

Short Communication

Nutritional status of children <5 years of age who have a working mother: an epidemiological perspective of diarrhoeal children in urban Bangladesh

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Abstract

Objective: The present analysis aimed to observe nutritional impacts among children <5 years of age by mother's engagement in paid employment.

Design: Between 1996 and 2012, 21 443 children <5 years of age with diarrhoea attended the International Centre for Diarrhoeal Disease Research, Bangladesh (icddr, b), Dhaka Hospital. They were enrolled in the hospital-based Diarrhoeal Disease Surveillance System and their relevant information was extracted from the electronic database.

Setting: The icddr,b, Bangladesh.

Subjects: The analytic sample was 19 597 children aged <5 years who had a mother aged ≤35 years with or without engagement in paid employment.

Results: Eleven per cent of the mothers (*n* 2051) were currently engaged in paid employment on behalf of the family. Univariate analysis showed that children with mothers engaged in paid employment had a 1·14 times higher risk of being undernourished, a 1·20 times of higher risk of being stunted, a 1·21 times higher risk of being wasted and a 1·31 times higher risk of being underweight (risk ratios) than were children with mothers not likewise engaged. Multivariate analysis showed that such associations remained significant for stunting (1·08; 95% CI 1·00, 1·16), wasting (1·15; 95% CI 1·06, 1·25) and underweight (1·09; 95% CI 1·02, 1·17) after controlling for covariates.

Conclusions: Mothers' engagement in income-generating employment was associated with undernutrition in children <5 years of age in urban Bangladesh.

Keywords
Children
Nutritional status
Mother's gainful employment
Undernutrition

Optimal care and feeding practices, including breast-feeding, in infancy and early childhood are important for satisfactory growth, health and development of children⁽¹⁾. Poor feeding practices and inadequate care of the child, coupled with high rates of infectious diseases, are the proximate causes of malnutrition⁽²⁾. Mothers' participation in income-generating activities in addition to their domestic activities results in reduced time for childcare⁽³⁾. Globally, economic empowerment of women is reported to have increased rapidly over the last decades^(4,5). As in other South Asian countries, economic

empowerment of women has also been demonstrated in Bangladesh⁽⁶⁾. However, the effect of mothers' employment on their children's health and nutrition is not well understood and conflicting results have been reported^(3,7).

The International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b) has been maintaining a Diarrhoea Disease Surveillance System (DDSS) in Dhaka Hospital since 1979⁽⁸⁾. Many of the mothers of the children enrolled in the DDSS have gainful employment. Thus, we sought to assess the impact of maternal engagement in

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paid employment on the nutritional status of their <5-year-old children with diarrhoea and to compare the results with those for children whose mothers stay at home.

Between 1996 and 2012, 21 443 children <5 years of age were included in the DDSS. For the present study, we selected children of mothers aged ≤ 35 years, assuming that mothers participating in any gainful employment on behalf of their families are of this age. Additionally, the majority of mothers are likely to have one or two children aged <5 years by this age⁽⁹⁾. Indeed, 19 585 mothers who presented with their <5-year-old diarrhoeal children were aged ≤ 35 years and comprised the present analytic sample size. Maternal gainful employment was defined as current maternal engagement in any activities that generate a cash income for the family, in addition to their childcare and household activities. According to the WHO guidelines⁽¹⁰⁾, children with undernutrition are defined as those with stunting (height-for-age Z-score < -2.00), with wasting (weight-for-height Z-score < -2.00) or who are underweight (weight-for-age Z-score < -2.00)⁽¹¹⁾.

Statistical analyses were performed using the statistical software package IBM SPSS Statistics Version 22.0. Comparative statistics were performed for all explainable variables such as sociodemographic characteristics and nutritional status between children of working mothers and of non-paid working mothers. The wealth index is a well-known measure of socio-economic status that uses information on household possessions. Principal component

analysis (factor analysis) facilitates understanding of the wealth index. A weight was attached to each item from the first principal component. The variables included were construction materials of the wall, roof and floor, along with the household assets. The categories for household floor were cemented or non-cemented, and those for each household functioning asset were 'owned' or 'not owned' by the household. The households were classified into quintiles of socio-economic status based on the wealth index: the 1st, 2nd, 3rd, 4th, and 5th quintiles. Poisson regression was performed using different models to examine the association with the outcome of interest (overall undernutrition and stunting, wasting and underweight) and the main exposure being mother's working status. One bivariate (model 1) and three multivariate models (models 2–4) were performed to observe the effects of mother's engagement in paid employment on the child's nutritional status after controlling for covariates as follows. In model 1, mother's involvement in a paid job; in model 2, model 1 plus sex (male=1, female=0), age (0–11 months=0, 12–23 months=1, 24–59 months=2), cough or fever within 1 month (yes=1, no=0) and diarrhoeal duration before hospitalization (≥ 4 d=1, < 4 d=0); in model 3, model 2 plus maternal literacy (higher secondary and more=0, secondary=1, primary=2, and illiteracy=3), wealth index (rich=0, upper middle=1, middle=2, lower middle=3 and poor=4), monthly family income ($< \$US 100 = 1$, $\geq \$US 100 = 0$) and family size

Table 1 Sociodemographic characteristics and nutritional status of <5-year-old diarrhoeal children whose mothers aged ≤ 35 years were with or without engagement in paid employment, Bangladesh, 1996–2012

	Children with paid working mothers (<i>n</i> 2051)		Children with non-paid working mothers (<i>n</i> 17 534)	
	<i>n</i>	%	<i>n</i>	%
Child's age (months)				
0–11	1007	49.1	10 354	59.1
12–23	590	28.8	4822	27.5
24–59	454	22.1	2358	13.4
Male children	1186	57.8	10 874	62.0
Mother's educational status				
Illiterate	887	43.2	5307	30.3
Primary (1–5 class)	395	19.3	3501	20.0
Secondary (6–10 class)	288	14.0	5489	31.3
Higher secondary and more (>10 class)	481	23.5	3237	18.4
Socio-economic status by wealth index				
Poor	420	20.4	4112	23.4
Lower middle	227	11.1	2753	15.7
Middle	391	19.1	3740	21.3
Upper middle	433	21.1	3588	20.5
Rich	580	28.3	3341	19.1
Monthly family income (<\$US 100)	1184	57.8	9534	54.4
Number of family members (≤ 5)	1527	74.5	11 665	66.5
Cough and/or fever	1437	70.1	12 482	71.2
Duration of diarrhoea before coming to hospital (≤ 3 d)	1442	70.3	11 831	67.5
Child's nutritional status				
Undernutrition	1189	58.0	8943	51.0
Stunting (<i>n</i> 19 216)	818	40.7	5839	33.9
Wasting (<i>n</i> 19 190)	676	33.7	4430	25.8
Underweight (<i>n</i> 19 337)	1002	49.8	7117	41.4

Table 2 Association between nutritional status of <5-year-old diarrhoeal children and mother's involvement in paid employment in urban Bangladesh, 1996–2012†

	Undernourished		Stunting		Underweight		Wasting	
	RR	95% CI	RR	95% CI	RR	95% CI	RR	95% CI
Model 1	1.1***	1.1, 1.2	1.2***	1.1, 1.3	1.2***	1.1, 1.3	1.3***	1.2, 1.4
Model 2	1.1**	1.0, 1.2	1.2***	1.1, 1.2	1.2***	1.1, 1.3	1.3***	1.2, 1.4
Model 3	1.1	0.9, 1.1	1.1	0.9, 1.2	1.1*	1.0, 1.2	1.2**	1.1, 1.3
Model 4	1.1	0.9, 1.1	1.1*	1.0, 1.2	1.1**	1.0, 1.2	1.2**	1.1, 1.3

RR, relative risk.

Model 1 adjusted for mother's involvement in a paid job.

Model 2 adjusted for covariate in model 1 plus sex, age, cough or fever within 1 month, and diarrhoeal duration before hospitalization.

Model 3 adjusted for covariates in model 2 plus maternal literacy, wealth index, monthly family income and family size.

Model 4 adjusted for covariates in model 3 plus year of hospitalization (continuous, 1996–2012).

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

†Outcome: overall undernutrition, stunting, wasting or underweight; main exposure: mother's involvement in a paid job; reference categories: mother not involved in any paid-job activities.

($\leq 5 = 1$, $> 5 = 0$); and in model 4, model 3 plus year of hospitalization (continuous, 1996–2012).

Of the 19 585 children, 11% (n 2051) had mothers who were currently engaged in paid employment on behalf of the family. The detailed baseline sociodemographic and nutritional characteristics of children of the paid working mothers and the non-paid working mothers are shown in Table 1. The children of mothers who were engaged in paid employment had a 1.14 times higher risk of undernutrition (presence of three: stunting and/or wasting and/or underweight) than did children of mothers not engaged in paid employment. A similar association was found for each individual indicator of undernutrition (stunting, wasting and underweight) in both the unadjusted and adjusted models (Table 2).

Although the children of paid working mothers were more undernourished than were those of non-paid working mothers, the causal association between undernutrition status of children and mother's engagement in paid-job activities is difficult to explain due to the cross-sectional study design as well as lack of information on the paid working mothers' working hours, length of engagement in the workplace and other detailed background information.

Globally, women's empowerment including their education status and engagement in paid work has improved and the structure of families has changed in the last few decades, especially in developing countries^(4,6). However, the main reason for mothers' participation in the workforce is their family's poor socio-economic context, particularly in developing countries^(3,12). Despite often living in slums⁽¹³⁾ and a quarter coming from high wealth-index families, children of paid working mothers were from families with relatively less monthly family income than their counterparts from families with non-paid working mothers. Moreover, the median monthly income of working mothers was only \$US 22.0, indicating their unskilled or unprofessional occupational status. Two contradictory dimensions of educational status were observed for paid working mothers: more illiteracy and higher level of education than their non-paid working

counterparts. On the basis of this information, we can conclude that participation of women in the labour force has a positive association with poverty, which has both positive and negative effects on child health^(12,14).

The present study was conducted in an urban hospital; thus, the research participants may not be representative and the findings may not be generalizable because these children had diarrhoea, which is known to be associated with childhood undernutrition. However, the strength of the study was that it investigated a large number of children with diarrhoea and over a longer period, without any bias in selection, than has been done previously.

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References

1. Agarwal RK (2008) Importance of optimal infant and young child feeding (IYCF) in achieving millennium development goals. *Indian Pediatr* **45**, 719–721.
2. World Health Organization (2002) Summary of guiding principles for complementary feeding of the breastfed child. In *Complementary Feeding: Report of the Global Consultation, Geneva, 10–13 December 2001*. Geneva: WHO, pp. 11–12; available at http://www.who.int/nutrition/publications/Complementary_Feeding.pdf
3. Lamontagne JF, Engle PL & Zeitlin MF (1998) Maternal employment, child care, and nutritional status of 12–18-month-old children in Managua, Nicaragua. *Soc Sci Med* **46**, 403–414.
4. Bartley M & Owen C (1996) Relation between socio-economic status, employment, and health during economic change, 1973–93. *BMJ* **313**, 445–449.
5. Minton JW, Pickett KE & Dorling D (2012) Health, employment, and economic change, 1973–2009: repeated cross sectional study. *BMJ* **344**, e2316.
6. Dalal K, Shabnam J, Andrews-Chavez J *et al.* (2012) Economic empowerment of women and utilization of maternal delivery care in Bangladesh. *Int J Prev Med* **3**, 628–636.
7. Powell CA & Grantham-McGregor S (1985) The ecology of nutritional status and development in young children in Kingston, Jamaica. *Am J Clin Nutr* **41**, 1322–1331.
8. Stoll BJ, Banu H, Kabir I *et al.* (1985) Nightblindness and vitamin A deficiency in children attending a diarrheal disease hospital in Bangladesh. *J Trop Pediatr* **31**, 36–39.
9. UNICEF (2010) Women and girls in Bangladesh. http://www.unicef.org/bangladesh/Women_and_girls_in_Bangladesh.pdf (accessed December 2015).
10. de Onis M & Onyango AW (2008) WHO child growth standards. *Lancet* **371**, 204.
11. Ferdous F, Das SK, Ahmed S *et al.* (2013) Severity of diarrhea and malnutrition among under five-year-old children in rural Bangladesh. *Am J Trop Med Hyg* **89**, 223–228.
12. Toyama N, Wakai S, Nakamura Y *et al.* (2001) Mother's working status and nutritional status of children under the age of 5 in urban low-income community, Surabaya, Indonesia. *J Trop Pediatr* **47**, 179–181.
13. Ferdous F, Das SK, Ahmed S *et al.* (2014) Diarrhoea in slum children: observation from a large diarrhoeal disease hospital in Dhaka, Bangladesh. *Trop Med Int Health* **19**, 1170–1176.
14. Bartley M, Sacker A & Clarke P (2004) Employment status, employment conditions, and limiting illness: prospective evidence from the British household panel survey 1991–2001. *J Epidemiol Community Health* **58**, 501–506.