

Maternal Nutritional Status as a Determinant of Child Health

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Summary

To determine the relationship between the nutritional status of the mother and that of the child, 339 children aged 3–36 months and their mothers in two urban hospitals and a community out-patient clinic, were studied. The weight and height of both children and their mothers were measured, and body mass indices (BMI) of the mothers were calculated. Socio-economic status, maternal educational level, and dietary information were recorded in a predesigned questionnaire. The child's nutritional status, as indicated by weight for age (as a percentage of NCHS median), was associated with the body mass index of the mother ($P < 0.001$), socio-economic status of the family ($P < 0.001$), and breastfeeding status of the child ($P < 0.005$) in a multivariate analysis after adjusting for several prognostic factors. The results indicate that maternal nutritional status is a proximate determinant of a child's nutritional status and should be considered in programmes aiming at improving child health.

Introduction

Each year about 13 million infants and children under 5 years of age die in developing countries and most of these deaths can be related to undernutrition.¹ Studies in Bangladesh have shown that undernutrition is a major risk factor for childhood mortality.^{2–4} Infectious diseases are more frequent and run a more severe course in nutritionally deprived children.⁵ The association between child health and certain socio-economic indicators, such as maternal education and family occupation, has been well documented in previous studies.^{6,7} Maternal variables affecting fetal growth and birth weight have also been identified.^{8,9} However, relationship between the nutritional status of the mother and that of the child has not been precisely defined. To determine this, we carried out a nutrition survey among mothers and their children attending

two urban hospitals and a community out-patient clinic.

Subjects and Methods

The survey consisted of two parts:

1. anthropometric measurements of mothers and their children;
2. interviews with the mothers to elicit their socio-economic status.

Subjects were selected from two hospitals and a community out-patient clinic. The hospitals were the Clinical Research Centre of the International Centre for Diarrhoeal Diseases Research, Bangladesh, which manages patients, mostly children, with diarrhoea, and the Dhaka Shishu Hospital, which is a multi-disciplinary children's hospital. The out-patient clinic is attended by children coming from a peri-urban community of Dhaka city and who have minor illnesses such as respiratory tract infections (RTI), skin and ear infections, helminthiasis, diarrhoeal illnesses, etc. The study was carried out during the month of January 1990. Children ranging in age from 3 to 36 months were randomly selected. One-hundred-and-fifty children in the hospitals and 189 in the community clinic were enrolled in the study. Mothers were interviewed regarding their socio-economic status, using a predesigned questionnaire. Socio-economic variables included family income, housing type, latrine type (sanitary or not), and household assets. Dietary information, including the breastfeeding status of the child, were recorded. Maternal education, in terms of years of schooling, was noted. The weight and height

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of the children and their mothers were taken. Children were weighed (after correction of dehydration in diarrhoeal patients) using a scale (Salter Co., England) with a precision of 100 g, and the supine length was measured with a locally made length-board with 1 mm precision. Maternal weight was taken with standard bathroom scales (100 g precision) and height with locally made vertical length scales (1 mm precision).

Data Analysis

All data were entered using the StatPac Gold package (Walonick Associates, Minneapolis, USA). Analysis was carried out with the SPSS-PC + software package (SPSS Inc., Chicago, USA). Anthropometric calculations were done using the National Centre for Health Statistics standards package (NCHS, CDC, USA).

A scoring system was used to quantify the socio-economic status (SES) as follows:

Assets: 0 = none; 1 = simple belongings; 2 = TV + fridge; 3 = car + TV + fridge.

House type: 1 = thatched; 2 = tin; 3 = building.

Toilet: 0 = non-sanitary; 1 = sanitary.

Family income (taka/month): 1 = < 1000; 2 = 1100–2000; 3 = 2100–3000; 4 = > 3000 (US \$1 = 39.00 Taka).

Adding the individual scores, an aggregate score for SES was computed. Based on this score, which ranged from 2 to 11, a family could be classified into low (2–4), middle (5–6), or upper socio-economic groups (7–11). Mother's nutritional status was defined in terms of body mass index (BMI = weight in kg/height in metres²). Univariate comparisons of continuous variables were performed by the Student's *t*-test. Analysis of variance (ANOVA) was used to compare different groups. Statistical significance was accepted at 5 per cent probability level.

Results

The nutritional status, as expressed in weight for age and weight for height (wt/ht not shown in table) of all children was significantly associated with the BMI of their mothers (Table 1). Mothers with higher values of

BMI had better nourished children than those with lower values. The nutritional status of the children was also directly related to their socio-economic class. When stratified according to socio-economic classes, a significant relationship was found between the nutritional status of the children and that of the mothers in the lower and middle socio-economic groups. In the upper socio-economic class, the nutritional status of the children of the better nourished mothers was also better than that of their undernourished counterparts. However, the difference was not statistically significant (Table 2).

To see the effect of other associated factors, a multiple regression analysis was performed taking age, sex, birth rank, and breastfeeding status of the child, SES, mother's BMI, and educational level of the mother as independent variables and weight for age of the child as the dependent variable. After adjusting for SES, maternal educational level, age of the child, birth rank, and breastfeeding status, a significant association between the child's nutritional status and the mother's BMI persisted (Table 3). Interaction between maternal BMI and SES (BMI × SES) was also examined in the regression analyses (not shown) which did not show any association with child's nutritional status.

Discussion

The study showed the association of the nutritional status of the child with various factors like SES, breastfeeding status, and mother's nutrition.

This study highlighted the relationship existing between maternal and child nutrition. Better nourished mothers were shown to have healthier children, a relationship that was statistically significant in the lower and middle socio-economic groups. However, this relationship, although present, was not statistically significant in the higher SES group. The reason could be the small sample size.

The problem of maternal malnutrition in a country like Bangladesh is a complex one with several underlying causes. Poverty is a direct cause of maternal undernutrition because mothers from poor families are nutritionally deprived during childhood and adolescence, and this does not improve when they are married. Social causes, like early marriage, frequent childbirth, lack of proper birth spacing, and discrimination of intrahousehold food distribution in a male dominated family all exacerbate the state of maternal undernutrition.^{10,11} In our study, undernourished mothers had little or no education and mostly came from poor families. Such mothers usually give birth to low birth-weight babies though information on birth weights of the children in our study is not available. Multiple regression analysis showed that breastfeeding significantly contributed to the nutritional well-being of the children. On the other hand, undernourished mothers probably could not

TABLE 1

Mother's body mass index (BMI) and child's weight for age (as a percentage of NCHS median)

Mother's BMI	No.	Child's wt/age mean (95% CI)
≤ 18.00	133	71 (69–73)*
18.01–19.9	112	73 (71–75)
20.00–22.9	61	78 (75–81)
≥ 23.0	17	81 (75–87)

* *P* value < 0.001 (Anova).

TABLE 2
Association of the child's nutritional status (wt/age) with the mother's body mass index and socioeconomic classes

Socioeconomic status*	Mother's body mass index (BMI)		P value
	<20.0 mean (95% CI)	≥20.0 mean (95% CI)	
Low	69 (67-71)	75 (70-80)	<0.05
Middle	72 (70-74)	79 (74-84)	<0.05
Upper	77 (73-81)	81 (76-86)	0.15

* Socioeconomic status (score): low, ≤4; middle, 5-6; upper, ≥7.

TABLE 3
Factors affecting weight for age of the child expressed as a percentage of 50th centile of NCHS (the dependent variable): a multiple regression analysis

Independent variable	Coefficient	Standard error	P value
BMI* (continuous variable)	1.127	0.283	0.0001
SES** (continuous variable)	1.703	0.396	0.0000
Breastfeeding (yes = 1, no = 0)	5.535	1.674	0.0011
Age of child (months; continuous variable)	0.081	0.073	0.2708
Mother's schooling (0 = no education, 1 = 1-5 years, 2 = ≥6 years)	0.519	1.103	0.6382
Birth rank (2 = 2 & 3, 3 = ≥4)	-0.687	0.843	0.4155
Constant	38.620	6.123	0.0000

* Body mass index of mother.

** Socioeconomic status.

Multiple $R=0.443$, R square = 0.197, $F=12.80$.

breast-feed their children adequately, which could have contributed to the poor nutrition of their children.¹²

Undernourished mothers may have undernourished children due to several reasons:

1. Such mothers give birth to low-weight babies.⁹
2. Being lactationally inadequate, they rear lighter children.¹²
3. Undernourished mothers are poor and illiterate and, as such, their children are deprived of proper weaning foods and primary health care facilities.

We conclude that inadequate nutrition of mothers is strongly related to the undernutrition of their children. Thus, any mass nutrition programme should have components of nutritional intervention including health education, and family planning for the mothers and adolescent females of the economically backward classes.

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