are classified as 'stunted'. The anthropometric calculations were done using the NCHS standard package, Anthro.

Socioeconomic information were collected from parents through interviewer-administered structured questionnaires. The analysis considers the socioeconomic determinant of nutrition for households that meet BRAC's eligibility criteria for participation in RDP with those that do not. The eligibility criteria are that the households possess less than 50 decimals of land and at least one member sells manual labour for at least 100 days a year (13). These households rank among the poorest of the poor while the non-eligible households are comparatively better-off socioeconomically and include the rural elite as well. Thus, the BRAC eligibility status of the household stands as a proxy of the socioeconomic condition in this particular community.

The category 'Wage-labour' comprises both farm and non-farm labour, and the category 'service' refers to those with a fixed monthly remuneration. 'Self-employment' includes petty trade and business, shop management and various types of jobs like poultry farming, handicrafts, pottery, rickshaw-pulling, fishing etc.

Information on immunization status were collected by interviewing mothers and verified by asking whether injection was given in the specific site of the baby's body or oral drops given, as the case may be. In ICDDR,B's intervention area, mothers' information were checked with children's Vaccination Cards. Immunization status of the study children was categorized into two types: one was 'complete', meaning those who received all doses of the six EPI vaccines, and the other was 'incomplete or nil', referring to those who either did not receive all the doses of the vaccines or to those who did not vaccinate at all. DPT3/OPV3 and measles vaccination were taken as indicators of coverage in contrast to DPT1/OPV1 which indicates access. Analysis was done with the SPSS/PC+ software package, and statistical tests done where appropriate.

RESULTS

The immunization status of the study children (n=992) according to sex and BRAC household status is shown in Table 1. There is sex difference in immunization coverage, significantly pronounced in case of those from BRAC non-eligible households. Table 2 presents the distribution of the 'severely malnourished (MUAC<125mm)' and 'stunted (Ht/Age<-2Z)' children by immunization against specific childhood diseases. The children who received immunization against DPT3 and measles, were proportionately less 'severely malnourished' than those who were not immunized---irrespective of their BRAC household status. However, the difference was not statistically significant. On the other hand, children from BRAC non-eligible households immunized by DPT3 were significantly less 'stunted' than those not so immunized. Lastly, there was significantly less proportion of 'severely malnourished' children from BRAC-eligible households receiving complete immunization against all the six EPI diseases. Table 3 presents the mean age, weight, height and MUAC of the completely immunized children according to sex and the BRAC eligibility status of the household. The children of BRAC-eligible and non-eligible households were of comparable age. As the table illustrates, children from BRAC non-eligible households were significantly better-off in all the anthropometric indices compared to those from BRAC-eligible households. Also, the nutritional status of the boys were better than the girls---irrespective of BRAC eligibility status.

The distribution of 'severely malnourished' and 'stunted' children according to the socioeconomic conditions of the household are presented in Table 4. The percentage of malnourished children decreased for mothers with some years of schooling. This trend was significant for MUAC and Ht/age among the BRAC non-eligible and eligible households respectively. No consistent relation was found with occupation of father, though the association was found to be significant in case of children from BRAC non-eligible households. Greater proportions of children from BRAC-eligible households were members of ≤2 room household, significantly so for 'stunted' children. There is a trend of decreased "severe malnourishment" and 'stunting' with increased subsistence on crops produced by the household (obtained from own/rented/leased land of household) in case of children of BRAC-eligible households which was reversed for the other group. However, this trend was not significantly associated.

Table 5 presents the Odds Ratios of logistic regression analysis for both the groups. Here, the nutritional indicators (MUAC and Ht/age) were taken as dependent variables and mother's years of schooling, sex of the child, father's occupation, number of dwellings in the household and children's immunization status as independent variables. Significant association was found for these variables during bi-variate analyses. During multivariate analysis, MUAC was categorized into two groups by taking 125 mm as the cut-off point for identifying severe malnutrition. For 'stunting', a value of <-2 Z score was taken as the cut-off point. Mother's education, sex of the child and father's occupation like wage labour were the most significant variables predicting MUAC of the BRAC non-eligible children. On the other hand, immunization status was the only significant variable for MUAC in case of BRAC-eligible children. Again, mother's education and number of dwellings in case of BRAC-eligibles and father's occupation like 'self-employment' in case of BRAC non-eligibles emerged as significant variables best explaining variations in Ht/age.

DISCUSSION

This study was based on a set of cross-sectional data collected primarily to record baseline information on selected health and socioeconomic indicators. The proportion of completely immunized (78%), among the study children, was higher than the national average of 62% at the time of survey. This may be due to the intensive health and family planning intervention administered by ICDDR, B in nearly half of the Matlab DSS villages (14). The sex difference in complete coverage of immunization, especially among the well-offs, may be explained in terms of the socioeconomic values attached to male children in this community (18,19).

Both bi-variate and multivariate analyses revealed the significant role of immunization status in affecting less severe acute malnutrition (MUAC) in poor households which was not seen in the better-off households. Again, immunization status appeared not to have any affect on 'stunting' i.e., long-term nutrition. When considering long term nutrition (Ht/age), both bi-variate and multivariate analyses identified mother's education and no. of dwellings in the household to be significant influencing factors for the BRAC-eligible children. Also, completely immunized children from BRAC non-eligible households were found to have significantly better anthropometric indices compared to their BRAC-eligible counterparts. These findings point to the important role of socioeconomic factors beyond immunization in affecting the chronic nutrition of the children.

One interesting finding in this study is the sex differential seen among the better-off BRAC non-eligible households. Girls in these households were much less likely to be completely immunized, and more likely to be acutely malnourished. This also emphasizes our previous findings about the role of immunization in influencing acute malnourishment. But this may not be the only reason. Further exploration of this issue is necessary to reveal the dynamics of gender discrimination in these relatively better-off households.

Thus, from the findings of this study, it can be said that immunization against six EPI diseases has made some beneficial, if marginal, impact on acute nutrition of the poor (from BRAC-eligible households) children. On the other hand, socioeconomic conditions are important for influencing long term nutritional status of these same children. Of course, EPI is primarily aimed at reducing childhood mortality. Whatever effects it may have on morbidity of the children should be considered as secondary. This study also corroborates previous findings in the literature about the significant role of mother's education for children's well-being.

It can safely be said that immunization is only one link among a chain of many bio-social factors that influence the nutritional status of children in developing countries. Malnutrition is the result of many interacting economic as well as socioecological factors. The problem of malnutrition is not just a health problem which can be solved through bio-medical approach, e.g., interrupting the vicious cycle of infection-malnutrition by immunization. It is a 'multifactorial' problem with roots in many other sectors of development such as education, agriculture and rural development. Sustained improvement in nutritional status of poor children can be brought about only through an all out offensive against these basic problems simultaneously.

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Table 1. Immunization status of study children (1- 5 Yrs) by sex and BRAC- membership eligiblity of households (%)

Immunization Status	BRAC eligible			BRAC non-eligible*		
	Boy	Girl	All	Boy	Girl	All
Complete	77.4	78.7	78.0	83.5	72.4	78.3
Incomplete	15.2	13.6	14.4	10.8	18.4	14.4
Nil	7.4	7.6	7.5	5.7	9.2	7.3
Total (n)	323	301	624	194	174	368

*$p<.05$ (Chi-square value)

Table 2: Immunization coverage of malnourished children (1-5yrs) against specific childhood diseases as percent of < -2 Z-scores by BRAC-membership eligibility of households (%)

	BRAC eligible			BRAC non-eligible		
	MUAC <125mm	HAZ < -2	All	MUAC <125mm	HAZ < -2	All
DPT 3						
Received	21.2	57.7	80.3	14.9	62.1	82.1
Not received	26.8	58.9	19.7	19.7	47.7	17.9
					p< 05	
MEASLES						
Received	21.0	58.5	83.3	15.1	48.2	81.3
Not received	28.8	59.6	16.7	18.8	59.4	18.8
Immunization status						
Complete	20.3	58.9	78.0	14.9	47.9	78.3
Incomplete/Nil	29.2	57.7	22.0	18.8	58.8	21.7
	p< 05					
Total (n)	139	366	624	58	185	368

Table 3. Characteristics of completely immunized children (1- 5 yrs) by sex and BRAC membership eligibility of households (mean±sd)

	BRAC eligible		't' value	BRAC non-eligible		't' value
	Boy	Girl		Boy	Girl	
Age (months)	38.0 ± 13.3	37.5 ± 13.1	0.64	37.7 ± 13.2	37.0 ± 13.8	0.43
(n)	(250)	(237)		(162)	(126)	
Weight (Kg)	10.7 ± 2.1	10.1 ± 2.1	3.19**	11.1 ± 2.1	10.5 ± 2.1	2.45*
(n)	(247)	(236)		(162)	(125)	
Height (cm)	88.2 ± 8.2	85.9 ± 9.4	2.51*	89.4 ± 8.2	90.0 ± 9.3	-0.41
(n)	(197)	(182)		(127)	(91)	
MUAC (mm)	135.0 ± 10.4	132.0 ± 10.7	3.28**	138.2 ± 12.4	135.0 ± 15.4	2.03*
(n)	(250)	(237)		(162)	(126)	

N.B. *P<.05 ; **P<.01

Table 4. Socioeconomic condition of malnourished children (1-5 yrs) as percent of < -2 Z-scores by BRAC-membership eligibility of households (%)

	BRAC eligible		BRAC non-eligible	
	MUAC<125mm (n=141)	HAZ < -2 (n=371)	MUAC<125mm (n=58)	HAZ < -2 (n=189)
Years of schooling (mother)				
None	82.3	83.6	72.4	58.2
Some	17.7	16.4	27.6	41.8
		p<.05	*p<.01*	
Occupation of father				
Agriculture	20.3	20.3	17.2	32.3
Wage labour	28.7	26.7	13.8	5.8
Service	7.0	6.9	25.9	22.2
Self-employment	25.2	26.4	6.9	11.6
Others	18.9	19.7	36.2	28.0
			p<.05	
No. of dwellings in the household				
≤2	80.4	82.4	51.7	60.8
2+	19.6	17.6	48.3	39.2
		p<.05		
Subsistence from land (months)				
0	44.1	44.5	17.5	18.7
1-6	40.6	41.3	31.6	33.7
7-12	15.4	14.1	50.9	47.6