

Maternal nutritional knowledge and child nutritional status

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Introduction

Despite being the major underlying cause of malnutrition in children, poverty does not always lead to undernutrition. Recent researches show that a significant proportion of mothers successfully raise wellnourished children in poor communities due to their positive attitude, belief, and practices related to child care, and their ability to use limited resources (Berggren and Wray 2002; Mackintosh *et al.* 2002). Mothers are the main providers of child care and the quality of care they provide to their children is largely dependent on their knowledge on nutrition as well as health related practices (Appoh and Krekling 2005). Studies show significant association between mother's nutritional knowledge and nutritional status of children although the association has been documented only in short-term effects (i.e., weight-for-height) as opposed to long-term effects (i.e., height-for-age) (Webb and Block 2003; Ruel *et al.* 1992; Glewwe 1999; Walia and Gambhir 1975).

The relationship between maternal nutritional knowledge and child nutritional outcomes has been found to be largely influenced by household socio economic status (Ruel *et al.* 1992; Reed *et al.* 1996). Maternal nutritional knowledge has positive effects on child nutritional status among mothers having adequate but not necessarily abundant resources. No effect has been found in mothers from the lowest socio-economic group and only a weak relationship was found in mothers of well-off socio-economic status (Reed *et al.* 1996). Further, maternal education has been found to be a key factor that enhances nutritional knowledge, thereby improves child nutrition in the upper socio-economic group (Ruel 1992).

Challenging the Frontiers of Poverty Reduction-Targeting the Ultra Poor (CFPR-TUP) is a poverty alleviation programme implemented by BRAC in rural areas of Bangladesh. The programme is specially designed to meet the needs of women who are too poor to access or benefit from traditional development interventions such as microfinance. CFPR-TUP addresses all aspects of extreme poverty and has been highly effective in targeting the ultra-poor. The programme succeeded in improving the socio-economic condition of the participant households through asset transfer, training, subsistence allowance, special health services, social development, legal assistance, and microfinance loans (Sulaiman and Matin 2006; Jalal 2008).

Health and nutrition education is one of the most important components of CFPR-TUP's health intervention strategy. BRAC's experience showed that awareness-raising messages along with health and nutrition education can influence its participant's practices to a significant extent (BRAC 2006; Victora, Habicht *et. al.* 2004). It is expected that this type of programme will have positive effects on maternal nutritional knowledge both at the individual and community levels, and thereby will improve child nutritional status of the targeted households. Understanding the level of maternal nutritional knowledge and the baseline nutritional status of children, as well as the association between the two, is therefore important to evaluate the programme's effect on child nutrition at the end of the intervention and effectively allocate resources in such efforts. This study aims to fill-in this knowledge gap.

Methods

This cross sectional study was conducted on a subsample of participants of a broader survey. The broader survey was conducted in rural areas of 19 districts of Bangladesh during May 2007-January 2008 and intended to serve as a baseline to investigate the impact of the CFPR-TUP programme at different points of time by comparing the programme households with a group of households of comparable socio-economic status (i.e., control households). It included a total of 29,144 households from program and control spots of both STUP I and STUP II areas. The details of the methodology involved in the survey are described elsewhere in this report. Households that had mothers of

children between ages 6-36 months were selected for this study. These mothers were essentially the respondents in the bigger survey. From each household, only one mother and whatever many children she had between ages 6-36 months were included. Based on the availability of mother-child pairs, 4789 households with 4789 mothers and 5039 children were finally selected for the study. This sample size was then tested for adequacy of power (i.e., $1-\alpha=90\%$ and $\alpha=0.05$) based on the mean and standard deviation of height and weight of the rural children under age 3 years as found in previous studies.

The survey instruments were well designed and tested in the ultra poor population. They were designed to collect information on maternal knowledge, attitudes, beliefs, and practices known to be associated with child nutrition and feeding. Data was also collected on mother's education and household socio-demographic characteristics. Both open and close ended questions were included in the questionnaires.

An index was prepared to measure maternal nutritional knowledge based on mother's responses to the six items shown in Table 1. A correct response was given a score of 1 while an incorrect response was scored 0. A cumulative score ranging from 0 to 6 was then created for the nutritional knowledge variable that has been used in the analyses to determine its association with child nutritional status.

Table 1. Scoring of mother's responses against items measuring nutritional knowledge

Item	Score=0	Score=1
Colostrum should be given to the baby	No	Yes
Child's age at which complementary food should be introduced	Before 6 months After 7 months	After 6 months
Eating green, yellow or orange vegetables is important	No	Yes
Iodized salt should be used	No	Yes
Vitamin A capsule should be taken after delivery	No	Yes
Should take iron tablets during pregnancy	No	Yes

Height and weight of the children were measured on the day of interview using standard wooden boards and TANITA digital weighing scales respectively. The digital scale recorded at 100 gram precision. Both measures were standardized for the children's age. A child was defined underweight (i.e., weight-for-age), stunted (i.e., height-for-age) or wasted (i.e., weight-for-height) for standardized scores below -2SD of the median reference value. Informed consent was obtained from each respondent prior to the interview and anthropometric measurement.

Data analysis

Chi-square test was performed for categorical variables to determine the association between nutritional status and the individual variables. Logistic regression was conducted to examine the independent contribution of maternal nutritional knowledge index on child nutritional status. Covariates used in the model were maternal nutritional status and education, sex of the children, and economic status. An alpha-level of 0.05 was considered statistically significant. STATA (Version 9) was used for all analyses while WHO ANTHRO (version 2.0.2) software was used to create standardized scores of weight and height.

Results

Characteristics of mothers and children of different categories of STUP households are compared in Table 2. In general, there was no age difference between mothers of different household types except that the TUP mothers of STUP I areas were younger than TUP mothers of STUP II areas ($p < 0.05$). Mean BMI of TUP mothers in both areas were lower than that of NTP mothers ($p < 0.001$ and $p < 0.05$). There was also no difference in nutritional status between TUP mothers of the two areas (i.e., 3 vs. 6). Fewer proportion of TUP mothers in both areas had ever been to school compared to the NTP mothers. The TUP mothers of STUP II area, however, had more schooling than the TUP mothers of STUP I. No difference was observed in terms of age, sex or anthropometric

status of the children between households of the two areas with the only exception seen in NTP-TUP difference among children of households of STUP II areas.

Table 2: Characteristics of mothers and children of different type of households.

	STUP I			STUP II			Comparison between type of households (<i>p</i> value)		
	NP (1)	NTP (2)	TUP (3)	NP (4)	NTP (5)	TUP (6)	2 vs 3	5 vs 6	3 vs 6
Mothers									
Age (years)	27.0	25.8	26.2	27.9	26.7	27.5	ns	ns	<0.05
BMI	19.2	18.8	18.5	19.6	19.1	18.5	<0.001	<0.05	ns
*Schooling (%)	66.6	49.9	31.1	80.8	70.3	45.4	<0.00	<0.01	<0.01
Children									
Age (month)	20.1	20.2	20.7	22.3	20.8	21.9	ns	ns	ns
Girls (%)	52.4	47.5	48.0	41.0	44.6	51.4	ns	ns	ns
Nutritional status (mean z-score)									
Weight-for-age	-1.7	-1.9	-2.0	-1.7	-1.8	-2.0	ns	ns	ns
Height-for-age	-1.7	-2.0	-2.1	-1.9	-1.8	-2.3	ns	0.013	ns
Weight-for-height	-1.1	-1.2	-1.2	-1.0	-1.1	-1.2	ns	ns	ns
n	917	2335	1200	194	272	121			

*Ever been in school

ns: not significant at 5% level

The prevalence of underweight (weight-for-age), stunting (height-for-age), and wasting (weight-for-height) by children's and mother's characteristics are shown in Table 3. About half of the study children were underweight (45%) and stunted (50%), and one-fifth (21%) wasted. The mean age of mothers of children with different undernutrition types were 27.2, 26.9, and 27.5 years while the mean z-scores of children's anthropometry were -2.82, -3.01, and -2.70 respectively.

The prevalence of underweight (47.1%) and stunting (52.2%) was more in children of mothers who were divorced, separated or widowed at the time of data collection as opposed to the children of the mothers who were married at the time of data collection (Table 3). Children of mothers who had some schooling showed better nutritional status

in all aspects compared to mothers who had never been to school. As expected, mothers who were better nourished (i.e., Body-mass index > 18.5) had fewer percentage of malnourished children. The prevalence of undernutrition was more in boys compared to the girls in terms of all types of undernutrition. In general, the older age groups were more undernourished compared to their younger ones.

A gradual change in percentage of underweight, stunted, and wasted children has been observed with household economic status of the households. The poorer households had more undernourished children compared to the non-poor households.

Table 3. Characteristics of mothers and children by categories of undernutrition.

Variables	Underweight (weight-for-age) (%) <i>n</i> =2265	Stunted (height-for-age) (%) <i>n</i> =2530	Wasted (weight-for-height) (%) <i>n</i> =1036
Mothers			
<i>Marital status</i>			
Currently married	44.8	49.9	20.6
Others	47.1	52.2	18.2
<i>Schooling</i>			
Some	42.0	46.8	19.0
Never been	47.7	53.0	22.0
<i>Body-mass index (BMI)</i>			
≥ 18.5	40.0	47.8	17.3
<18.5	50.5	52.4	24.2
Children			
<i>Sex of the child</i>			
Boy	44.3	49.5	20.5
Girl	39.6	42.9	17.3
<i>Age category</i>			
6-11 months	34.9	36.1	18.5
12-23 months	44.4	52.4	22.6
24-36 months	51.0	56.1	20.1
Household economic status			
STUP I NP	37.2	42.6	19.4
STUP I NTP	46.2	51.5	20.6
STUP I TUP	49.7	53.5	22.5
STUP II NP	34.0	40.2	14.4
STUP II NTP	43.7	48.1	18.7

Mother's nutritional knowledge and practices and child nutritional status

Mothers of wellnourished children had higher scores on the nutritional knowledge index indicating better nutritional knowledge compared to the mothers of underweight (i.e., weight-for-age) and stunted children (i.e., height-for-age) (Table 4). Chi square analysis shows no association between the variables used in the nutritional knowledge index and wasting. The index variable, "Iodized salt should be used" and "Should take iron tablets during pregnancy", however, showed significant association ($p<0.01$ and $p<0.001$) with underweight. These two variables were also found significantly ($p<0.001$ and $p<0.001$) associated with stunting.

Table 4. Associations between maternal nutritional knowledge and practices and child nutritional status

Variables	Underweight (weight-for-age) (%) n=2265	Stunted (height-for-age) (%) n=2520	Wasted (weight-for-height) (%) n=1036
Colostrum should be given to the baby			
Yes	44.73	49.96	20.43
No	48.48	50.84	22.56
X ² Significance	ns	ns	ns
Child's age at which complementary food should be introduced			
After 6 months	44.77	50.41	21.14
Before 6 and after 7 months	45.01	49.87	20.35
X ² Significance	ns	ns	ns
Eating green, yellow or orange vegetables is important			
Yes	44.86	49.89	20.54
No	54.17	62.50	22.92
X ² Significance	ns	ns	ns
Iodized salt should be used			
Yes	43.68	48.03	20.55
No	49.00	56.33	20.58
X ² Significance	<0.01	<0.001	ns
Vitamin A capsule should be taken after delivery			

Yes	45.32	49.85	20.72
No	43.98	50.43	20.13
X ² Significance	ns	ns	ns
Should take iron tablets during pregnancy			
Yes	41.26	46.85	20.22
No	51.89	55.94	21.20
X ² Significance	<0.001	<0.001	ns

ns: Not significant at the 5% level

The results from the regression analysis show that maternal nutritional knowledge (i.e., index) is a significant predictor ($p < 0.05$ and $p < 0.01$) of child nutritional status in terms of adjusted height-for-age but only in children between ages 6 to 23 months (Table 5). The models, however, show no effect of maternal nutritional knowledge on nutritional status of children (i.e., weight-for-age and weight-for-height) in any of the age groups. Maternal nutritional status (i.e., BMI) was found to be a significant predictor of weight-for-age and weight-for-height for all age groups, but of height-for-age only in age 24-36 month group.

Table 5. Effect of mothers' nutritional knowledge on weight-for-age (WAZ), height-for-age (HAZ), and weight-for-height (WHZ).

		Coefficient	<i>p</i> value	95% conf. interval	
6-11 months	†WAZ	-.000	ns	-.073	-.073
	†HAZ	.093	<0.05	.008	.178
	‡WHZ	-.067	ns	-.150	-.015
12-23 months	†WAZ	.046	ns	-.009	.103
	†HAZ	.105	<0.01	.034	.175
	‡WHZ	-.007	ns	-.069	.054
24-36 months	†WAZ	.001	ns	-.043	.046
	†HAZ	-.014	ns	-.073	.044
	‡WHZ	.011	ns	-.033	.057

† Nutritional status and education of mothers, sex and age of the children, household economic status has been controlled for.

‡ Nutritional status and education of mothers, sex, height, and age of the children, household economic status has been controlled for.

ns: Not significant at the 5% level

Discussion and conclusion

This study aimed at investigating the nutritional knowledge of mothers participating in CFPR-TUP programme and its association with child nutritional status. Our results show that mother's nutritional knowledge (i.e., the index) is positively associated with the nutritional status of children under age 24 months in terms of stunting (i.e., height-for-age). The lack of association in the older age group may be explained by the fact that stunting happens during the earlier age when children's demand for nutrients is high but the quality and quantity of diets are poor. Although no causality could be established due to the cross-sectional nature of the study, the association has particular importance as it implies positive impact of mothers' nutritional knowledge on long-term nutrition (Black, Allen *et.al.* 2008).

As expected, few of the individual variables that made up the nutritional knowledge index were also found to be independently associated with nutritional status. Although feeding colostrum is important for child nutrition and its prevalence has been found to be very high in our study (94%), we found no association between colostrum feeding and nutritional status. The lack of association may have been due to introduction of prelacteal feeding which is detrimental to the health and nutritional status of the children. This study did not investigate the use of prelacteal feeds and therefore cannot exclude the resultant onset of diseases such as diarrhea leading to undernutrition.

Studies show both significant associations (Webb and Block 2003) and lack of associations (Grant and Stone 1986) between mother's nutritional knowledge and child nutritional status. Caution, however, is needed when comparing the findings as such studies report on different indices of anthropometric measurements, variable age groups, and different composition of nutritional knowledge scale. Our study suggests that specific components of maternal nutritional knowledge may be related only to specific anthropometric measures.

The findings from this study give further support to the evidence that maternal nutritional knowledge is important in reducing long-term child malnutrition (height-for-age) up to the age of 23 months. Programmes targeting rural women should therefore emphasize

more on improving nutritional knowledge of mothers and take measures to effectively translate this knowledge into practice.

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