Maternal Exposure to Intimate Partner Violence and the Risk of Undernutrition Among Children Younger Than 5 Years in Bangladesh

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Objectives. We examined the association between maternal experiences of intimate partner violence (IPV) and the risk of undernutrition among children younger than 5 years in Bangladesh.

Methods. We used data from the 2007 Bangladesh Demographic Health Survey. Our analyses were based on the responses of 1851 married women living with at least 1 child younger than 5 years. Exposure was determined from maternal reports of physical and sexual IPV. Outcomes included underweight, stunting, and wasting.

Results. Twenty-nine percent of the respondents had experienced IPV in the year preceding the survey. Maternal experience of any physical or sexual IPV was associated with an increased risk of stunting (adjusted odds ratio [AOR] = 1.59; 95% confidence interval [CI] = 1.23, 2.08) and underweight (AOR = 1.33; 95% CI = 1.04, 1.71) but was not significantly associated with wasting (AOR = 1.08; 95% CI = 0.78, 1.49).

Conclusions. The association between maternal exposure to physical or sexual IPV and child underweight and stunting suggests that partner violence plays a significant role in compromising child health by impairing child nutrition. Our findings reinforce the evidence that improving child nutrition is an additional reason to strengthen efforts to protect women from physical and sexual IPV. (*Am J Public Health.* 2012;102:1336–1345. doi:10.2105/AJPH.2011.300396)

There has been substantial progress over the past decade in reducing child undernutrition. However, Bangladesh continues to have one of the highest rates of child undernutrition in the world,[1,2] and this condition is the leading cause of child morbidity and mortality in the country.[3,4] In 2005, nearly half of Bangladeshi children were underweight or stunted, and roughly two thirds of deaths among children younger than 5 years were attributed to undernutrition.[4]

Although biological,[5,6] environmental,[7,8] and socioeconomic[9–11] risk factors for child undernutrition are well documented, research has only begun to investigate the influence of other aspects of the social environment. Intimate partner violence (IPV), defined as the range of sexually, physically, and psychologically coercive acts perpetrated against women by current or former male intimate partners,[12] is considered to be one of the psychosocial factors that might influence child undernutrition.[13] IPV can place psychological stress on children who observe IPV, and stress in turn can affect immune reactivity, predisposing children to severe and chronic infections, most commonly infectious diarrhea.[14] These infections further compromise children's nutritional status. More directly, IPV can affect child nutritional status through familial circumstances such as the withholding of food by abusive family members[15] or through physical or psychological maternal health outcomes[13] that prevent proper care of the child.[16]

Within and outside of South Asia, increasing evidence has shown a linkage between high rates of IPV among women[17–20] and poor infant and child health outcomes such as miscarriage,[21,22] morbidity,[23–25] and mortality.[26–29] However, few studies have been conducted in South Asia to assess the relationship between maternal experiences of IPV and poor child nutritional outcomes. The only study examining this issue was an investigation in India involving a statewide sample. It revealed an association between experiences of physical IPV in the preceding year and chronic undernutrition among children.[30] In addition, outside of South Asia, results from a hospital-based study in Brazil indicated a 3-fold increase in the risk of severe acute malnutrition among children aged 1 to 24 months in families with severe and recurrent physical partner abuse.[31]

However, the Indian study measured only physical IPV and did so via only a single global question, and the study in Brazil measured only physical IPV via hospital-based data. There is a clear need to use behaviorally specific questions and nationally representative data to better understand whether physical and sexual IPV are associated with child undernutrition. We examined the association of physical and sexual IPV with child underweight, stunting, and wasting in a nationally representative sample of households in Bangladesh.

METHODS

We used data from the 2007 Bangladesh Demographic Health Survey (BDHS), conducted by the National Institute for Population Research and Training of the Ministry of Health and Family Welfare of Bangladesh from March 24, 2007, to August 11, 2007. The BDHS sample was drawn from Bangladeshi adults residing in private dwellings. A stratified, multistage cluster sample of 361 primary sampling units was constructed (134 in urban areas and 227 in rural areas). The primary sampling units were derived from a sampling frame created for the 2001 Bangladeshi census.

The 2007 BDHS used 5 questionnaires. Of the 11 178 ever-married women aged 15 to

49 years deemed eligible to complete the women's questionnaire on maternal and child health behaviors and outcomes, 10 996 did so (response rate=98.4%). One woman from each household was selected at random for the domestic violence module to answer an additional set of questions regarding IPV perpetrated by her husband.

Of 4489 women eligible to respond to the domestic violence module, only 7 had to be excluded owing to lack of privacy (husbands or other respondents were present in the household during the interview period). Privacy is important because an abusive husband's discovery that his wife has disclosed details on IPV to an interviewer could put the woman at risk for further violence. An additional 15 women were not interviewed for other reasons. In our analyses, we included only currently married women aged 15 to 49 years living with at least 1 child younger than 5 years (n=1851; for details on sample selection, see Figure A, available as a supplement to the online version of this article at http://www.ajph.org).

Outcome Measures

The 2007 BDHS included an anthropometric component in which all children younger than 5 years were weighed and measured. The UNISCALE was used to measure body weight, and a stadiometer was used to measure height or length.[32] Children younger than 24 months were measured while lying down on a board (recumbent length). Standing height was measured for older children.

To provide a complete assessment of nutritional status, we analyzed 3 anthropometric outcome variables: low height for age (stunting), low weight for height (wasting), and low weight for age (underweight). We classified children as stunted (chronically undernourished), wasted (acutely undernourished), or underweight if their height-for-age, weight-for-height, or weight-for-age *z* score was 2 standard deviations below the median of the World Health Organization's reference population. Binary variables were created to define stunting, wasting, and underweight.

Exposures

Women's experience of IPV was the main exposure of interest in this study. In the BDHS, IPV was measured with a shortened and

TABLE 1—Sociodemographic, Nutritional, and IPV Characteristics Among Mothers of Children Younger Than 5 Years (n=1851): Bangladesh Demographic Health Survey, 2007

Characteristic	No.	% (95% CI)
Maternal age, y		
15–24	816	49.0 (46.2, 51.9)
25–34	840	41.2 (38.5, 44.1)
35–49	195	9.7 (8.2, 11.4)
Maternal education		
No education	565	29.2 (26.7, 31.9)
Primary	511	27.0 (24.6, 29.6)
Secondary or higher	775	43.8 (41.0, 46.6)
Maternal decision-making autonomy, no. of aspects[a]		
0	223	11.0 (9.0, 13.0)
1	126	6.9 (5.5, 8.4)
2	199	11.8 (9.9, 14.1)
3	272	15.1 (12.9, 17.4)
4	308	16.3 (14.4, 18.5)
5	721	38.9 (36.0, 41.9)
Data missing	2	
Maternal BMI category[b]		
Thin	591	32.0 (29.3, 34.9)
Normal	1088	60.4 (57.7, 63.2)
Overweight/obese	167	7.6 (6.2, 9.8)
Data missing	5	
Area of residence		
Rural	1200	78.5 (76.3, 80.6)
Urban	651	21.5 (19.4, 23.7)
No. of household members (tertiles)		
2–4	627	30.4 (27.8, 33.1)
5–6	716	36.6 (33.8, 39.6)
≥7	508	33.0 (30.1, 35.9)
Parity, no. of children		
1	546	33.7 (30.9, 36.6)
2	556	28.7 (26.4, 31.3)
≥3	749	37.5 (35.1, 40.1)
Maternal occupation		
Unemployed	1322	69.6 (66.9, 72.3)
Agriculture/nonmanual labor	369	22.7 (20.4, 25.2)
Manual labor	157	7.7 (6.2, 9.1)
Data missing	3	
Wealth index category		
Poor	812	46.0 (43.1, 49.0)
Middle	317	16.7 (14.8, 18.8)
Rich	722	37.3 (34.4, 40.2)
Child age, mo		
0–11	440	24.5 (22.1, 27.1)
12–23	436	24.4 (22.0, 26.9)
24–35	394	21.0 (18.9, 23.3)
36–59	581	30.1 (27.6, 32.8)

Continued

TABLE 1—*Continued*

Child gender		
Female	931	49.9 (47.0, 52.8)
Male	920	50.1 (47.2, 53.0)
Initiation of breastfeeding		
Early	635	34.2 (31.6, 36.8)
Late	1212	65.8 (63.2, 68.4)
Data missing	4	
Duration of breastfeeding, mo		
0–11	497	27.7 (25.2, 30.2)
12–23	528	29.5 (27.0, 32.2)
≥24	824	42.8 (40.2, 45.5)
Data missing	2	
Stunting		
No	1081	58.0 (55.4, 61.1)
Yes	770	42.0 (38.8, 44.5)
Underweight		
No	1099	59.2 (56.3, 62.2)
Yes	752	40.8 (38.0, 43.7)
Wasting		
No	1504	81.0 (78.4, 83.3)
Yes	347	19.0 (16.7, 21.6)
Recent child illness		
No	1007	54.4 (51.3, 57.3)
Yes	844	45.6 (42.7, 48.9)
Any physical or sexual IPV		
No	1290	71.0 (68.4, 73.4)
Yes	559	29.0 (26.6, 31.6)
Data missing	2	
Types of physical IPV, no.		
0	1396	77.2 (74.8, 79.5)
1	150	8.1 (6.6, 9.8)
2	118	5.9 (4.7, 7.4)
≥3	185	8.8 (7.4, 10.4)
Data missing	2	
Form of IPV		
None	1290	71.0 (68.4, 73.4)
Physical only	315	15.5 (13.6, 17.6)
Sexual only	106	6.2 (5.0, 7.8)
Both physical and sexual	138	7.3 (5.9, 8.9)
Data missing	2	

Note. BMI = body mass index (defined as weight in kilograms divided by the square of height in meters); CI = confidence interval; IPV = intimate partner violence. Numbers are unweighted; percentages are weighted.
[a]Aspects of family decisions a woman participated alone or jointly in making.
[b]BMI categories were thin (<18.5), normal (18.5–24.9), or overweight–obese (≥25).

modified version of the Conflict Tactics Scale.[33,34] Perpetration of IPV by the woman's husband in the year prior to the survey was assessed via 8 survey items. Women who reported that their husband engaged in any of the following behaviors were classified as having experienced physical IPV:

1. pushing, shaking, or throwing an object;
2. slapping;
3. pulling hair or twisting an arm;
4. punching or hitting with a fist or something harmful;
5. kicking or dragging;
6. choking or burning; or
7. threatening or attacking with a knife or gun.

Perpetration of sexual IPV was indicated by a woman's positive response to an item asking whether she had been physically forced to have sexual intercourse even when she did not want to.

Women's responses were used to create a 4-level categorical variable reflecting experiences of 3 categories of IPV: physical IPV only, sexual IPV only, and both physical and sexual IPV. The fourth category was a referent category indicating no IPV perpetration of either form.

In addition, we created a binary variable measuring whether a mother reported any form of IPV (physical, sexual, or both). We also created a categorical variable representing how many of the 7 types of physical abuse a mother reported. Although psychological violence is one of the important components of IPV,[28] information on this form of violence was not collected in the BDHS.

Covariates

We included several socioeconomic and demographic variables that have been theoretically and empirically linked to IPV[17,35] and child undernutrition.[5,7,9,10] We classified maternal age into empirically important groups (younger [15–24 years], middle age [25–34 years], and older [35–49 years]).[36] Women's educational level was defined in terms of the formal education system of Bangladesh: no education (0 years), primary (1–5 years), or secondary or higher (6 years or more). To assess women's decision-making autonomy, we determined the number of types of family decisions a woman participated in either alone or jointly, including whether to obtain health care for herself, to obtain health care for her child, to make large purchases, to make household purchases, and to visit her relatives.[37]

Maternal body mass index (BMI, defined as weight in kilograms divided by the square of height in meters), which is a proximate determinant of child nutritional status,[38] was classified into 3 categories: thin (BMI<18.5),

TABLE 2—Descriptive Statistics of Mothers of Children Younger Than 5 Years (n = 1851), by Different Forms of IPV Experienced: Bangladesh Demographic Health Survey, 2007

Characteristic	Any Form of IPV, % (95% CI)	Physical IPV Only, % (95% CI)	Sexual IPV Only, % (95% CI)	Both Physical and Sexual IPV, % (95% CI)
Maternal age, y				
15–24	33.8 (29.7, 38.1)	18.0 (14.9, 21.6)	6.9 (4.9, 9.7)	8.9 (6.6, 11.8)
25–34	24.6 (21.5, 27.9)	14.0 (11.5, 16.9)	5.6 (4.0, 7.6)	5.1 (3.6, 7.9)
35–49	24.1 (17.6, 31.9)	9.5 (5.9, 15.0)	5.8 (2.7, 12.0)	8.7 (5.1, 14.6)
P	.001	.018	.652	.031
Maternal education				
No education	34.8 (30.5, 39.4)	18.4 (15.1, 22.2)	6.8 (4.6, 9.9)	9.6 (6.9, 13.2)
Primary	28.1 (23.5, 33.2)	15.2 (11.6, 19.7)	5.1 (3.2, 8.1)	7.7 (5.3, 11.2)
Secondary or higher	25.8 (22.0, 30.0)	13.8 (11.0, 17.1)	6.6 (4.6, 9.4)	5.4 (3.6, 8.1)
P	.014	.17	.635	.048
Maternal decision-making autonomy, no. of aspects[a]				
0	29.9 (22.6, 38.5)	13.8 (8.6, 21.3)	8.0 (4.1, 15.0)	8.1 (4.7, 13.7)
1	38.9 (28.7, 50.2)	17.8 (10.9, 27.7)	11.7 (6.4, 20.7)	9.4 (4.2, 19.7)
2	28.0 (20.4, 37.1)	16.7 (10.5, 25.6)	2.9 (12.9, 6.5)	8.3 (4.4, 15.1)
3	31.2 (24.5, 38.7)	15.6 (11.3, 21.1)	6.4 (3.6, 11.1)	9.1 (5.4, 14.9)
4	34.6 (28.7, 41.2)	18.9 (14.6, 24.0)	8.3 (4.8, 14.1)	7.5 (4.4, 12.3)
5	24.2 (20.8, 28.1)	13.8 (11.2, 16.9)	4.9 (3.2, 7.3)	5.6 (3.9, 7.9)
P	.038	.617	.081	.621
Maternal BMI category[b]				
Thin	33.4 (29.1, 37.9)	18.5 (15.4, 22.0)	7.6 (5.3, 10.7)	7.3 (5.2, 10.2)
Normal	28.5 (25.1, 32.2)	14.9 (12.3, 17.9)	5.8 (4.2, 7.9)	7.9 (6.0, 10.3)
Overweight/obese	15.1 (9.5, 23.2)	8.4 (4.4, 15.3)	4.7 (1.8, 11.6)	2.1 (0.9, 4.8)
P	.002	.03	.421	.062
Area of residence				
Rural	30.1 (27.4, 33.0)	16.0 (13.8, 18.4)	6.7 (5.2, 8.7)	7.4 (5.8, 9.4)
Urban	25.1 (21.0, 29.6)	13.8 (11.0, 17.3)	4.4 (2.9, 6.8)	6.8 (4.6, 9.9)
P	.05	.266	.104	.701
No. of household members (tertiles)				
2–4	36.7 (31.9, 41.8)	23.1 (19.1, 27.5)	4.9 (3.2, 7.5)	8.7 (6.3, 12.0)
5–6	28.3 (24.5, 32.3)	15.1 (12.4, 18.4)	5.7 (4.0, 8.0)	7.4 (5.3, 10.4)
≥7	22.8 (18.3, 27.9)	8.9 (6.4, 12.4)	8.0 (5.3, 12.1)	5.8 (3.6, 9.1)
P	<.001	<.001	.208	.336
Parity, no. of children				
1	32.2 (27.3, 37.6)	17.8 (14.0, 22.4)	6.6 (4.2, 10.3)	7.9 (5.6, 10.9)
2	28.9 (24.6, 33.6)	15.2 (12.0, 19.1)	5.7 (3.8, 8.5)	7.8 (5.1, 11.6)
≥3	26.3 (22.8, 30.1)	13.6 (11.1, 16.7)	6.3 (4.5, 8.8)	6.4 (4.6, 8.8)
P	.169	.235	.885	.642
Maternal occupation				
Unemployed	26.8 (24.1, 29.7)	15.1 (12.8, 17.7)	4.5 (3.2, 6.2)	7.3 (5.9, 8.9)
Agriculture/nonmanual labor	35.8 (29.9, 42.3)	18.6 (14.5, 23.5)	9.7 (6.6, 14.1)	7.5 (4.5, 12.1)
Manual labor	28.4 (20.1, 37.9)	10.4 (6.6, 15.8)	11.4 (6.4, 19.7)	6.7 (2.3, 14.6)
P	.018	.083	.001	.97

Continued

TABLE 2—*Continued*

Wealth index category				
Poor	35.6 (31.9, 39.5)	18.5 (15.8, 21.5)	7.8 (5.9, 10.4)	9.3 (7.0, 12.2)
Middle	27.4 (22.1, 33.4)	15.6 (11.6, 20.7)	4.1 (2.2, 7.8)	7.6 (4.7, 12.3)
Rich	21.7 (17.9, 26.1)	11.8 (9.1, 15.3)	5.2 (3.3, 8.1)	4.6 (2.9, 7.2)
P	<.001	.007	.049	.025
Recent child illness				
No	25.0 (21.7, 28.6)	13.9 (11.4, 16.8)	6.2 (4.5, 8.5)	4.9 (3.4, 6.9)
Yes	33.8 (30.1, 37.7)	17.4 (14.6, 20.7)	6.3 (4.5, 8.7)	10.1 (7.8, 13.0)
P	.001	.088	.959	<.001
Child gender				
Female	26.9 (23.7, 30.4)	14.7 (12.2, 17.7)	5.5 (3.9, 7.7)	6.7 (5.0, 9.0)
Male	31.1 (27.5, 35.0)	16.3 (13.4, 19.6)	7.0 (5.1, 9.4)	7.8 (5.8, 10.6)
P	.105	.478	.303	.485
Child age, mo				
0–11	27.3 (22.3, 33.0)	13.4 (10.3, 17.2)	8.0 (5.0.3, 12.5)	6.0 (3.7, 9.4)
12–23	33.6 (28.3, 39.4)	18.1 (14.1, 22.9)	6.7 (4.1, 10.8)	8.8 (5.7, 13.4)
24–35	26.6 (21.8, 32.1)	17.8 (13.8, 22.7)	3.2 (1.7, 6.0)	5.6 (3.7, 8.4)
36–49	28.4 (23.8, 33.6)	13.6 (10.3, 17.7)	6.6 (4.7, 9.2)	8.2 (5.8, 11.5)
P	.274	.177	.162	.333
Initiation of breastfeeding				
Early	28.6 (25.6, 31.7)	15.8 (12.5, 19.7)	7.1 (5.1, 9.8)	7.1 (5.0, 9.9)
Late	30.0 (25.9, 34.4)	15.3 (13.1, 17.8)	5.8 (4.3, 7.8)	7.4 (5.7, 9.6)
P	.594	.833	.348	.816
Duration of breastfeeding, mo				
0–11	26.2 (21.6, 31.5)	12.8 (9.9, 16.3)	7.4 (4.7, 11.5)	6.1 (3.9, 9.4)
12–23	30.9 (26.2, 36.0)	16.6 (13.2, 20.7)	5.4 (3.3, 8.7)	8.9 (6.1, 12.7)
≥24	29.3 (25.5, 33.4)	16.6 (13.6, 20.1)	5.8 (4.3, 7.9)	6.9 (5.0, 9.5)
P	.429	.227	.579	.398
Total	29.0 (26.6, 31.6)	15.5 (13.6, 17.6)	6.2 (5.0, 7.8)	7.3 (5.9, 8.9)

Note. BMI = body mass index (defined as weight in kilograms divided by the square of height in meters); CI = confidence interval; IPV = intimate partner violence. *P* values refer to differences between groups.
[a]Aspects of family decisions a woman participated alone or jointly in making.
[b]BMI categories were thin (<18.5), normal (18.5-24.9), or overweight-obese (≥25).

normal (BMI = 18.5–24.9), or overweight–obese (BMI ≥ 25). Maternal occupation was classified according to whether the woman was not working or was working in a manual, nonmanual, or agricultural profession.[30] Tertiles were used in classifying total number of household members (2–4, 5–6, 7 or more).[23] Place of residence was categorized as rural versus urban. Parity was categorized as having had 1, 2, or 3 or more children. Child age was grouped into the following categories: 0 to 11 months, 12 to 23 months, 24 to 35 months, or 36 to 59 months.

We classified initiation of breastfeeding, which has been found to be a strong predictor of child health outcomes in developing countries,[39] into 2 categories: early or late. Early initiation of breastfeeding was defined as the mother initiating breastfeeding within 1 hour of birth. We also included a categorical variable for duration of breastfeeding (0–11, 12–23, or ≥24 months).

We created a binary illness variable, dichotomized as no illness (0) or illness (1; combined fever, acute respiratory illness [ARI], and diarrhea), to assess the overall level of child illness. Illness is a strong predictor of child undernutrition in Bangladesh.[5] Information on diarrhea, ARI (defined as reports of cough accompanied by short, rapid breathing[32]), and fever was gathered from women's BDHS questionnaire responses. For each child younger than 5 years, women indicated whether the child had been ill with fever, had experienced an episode of diarrhea, or had been ill with a cough accompanied by short, rapid breathing in the 2 weeks prior to the survey.

In some South Asian communities, male children are more valued than are female children, receiving preferential treatment in terms of nutrition and care[28]; thus, we created a variable for child gender. We used the BDHS wealth index as a proxy indicator of socioeconomic position. The BDHS wealth index was constructed from data on household assets, including ownership of durable goods (such as televisions and bicycles) and dwelling characteristics (such as source of drinking water, sanitation facilities, and construction

materials). We used principal components analyses to assign individual household wealth scores. These weighted values were then summed and rescaled to range from 0 to 1, and each household was assigned to the poor, middle, or rich tertile.

Statistical Analyses

We calculated descriptive statistics for our sample's sociodemographic, IPV, and nutritional characteristics. We used χ^2 analyses to assess sociodemographic differences in IPV perpetration. In all analyses, the significance level was set at $P<.05$ (2-tailed). We created 3 fully adjusted models to analyze the appropriate binary value for each nutritional outcome of stunting, underweight, and wasting, with each model containing a different IPV predictor (any vs no IPV; separate effects of physical IPV only, sexual IPV only, and both physical and sexual IPV vs no IPV; and number of types of physical IPV vs no IPV).

We entered all covariates simultaneously into the multiple regression models. We estimated odds ratios (ORs) to assess the strength of the associations, and we used 95% confidence intervals (CIs) for significance testing. We checked multicollinearity in the logistic regression analyses by examining the standard errors of the regression coefficients. A standard error larger than 2.0 indicates numerical problems such as multicollinearity among the independent variables.[40,41] The standard errors of all of the independent variables in the 3 adjusted models for each nutritional outcome were below 1, indicating an absence of multicollinearity. To take into account sample weighting based on the complex design of the BDHS, we used Stata version 9.0 (StataCorp LP, College Station, TX) in conducting all of our analyses.

RESULTS

Nearly half of the respondents (49.1%) were 15 to 24 years old, 29.2% had no education, and 78.5% lived in rural areas (Table 1). Approximately 11% had no decision-making autonomy. Regarding nutritional status, 60.3% of the women were considered to be of normal weight, 32.0% were undernourished or thin (BMI<18.5), and 7.5% were overweight or obese (BMI≥25). Approximately 70% of the women's children were younger than 3 years, almost half were female, and nearly 43% had been breastfed for 24 months or more. Percentages of underweight, stunting, and wasting were 40.8%, 42.0%, and 19.0%, respectively. Overall, 45.6% of the children had suffered from an illness (diarrhea, ARI, or fever) 2 weeks before the survey.

A substantial percentage of mothers (29.0%) reported that they had suffered physical or sexual IPV in the year prior to the survey; 15.5% indicated that they had experienced only physical IPV, 6.2% indicated that they had experienced only sexual IPV, and 7.3% indicated that they had experienced both types of IPV. A total of 8.8% of the respondents reported 3 or more types of physical IPV (Table 1).

The bivariate analyses revealed several significant differences in the prevalence of IPV perpetration across various sociodemographic groups (Table 2). Specifically, younger women (those aged 15–24 years) were significantly more likely than were older women to report any form of IPV, physical IPV only, and both physical and sexual IPV. In addition, women with no education were significantly more likely than women with a primary education and women with a secondary education or higher to report any form of IPV and to report both physical and sexual IPV. Women whose children had recently been ill were also significantly more likely to report any form of IPV and both physical and sexual IPV. Women in the rich and middle wealth categories were less likely than were women in the poor wealth category to report any form of IPV, physical IPV alone, sexual IPV alone, and both physical and sexual IPV.

Reports of any form of IPV and physical IPV alone were significantly more frequent among women in the thin BMI category and among mothers in households with 2 to 4 members than among their counterparts. In addition, unemployed women were less likely than were employed women to report having experienced any form of IPV and sexual IPV alone. Women participating in at least 5 aspects of family decision-making were more likely than their counterparts to report any form of IPV in the preceding year, but group differences were not significant for the 3 mutually exclusive categories of violence assessed (Table 2).

Additional analyses were performed to assess the correlation between stunting, underweight, and wasting. Underweight was

TABLE 3—Associations Between Child Nutritional Status and Forms of Maternal IPV Among Mothers of Children Younger Than 5 Years (n = 1851): Bangladesh Demographic Health Survey, 2007

	Child Nutritional Status, AOR (95% CI)		
IPV Measure	Stunting	Underweight	Wasting
Form of IPV			
None (Ref)	1.00	1.00	1.00
Any physical or sexual IPV or both	1.59 (1.23, 2.08)	1.33 (1.04, 1.71)	1.08 (0.78, 1.49)
Physical IPV only	1.40 (1.02, 1.94)	1.23 (0.90, 1.69)	1.01 (0.70, 1.47)
Sexual IPV only	1.64 (1.00, 2.67)	1.33 (0.77, 2.27)	1.07 (0.56, 2.02)
Both physical and sexual IPV	2.07 (1.24, 3.46)	1.60 (1.02, 2.51)	1.23 (0.68, 2.25)
No. of types of physical IPV			
0 (Ref)	1.00	1.00	1.00
1	1.48 (0.88, 2.46)	1.02 (0.62, 1.67)	0.87 (0.49, 1.53)
2	1.50 (0.99, 2.28)	1.42 (0.96, 2.11)	1.21 (0.64, 2.26)
≥3	1.57 (1.00, 2.46)	1.49 (0.97, 2.30)	1.19 (0.74, 1.90)

Note. AOR = adjusted odds ratio; CI = confidence interval; IPV = intimate partner violence. Models were adjusted for maternal age, maternal education, maternal decision-making autonomy, maternal occupation, maternal body mass index, parity, residence, number of household members, child gender, child age, initiation of breastfeeding, duration of breastfeeding, recent child illness, and wealth index category.

found to be significantly correlated with stunting ($r=0.57$, $P<.001$). Wasting was not significantly correlated with stunting ($r=0.06$).

Maternal experiences of any physical or sexual IPV (adjusted OR [AOR]=1.59; 95% CI=1.23, 2.08) were associated with stunting, as were physical IPV only (AOR=1.40; 95% CI=1.02, 1.94), sexual IPV only (AOR=1.64; 95% CI=1.00, 2.67), and both types of IPV (AOR=2.07; 95% CI=1.24, 3.46; Table 3). There was a marginally significant association between the experience of 3 or more types of physical IPV and childhood stunting.

In addition, maternal experiences of any IPV (AOR=1.33; 95% CI=1.04, 1.71) and both physical and sexual IPV (AOR=1.67; 95% CI=1.02, 2.51) were associated with underweight (Table 3). Exposure to any IPV was not significantly associated with wasting (AOR=1.08; 95% CI=0.78, 1.49; Table 3). Furthermore, no statistically significant associations were found between wasting and physical IPV only, sexual IPV only, or both physical and sexual IPV.

Stunting and underweight were associated with maternal BMI (normal or obese), high wealth index score, and recent child illness. In addition, significant associations were found between stunting and child age (24–35 or 36–59 months) and between underweight and mother's educational level (secondary or higher). Maternal BMI (normal or obese), maternal decision-making autonomy (involvement in only 1 aspect of family decision-making), and child gender (male) were associated with wasting (Table 4).

TABLE 4—Associations of Any Maternal IPV and All Covariates With Child Nutritional Status Among Mothers of Children Younger Than 5 Years (n=1851): Bangladesh Demographic Health Survey, 2007

Characteristic	Child Nutritional Status		
	Stunting, AOR (95% CI)	Underweight, AOR (95% CI)	Wasting, AOR (95% CI)
Maternal age, y			
15-24 (Ref)	1.00	1.00	1.00
25-34	0.87 (0.63, 1.19)	0.86 (0.63, 1.19)	1.20 (0.80, 1.81)
35-49	1.10 (0.66, 1.84)	0.83 (0.51, 1.36)	0.85 (0.46, 1.56)
Maternal education			
No education (Ref)	1.00	1.00	1.00
Primary	0.92 (0.67, 1.25)	0.92 (0.66, 1.27)	1.00 (0.69, 1.46)
Secondary or higher	0.77 (0.54, 1.10)	0.66 (0.46, 0.94)	0.70 (0.45, 1.08)
Maternal decision-making autonomy, no. of aspects[a]			
0 (Ref)	1.00	1.00	1.00
1	0.67 (0.36, 1.23)	0.72 (0.39, 1.32)	0.33 (0.15, 0.71)
2	0.97 (0.58, 1.63)	1.18 (0.72, 1.92)	0.85 (0.40, 1.80)
3	1.07 (0.67, 1.71)	0.97 (0.60, 1.57)	0.93 (0.53, 1.65)
4	0.75 (0.47, 1.19)	0.74 (0.47, 1.19)	0.68 (0.37, 1.25)
5	0.94 (0.61, 1.45)	0.95 (0.62, 1.45)	0.94 (0.55, 1.58)
Maternal BMI category[b]			
Thin (Ref)	1.00	1.00	1.00
Normal	0.69 (0.52, 0.91)	0.63 (0.49, 0.82)	0.68 (0.50, 0.93)
Overweight/obese	0.44 (0.25, 0.78)	0.37 (0.21, 0.67)	0.34 (0.16, 0.72)
No. of household members (tertiles)			
2-4 (Ref)	1.00	1.00	1.00
5-6	0.97 (0.70, 1.36)	1.16 (0.86, 1.59)	1.30 (0.89, 1.92)
≥7	0.91 (0.64, 1.29)	1.02 (0.69, 1.34)	1.10 (0.74, 1.63)
Parity, no. of children			
1 (Ref)	1.00	1.00	1.00
2	0.84 (0.58, 1.21)	0.81 (0.57, 1.15)	1.01 (0.67, 1.51)
≥3	1.13 (0.73, 1.74)	0.90 (0.59, 1.38)	0.67 (0.40, 1.13)
Area of residence			
Rural (Ref)	1.00	1.00	1.00
Urban	0.95 (0.70, 1.27)	0.95 (0.71, 1.27)	0.78 (0.53, 1.15)
Maternal occupation			
Unemployed (Ref)	1.00	1.00	1.00
Agriculture/nonmanual labor	0.98 (0.72, 1.32)	0.89 (0.65, 1.22)	0.86 (0.59, 1.25)
Manual labor	0.70 (0.44, 1.12)	0.6 (0.37, 1.07)	0.72 (0.36, 1.44)
Wealth index category			
Poor (Ref)	1.00	1.00	1.00
Middle	0.67 (0.47, 0.96)	0.76 (0.55, 1.05)	0.89 (0.58, 1.35)
Rich	0.69 (0.48, 0.97)	0.62 (0.44, 0.88)	0.87 (0.56, 1.36)
Child gender			
Female (Ref)	1.00	1.00	1.00
Male	0.97 (0.76, 1.24)	0.79 (0.63, 1.00)	1.46 (1.09, 1.94)

Continued

DISCUSSION

Twenty-nine percent of our sample of Bangladeshi women with children younger than 5 years had experienced physical or sexual IPV in the year preceding the study. Maternal experiences of IPV were associated with an increased risk of stunting and underweight among children but not with an increased risk of wasting. Data from a large survey in India[30] and a hospital-based study in Brazil[31] previously suggested an association between past-year physical IPV experiences and childhood undernutrition, but these studies could not address sexual IPV because information on sexual violence was not

TABLE 4—*Continued*

Child age, mo			
0–11 (Ref)	1.00	1.00	1.00
12–23	2.13 (0.92, 4.90)	1.46 (0.57, 3.74)	2.25 (0.80, 6.33)
24–35	2.67 (1.24, 5.74)	1.40 (0.57, 3.47)	1.53 (0.54, 4.35)
36–59	2.73 (1.27, 5.87)	1.90 (0.77, 4.67)	1.42 (0.49, 4.16)
Initiation of breastfeeding			
Early (Ref)	1.00	1.00	1.00
Late	1.15 (0.87, 1.51)	0.93 (0.71, 1.23)	1.08 (0.81, 1.44)
Duration of breastfeeding, mo			
0–11 (Ref)	1.00	1.00	1.00
12–23	1.02 (0.46, 2.26)	1.13 (0.45, 2.82)	0.82 (0.30, 2.21)
≥24	1.21 (0.58, 2.51)	1.40 (0.59, 3.30)	0.73 (0.27, 1.97)
Recent child illness			
No (Ref)	1.00	1.00	1.00
Yes	1.27 (1.00, 1.62)	1.37 (1.07, 1.75)	1.20 (0.87, 1.64)
Any physical or sexual IPV			
No (Ref)	1.00	1.00	1.00
Yes	1.59 (1.23, 2.08)	1.33 (1.04, 1.71)	1.08 (0.78, 1.49)

Note. AOR = adjusted odds ratio; BMI = body mass index (defined as weight in kilograms divided by the square of height in meters); CI = confidence interval; IPV = intimate partner violence.
[a]Aspects of family decisions a woman participated alone or jointly in making.
[b]BMI categories were thin (< 18.5), normal (18.5–24.9), or overweight–obese (≥ 25).

available. Our results indicate that preventing physical and sexual violence on the part of husbands is an important component of improving childhood nutritional status in Bangladesh.

The association observed between IPV and childhood stunting (as opposed to wasting) can be explained by the cumulative effects of IPV with respect to abused mothers' caregiving behaviors toward their children. Previous studies have shown that physical and sexual IPV are strong predictors of long-term negative mental health outcomes among mothers, including symptoms of stress, depression, and anxiety.[42–44] There is evidence that such negative mental health outcomes reduce a mother's ability to cope with the everyday needs of a small child and diminish the quality of caregiving behaviors, leading to negative health consequences for children.[45–49]

Thus, height-for-age *z* scores, which reflect cumulative growth, are more likely than shorter-term weight-for-height *z* scores to be influenced by less-optimal caregiving behaviors of mothers experiencing IPV over a long period of time. Wasting, by contrast, signals acute nutritional deficiencies that may be attributable to differences in dietary intake related to seasonal variations (e.g., a higher prevalence of diarrhea in the summer than in the winter). Given the presence of these factors, wasting may be less affected by the quality of maternal caregiving behavior than stunting is.[50,51]

The mechanism underpinning the association of IPV with childhood underweight can be explained by the high correlation between underweight and stunting, which are effects of the same underlying causes. Previous studies have shown that the risk of underweight rises sharply among children at increasing levels of growth retardation.[52,53] Therefore, it is expected that chronic dietary inadequacy contributes to a higher prevalence of underweight along with stunting (as opposed to wasting) through less-optimal cumulative caregiving behaviors of mothers stemming from their experiences of IPV.

Similar to the results of previous studies carried out in other developing countries,[54,55] we found that higher proportions of older children were stunted. In the second year of life, with their introduction to the family diet, children become more responsible for feeding themselves but often do not have access to adequate amounts of solid food, which may contribute to inadequate energy and protein intake.[56] In addition, children begin crawling at approximately this age and are more likely to be carried outdoors, which exposes them to infections.[57] We also found that wealth inequality was an important risk factor for childhood stunting and underweight, again consistent with the results of previous studies.[56,57]

In our study, children of well-nourished mothers (i.e., those in the normal and overweight–obese BMI categories) were at lower risk of underweight, stunting, and wasting than were children of undernourished mothers. This finding is expected because maternal nutritional status is a proximate determinant of (and may have a positive impact on) a child's nutritional status.[38,58] Children suffering from illness (diarrhea, ARI, or fever) were more likely to be stunted and underweight than were their counterparts. Previous studies in developing countries have also reported strong effects of diarrhea and ARI on child stunting and underweight.[59,60]

Limitations

Some limitations should be considered when interpreting our findings. First, our analyses were cross-sectional, so our limited study time frame did not permit us to assess the relative chronology of child undernutrition in relation to mothers' IPV experiences. Longitudinal research on the relationship of IPV to child nutritional outcomes is needed to address this issue. Second, although psychological violence is an important facet of IPV,[28] information on this form of violence was not available from the BDHS.

Third, our low-weight-for-height measure is problematic because it involved an interaction between 2 variables (low height for age and low weight for age) that may both be affected by the causal factor being investigated. However, we included this variable because it is particularly sensitive to acute growth disturbances and is therefore useful in detecting the presence of wasting in relation to IPV. Fourth, our selection of variables was constrained by the preexisting BDHS data, so we were unable to include certain potentially important variables. One such variable is the prevalence of low birth weight among women subjected to IPV,[21,23] given that birth weight is an important determinant of the future health and development of babies.

Finally, the possibility of underreporting must also be considered. Because IPV is a private issue that often confers a stigma, women may be reluctant to reveal their abuse status. However, the personal interview method we employed has been used widely in this type of IPV research.[61] In addition, we used behaviorally specific questions to ascertain physical and sexual IPV, and these types of questions are considered the best methodological means for eliciting accurate responses.[28,33]

Moreover, according to the BDHS, interviewers were provided training in implementing the domestic violence module based on a training manual specially developed to enable field staff to collect violence data in a secure, confidential, and ethical manner, thus creating a safe atmosphere in which respondents would feel comfortable discussing this issue.[32] In addition, the domestic violence module was administered at the end of the interview so that both interviewers and respondents had become well acquainted with each other by the time they reached the section on domestic violence.

Conclusions

Physical IPV and sexual IPV were associated with an increased risk of stunting and underweight among children younger than 5 years in Bangladesh. Our findings reinforce the evidence that improving child nutrition is an additional reason to strengthen efforts to protect women from physical and sexual violence perpetrated by their husbands. Our results may also be relevant in other resource-limited settings where child undernutrition is common, and they may be of interest to clinicians assessing children with problems related to nutritional status. However, future longitudinal studies are needed to investigate the influence of potential mechanisms mediating the association between IPV and poor child nutritional outcomes. ■

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Contributors

M. Rahman originated the study and contributed to study design, statistical analysis, and the writing of the article. K.C. Poudel helped conceptualize the study and contributed to study design, statistical analysis, interpretation of the data, and revisions of the article. J. Yasuoka, K. Otsuka, and K. Yoshikawa contributed to analysis and interpretation of data and to revisions of the article. M. Jimba monitored study progress, contributed to conception and design of the study, and critically revised the article.

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Human Participant Protection

Data collection procedures for the BDHS were approved by the ORC Macro institutional review board. The protocol of the survey was reviewed and approved by the National Ethics Review Committee of the Bangladesh Ministry of Health and Family Welfare. Before participating, all individuals were asked to provide informed consent after being read a document emphasizing the voluntary nature of the survey. For the section focusing on intimate partner violence, respondents were read an additional statement informing them that the questions to follow could be sensitive and reassuring them of the confidentiality of their responses. Interviews were conducted under the most private conditions afforded by the environments encountered. If privacy could not be ensured, the interviewers were instructed to omit the module.

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