Intimate Partner Violence and Death Among Infants and Children in India

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Intimate Partner Violence and Death Among Infants and Children in India

Leland K. Ackerson and S. V. Subramanian

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Intimate Partner Violence and Death Among Infants and Children in India

WHAT'S KNOWN ON THIS SUBJECT: Evidence from developing countries on the association between maternal IPV victimization and child death has been suggestive but inconclusive.

WHAT THIS STUDY ADDS: This study uses a nationally representative data set from India to provide strong evidence of a relationship between maternal physical IPV victimization and death among both infants and older children.

abstract

OBJECTIVE: The goal was to test the association between maternal intimate partner violence (IPV) victimization and child death.

METHODS: Information was collected regarding 39 096 children <60 months of age in the nationally representative 2005–2006 National Family Health Survey of India. The exposures were maternal reports of physical, sexual, psychological, and any IPV. Outcomes included infant (0 to <12 months), older child (12 to <60 months), and any child (0 to <60 months) deaths.

RESULTS: Maternal experience of physical IPV was associated with increased mortality rates among all children (risk ratio [RR]: 1.21 [95% confidence interval [CI]: 1.13–1.30]), infants (RR: 1.24 [95% CI: 1.01–1.53]), and older children (RR: 1.25 [95% CI: 1.00–1.56]). Sexual and psychological IPV were less strongly associated with child death. The associations between maternal IPV and death did not differ according to the child's gender.

CONCLUSION: The robust association between exposure to household IPV and infant and child death could be attributable to the mother's inability to care for her child, psychological stress associated with witnessing violence, and the use of maternal violence victimization as a proxy for child violence victimization. *Pediatrics* 2009;124:e878–e889

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KEY WORDS
child death, domestic violence, India, infant death, intimate partner violence

ABBREVIATIONS
CI— confidence interval
IPV—intimate partner violence
RR—risk ratio

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More than 2 million Indian children die each year, constituting an annual mortality rate of 76 deaths per 1000.[1] Although major clinical[2,3] and socioeconomic[1,4] causes of child death are well documented, research has begun to investigate the influence of other aspects of the social environment. Intimate partner violence (IPV), that is, the abuse of a spouse, boyfriend, or girlfriend, is one such health determinant.[5] A manifestation of India's paternalistic culture,[6] IPV affects 40% of Indian women during their lifetimes.[7] Although physical IPV has recognized relationships with morbidity and death among abused women in India,[7] psychological abuse[8] and sexual abuse[9] also are associated with poor health outcomes. An increasing body of evidence shows links between women's IPV victimization and poor child health outcomes.[10,11] IPV could affect child health outcomes through physical or psychological maternal health outcomes[5] that prevent proper care of the child,[12] psychological stress resulting from observation of IPV,[13] or direct physical injury incurred by the child.[14]

Previous research in India examined associations of IPV with neonatal[15] and infant[16] deaths in smaller, community-specific samples. Mortality associations with nonphysical types of abuse have not been investigated. Pathways through which physical and nonphysical types of abuse harm health may be substantially different, and the relationship between abuse and child health may vary according to the age of the child. For a better understanding of these relationships, we tested whether physical, psychological, and sexual forms of IPV were associated with infant and child death in India, in a nationally representative sample.

METHODS

Data Source

We used the 2005–2006 National Family Health Survey, a nationally representative cross-sectional study designed to provide information about maternal and child health in India.[17] This is the Indian version of the Demographic and Health Surveys, and data are publicly available via the Internet (www.measuredhs.com). Respondents were selected through a multistage, stratified, survey procedure.

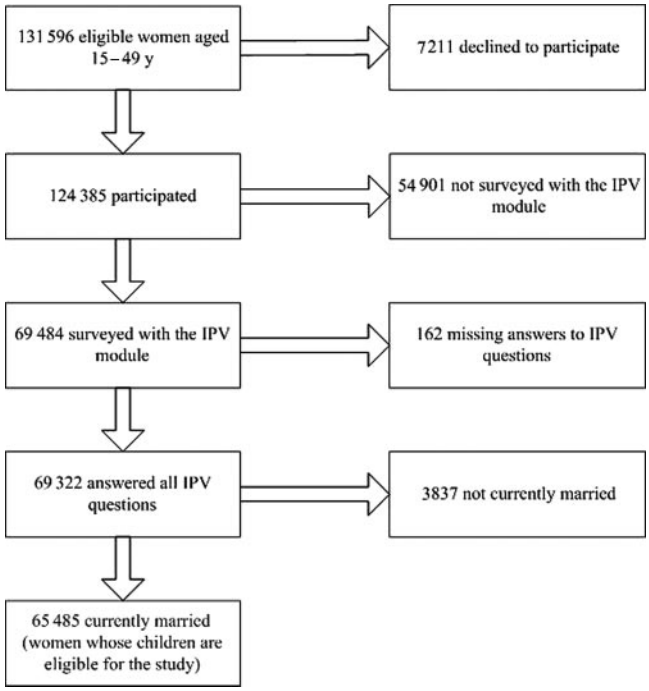

FIGURE 1
Selection of eligible mothers.

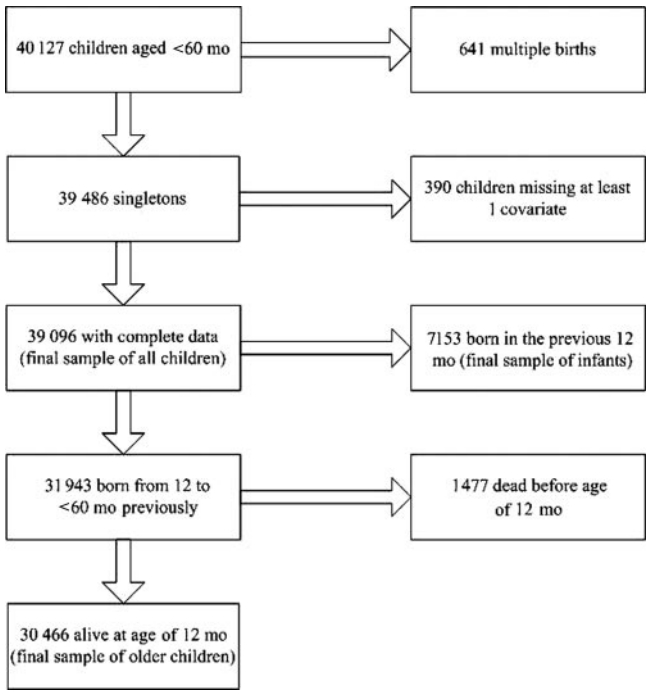

FIGURE 2
Selection of children for the samples of infants, older children, and all children.

Each state was divided into urban and rural areas, and the sample size for each state was proportional to the sizes of the state's urban and rural populations. Primary sampling units were census enumeration blocks in urban areas and villages or village clusters in rural areas. Within states, rural and urban primary sampling units were selected through probability proportional to size. Households were selected randomly from each primary sampling unit. All women 15 to 49 years of age who resided in the household the previous night were eligible for inclusion in the survey.[17]

Trained data collectors performed face-to-face interviews with an adult member in each of 109 041 selected households to obtain demographic information about the household and family members, achieving a household response rate of 97.7%.[18] Of 131 596 eligible women in those households, 94.5% participated in a survey of maternal and child health behaviors and outcomes. One woman from each household was selected at random to answer an additional set of questions regarding IPV perpetrated by her husband, which yielded 65 485 married women with complete data (Fig 1). Each woman provided information on her live births, for a total of 39 096 singleton children with complete data; these data were used to investigate the deaths of all children <60 months of age. We created subsets of this data set to investigate infant deaths among 7153 children who were born <12 months before the date of the survey interview and to investigate deaths among 30 466 older children who were born >12 months but <60 months before the survey interview and were still alive at the age of 12 months (Fig 2).

Outcome Measures

Each woman was asked about all of her living children. Then each woman

TABLE 1 Descriptive Demographic and IPV Characteristics for Singleton Children 0 to <60 Months of Age With Married Mothers in the 2005–2006 National Family Health Survey

Variable	All Ages	Age 0 to <12 mo	Age 12 to <60 mo
Total, *N* (%)	39 096 (100.0)	7153 (100.0)	30 466 (100.0)
Any IPV, *n* (%)			
No	24 399 (62.4)	4703 (65.8)	18 889 (62.0)
Yes	14 697 (37.6)	2450 (34.3)	11 577 (38.0)
Any physical IPV, *n* (%)			
No	26 110 (66.8)	5027 (70.3)	20 215 (66.4)
Yes	12 986 (33.2)	2126 (29.7)	10 251 (33.7)
No. of types of physical IPV, *n* (%)			
0	26 110 (66.8)	5027 (70.3)	20 215 (66.4)
1	5586 (14.3)	948 (13.3)	4397 (14.4)
2	2548 (6.5)	408 (5.7)	2029 (6.7)
≥3	4852 (12.4)	770 (10.8)	3825 (12.6)
Physical IPV injury, *n* (%)			
No	34 579 (88.5)	6415 (89.7)	26 903 (88.3)
Yes	4517 (11.6)	738 (10.3)	3563 (11.7)
Sexual IPV, *n* (%)			
No	35 454 (90.7)	6494 (90.8)	27 646 (90.7)
Yes	3642 (9.3)	659 (9.2)	2820 (9.3)
Psychological IPV, *n* (%)			
No	33 597 (85.9)	6244 (87.3)	26 124 (85.8)
Yes	5499 (14.1)	909 (12.7)	4342 (14.3)
Type of IPV, *n* (%)			
None	24 399 (62.4)	4703 (65.8)	18 889 (62.0)
Physical only	7229 (18.5)	1167 (16.3)	5718 (18.8)
Sexual only	595 (1.5)	133 (1.9)	440 (1.4)
Psychological only	1007 (2.6)	172 (2.4)	796 (2.6)
Multiple types	5866 (15.0)	978 (13.7)	4623 (15.2)
Mortality status, *n* (%)			
Alive	37 027 (94.7)	6854 (95.8)	30 173 (99.0)
Dead	2069 (5.3)	299 (4.2)	293 (1.0)
Gender, *n* (%)			
Female	18 698 (47.8)	3547 (49.6)	14 462 (47.5)
Male	20 398 (52.2)	3606 (50.4)	16 004 (52.5)
Birth order, *n* (%)			
First	11 608 (29.7)	2100 (29.4)	9027 (29.6)
Second	11 005 (28.2)	2029 (28.4)	8642 (28.4)
Third	6652 (17.0)	1175 (16.4)	5259 (17.3)
Fourth	4165 (10.7)	755 (10.6)	3239 (10.6)
Fifth or greater	5666 (14.5)	1094 (15.3)	4299 (14.1)
Age, mean ± SD, mo	28.9 ± 17.7	5.6 ± 3.3	35.7 ± 13.8
Mother's age at birth, *n* (%)			
<17 y	2451 (6.3)	330 (4.6)	1956 (6.4)
17–19 y	7363 (18.8)	1251 (17.5)	5769 (18.9)
20–24 y	15 162 (38.8)	2768 (38.7)	11 849 (38.9)
25–29 y	9237 (23.6)	1797 (25.1)	7172 (23.5)
≥30 y	4883 (12.5)	1007 (14.1)	3720 (12.2)
Maternal autonomy (aspects), *n* (%)			
0	6939 (17.8)	1481 (20.7)	5161 (16.9)
1	4781 (12.2)	930 (13.0)	3666 (12.0)
2	5113 (13.1)	931 (13.0)	3989 (13.1)
3	6263 (16.0)	1071 (15.0)	4956 (16.3)
4	16 000 (40.9)	2740 (38.3)	12 694 (41.7)
Mother's height, *n* (%)			
<145.0 cm	4279 (10.9)	820 (11.5)	3201 (10.5)
145.0–149.9 cm	9903 (25.3)	1887 (26.4)	7614 (25.0)
150.0–154.9 cm	12 649 (32.4)	2283 (31.9)	9943 (32.6)
155.0–159.9 cm	7639 (19.5)	1340 (18.7)	6036 (19.8)
≥160 cm	3089 (7.9)	541 (7.6)	2471 (8.1)
Missing data	1537 (3.9)	282 (3.9)	1201 (3.9)

TABLE 1 Continued

Variable	All Ages	Age 0 to <12 mo	Age 12 to <60 mo
Mother's occupation, *n* (%)			
Not working	25 169 (64.4)	5059 (70.7)	19 256 (18.3)
Nonmanual	1763 (4.5)	252 (3.5)	1461 (16.6)
Agricultural	8418 (21.5)	1346 (18.8)	6676 (32.1)
Manual	3746 (9.6)	496 (6.9)	3073 (33.0)
Mother's education, *n* (%)			
None	16 515 (42.2)	2869 (40.1)	12 821 (42.1)
1–5 y	5628 (14.4)	1018 (14.2)	4373 (14.4)
6–8 y	5993 (15.3)	1138 (15.9)	4654 (15.3)
9–10 y	5666 (14.5)	1055 (14.8)	4486 (14.7)
11–12 y	2413 (6.2)	493 (6.9)	1867 (6.1)
≥13 y	2881 (7.4)	580 (8.1)	2265 (7.4)
Father's education, *n* (%)			
None	10 029 (25.7)	1768 (24.7)	7783 (25.6)
1–5 y	6049 (15.5)	1091 (15.3)	4676 (15.4)
6–8 y	6596 (16.9)	1232 (17.2)	5105 (16.8)
9–10 y	8360 (21.4)	1554 (21.7)	6534 (21.5)
11–12 y	3501 (9.0)	617 (8.6)	2791 (9.2)
≥13 y	4561 (11.7)	891 (12.5)	3577 (11.7)
Wealth, *n* (%)			
First (lowest) quintile	7503 (19.2)	1405 (19.6)	5714 (18.8)
Second quintile	7468 (19.1)	1362 (19.0)	5745 (18.9)
Third quintile	8122 (20.8)	1458 (20.4)	6357 (20.9)
Fourth quintile	8446 (21.6)	1565 (21.9)	6614 (21.7)
Fifth (highest) quintile	7557 (19.3)	1363 (19.1)	6036 (19.8)
Caste, *n* (%)			
General class	12 750 (32.6)	2296 (32.1)	10 054 (33.0)
Scheduled caste	7235 (18.5)	1324 (18.5)	5572 (18.3)
Scheduled tribe	6592 (16.9)	1277 (17.9)	5050 (16.6)
Other backward class	12 519 (32.0)	2256 (31.5)	9790 (32.1)
Religion, *n* (%)			
Hindu	26 871 (68.7)	4872 (68.1)	20 926 (68.7)
Muslim	6349 (16.2)	1150 (16.1)	4976 (16.3)
Christian	4095 (10.5)	775 (10.8)	3193 (10.5)
Sikh	607 (1.6)	113 (1.6)	474 (1.6)
Other/missing data	1174 (3.0)	243 (3.4)	897 (2.9)
Toilet, *n* (%)			
None	17 195 (44.0)	3066 (42.9)	13 332 (43.8)
Latrine	3651 (9.3)	693 (9.7)	2827 (9.3)
Flush	15 873 (40.6)	2753 (38.5)	12 672 (41.6)
Other	2377 (6.1)	641 (9.0)	1635 (5.4)
Water source, *n* (%)			
Unprotected	6024 (15.4)	1146 (16.0)	4628 (15.2)
Protected well or spring	15 095 (38.6)	2709 (37.9)	11 732 (38.5)
Truck or bottle	525 (1.3)	88 (1.2)	422 (1.4)
Tap	15 718 (40.2)	2692 (37.6)	12 544 (41.2)
Other	1734 (4.4)	518 (7.2)	1140 (3.7)
Location, *n* (%)			
Large city	6807 (17.4)	1180 (16.5)	5400 (17.7)
Small city	2336 (6.0)	413 (5.8)	1845 (6.1)
Town	5850 (15.0)	1071 (15.0)	4600 (15.1)
Village	24 103 (61.7)	4489 (62.8)	18 621 (61.1)

was asked, "Have you ever given birth to a boy or girl who was born alive but later died?" Affirmative answers were followed by questions about the deceased child's date of birth and age at death. Child death, infant death, and older child death were binary variables describing whether each child had died before reaching 60 months of age, before reaching 12 months of age, or after reaching 12 months but before reaching 60 months of age, respectively.

Exposures

We assessed IPV with 7 variables. A binary psychological IPV variable indicated whether the mother's husband ever insulted, humiliated, or threatened her with harm. A binary sexual IPV variable assessed whether the mother's husband ever physically forced her to have sex or to perform sexual acts that she did not want. A binary physical IPV variable measured whether the mother's husband ever performed any of the following acts against her: (1) pushing, shaking, or throwing an object; (2) slapping; (3) punching or hitting with a fist or something harmful; (4) kicking or dragging; (5) choking or burning; (6) threatening or attacking with a knife or gun; or (7) twisting her arm or pulling her hair. We created a categorical variable counting how many of the 7 types of physical abuse a mother reported and a binary variable to measure whether a mother ever experienced any injuries resulting from physical IPV. We created a binary variable measuring whether a mother reported any physical, psychological, or sexual IPV. We created an IPV type variable with 5 mutually exclusive categories, namely, none, only physical, only psychological, only sexual, or >1 type of abuse.

Covariates

We included several socioeconomic and demographic variables theoretically and empirically linked to IPV[7,19] and child death[1,20] (Table 1). We classified the mother's age at the child's birth into empirically important groups.[21,22] The mother's decision-making autonomy measured the number of types of family decisions a woman participated in making, including whether to obtain health care, to make large purchases, to make household purchases, and to visit her relatives.[23] We classified the mother's height, which is a strong predictor of

child death in India,[24] into clinically important categories.[25–27] We defined wealth in terms of living environment and material possessions,[28] with each child being assigned a wealth score on the basis of household characteristics that were weighted according to a factor analysis procedure and divided into quintiles.[17,29] We used caste identification of the household head to categorize each child as belonging to a scheduled caste, a scheduled tribe, another backward class, or the general class. Members of scheduled castes have suffered the greatest burden of deprivation within the caste system.[30] Scheduled tribes include ~700 officially designated, historically isolated, social groups.[31] Members of legislatively defined other backward classes historically have suffered deprivation that is not as severe as that of scheduled castes and tribes. The general class is a residual category containing those who are not members of legislatively recognized marginalized classes.

We included characteristics of the household and neighborhood environment that are related to child health outcomes, including toilet type and household water source.[32,33] We used 2001 Indian National Census figures to define each primary sampling unit as being within a large city, small city, town, or village.

Statistical Analyses

We created 7 fully adjusted models to analyze the appropriate binary mortality outcome for each data set, with each model containing a different IPV predictor. We created additional models to investigate the association of the interaction of IPV and child gender with death. We used a generalized estimating equation-modified Poisson regression approach with robust error variance to produce direct assessments of risk ratios (RRs).[34] All models accounted for clustering within primary sampling units, and states were included as dummy variables. We checked for colinearity between covariates by investigating cross-tabulations of the most highly correlated variables. These cross-tabulations showed substantial variations of these variables across each categorical level, leaving no empty or small-sized cells, which provided evidence that independent effects of each predictor variable could be estimated efficiently with regression models.

TABLE 2 Descriptive Statistics According to Any Experience of Maternal IPV Victimization for Singleton Children 0 to <60 Months of Age With Married Mothers in the 2005–2006 National Family Health Survey

Variable	No Maternal IPV	Any Maternal IPV
Total, *N* (%)	24 399 (100.0)	14 697 (100.0)
Mortality status, *n* (%)		
Alive	23 271 (95.4)	13 756 (93.6)
Dead	1128 (4.6)	941 (6.4)
Gender, *n* (%)		
Female	11 656 (47.8)	7042 (47.9)
Male	12 743 (52.2)	7655 (52.1)
Birth order, *n* (%)		
First	8222 (33.7)	3386 (23.0)
Second	7187 (29.5)	3818 (26.0)
Third	3918 (16.1)	2734 (18.6)
Fourth	2271 (9.3)	1894 (12.9)
Fifth or greater	2801 (11.5)	2865 (19.5)
Age, mean ± SD, mo	28.6 ± 17.7	29.3 ± 17.8
Mother's age at birth, *n* (%)		
<17 y	1368 (5.6)	1083 (7.4)
17–19 y	4546 (18.6)	2817 (19.2)
20–24 y	9556 (39.2)	5606 (38.1)
25–29 y	5984 (24.5)	3253 (22.1)
≥30 y	2945 (12.1)	1938 (13.2)
Maternal autonomy (aspects), *n* (%)		
0	4214 (17.3)	2725 (18.5)
1	2748 (11.3)	2033 (13.8)
2	3027 (12.4)	2086 (14.2)
3	3807 (15.6)	2456 (16.7)
4	10 603 (43.5)	5397 (36.7)
Mother's height, *n* (%)		
<145.0 cm	2405 (9.9)	1874 (12.8)
145.0–149.9 cm	5880 (24.1)	4023 (27.4)
150.0–154.9 cm	7847 (32.2)	4802 (32.7)
155.0–159.9 cm	5011 (20.5)	2628 (17.9)
≥160 cm	2189 (9.0)	900 (6.1)
Missing data	1067 (4.4)	470 (3.2)
Mother's occupation, *n* (%)		
Not working	16 573 (67.9)	8596 (58.5)
Nonmanual	1288 (5.3)	475 (3.2)
Agricultural	4579 (18.8)	3839 (26.1)
Manual	1959 (8.0)	1787 (12.2)
Mother's education, *n* (%)		
None	8612 (35.3)	7903 (53.8)
1–5 y	3252 (13.3)	2376 (16.2)
6–8 y	3910 (16.0)	2083 (14.2)
9–10 y	4163 (17.1)	1503 (10.2)
11–12 y	1933 (7.9)	480 (3.3)
≥13 y	2529 (10.4)	352 (2.4)
Father's education, *n* (%)		
None	5156 (21.1)	4873 (33.2)
1–5 y	3360 (13.8)	2689 (18.3)
6–8 y	3985 (16.3)	2611 (17.8)
9–10 y	5693 (23.3)	2667 (18.2)
11–12 y	2545 (10.4)	956 (6.5)
≥13 y	3660 (15.0)	901 (6.1)
Wealth, *n* (%)		
First (lowest) quintile	3569 (14.6)	3934 (26.8)
Second quintile	4023 (16.5)	3445 (23.4)
Third quintile	4976 (20.4)	3146 (21.4)
Fourth quintile	5638 (23.1)	2808 (19.1)
Fifth (highest) quintile	6193 (25.4)	1364 (9.3)
Caste, *n* (%)		
General class	8727 (35.8)	4023 (27.4)
Scheduled caste	3837 (15.7)	3398 (23.1)
Scheduled tribe	4323 (17.7)	2269 (15.4)
Other backward class	7512 (30.8)	5007 (34.1)
Religion, *n* (%)		
Hindu	16 452 (67.4)	10 419 (70.9)
Muslim	3673 (15.1)	2676 (18.2)
Christian	3075 (12.6)	1020 (6.9)
Sikh	451 (1.9)	156 (1.1)
Other/missing data	748 (3.1)	426 (2.9)
Toilet, *n* (%)		
None	9380 (38.4)	7815 (53.2)
Latrine	2242 (9.2)	1409 (9.6)
Flush	11 240 (46.1)	4633 (31.5)
Other	1537 (6.3)	840 (5.7)
Water source, *n* (%)		
Unprotected	3657 (15.0)	2367 (16.1)
Protected well or spring	8290 (34.0)	6805 (46.3)
Truck or bottle	331 (1.4)	194 (1.3)
Tap	10 964 (44.9)	4754 (32.4)
Other	1157 (4.7)	577 (3.9)
Location, *n* (%)		
Large city	4482 (18.4)	2325 (15.8)
Small city	1604 (6.6)	732 (5.0)
Town	3876 (15.9)	1974 (13.4)
Village	14 437 (59.2)	9666 (65.8)

Human Subjects

The institutional review board of the University of Massachusetts Lowell approved this study. Before participating in the household survey, the women's survey, and the IPV module, all participants were asked to provide informed consent after being read a document emphasizing the voluntary nature of this project, outlining potential risks, and explaining that the information gathered would be used to assess health needs and to plan health services.

Protocols were implemented to protect all female respondents. The women's survey was conducted by women chosen for their maturity and trained to emphasize the importance of maintaining confidentiality.[35] Interviewers obtained verbal informed consent a

total of 3 times before asking IPV questions. Interviews were conducted under the most private conditions afforded by the environments encountered, and interviewers did not implement the IPV module if confidentiality could not be ensured.[36] If several eligible women resided in a household, then only 1 woman was selected to answer questions about IPV.[36]

RESULTS

Descriptive Statistics

Substantial numbers of children in the full sample had mothers who reported physical (33.2%), psychological (14.1%), sexual (9.3%), or any (37.6%) IPV; 12.4% had mothers who reported ≥3 types of physical IPV; and 11.6% had mothers who experienced IPV-related injury (Table 1). Mothers of a substantial proportion of the sample experienced only physical IPV (18.5%), whereas much smaller proportions reported only sexual IPV (1.5%) or only psychological IPV (2.6%). Of those who experienced multiple types of IPV (15.0%), nearly all experienced physical IPV (14.7%). Prevalence rates of IPV were similar within the strata of infants and older children. Approximately 5.3% of all children in the full sample, 4.2% of those in the infant sample, and 1.0% of those in the older child sample had died. Among all children, 4.6% of those whose mothers reported no IPV had died, whereas 6.4% of the children whose mothers reported IPV had died (Table 2). Comparable figures were 3.7% and 5.1% for infants and 0.8% and 1.3% for older children (Table 3).

All-Child Death

Among all children <60 months of age (Table 4), we found increased mortality rates among children whose mothers reported any IPV (RR: 1.17 [95% confidence interval [CI]: 1.09–1.26]), physical IPV (RR: 1.21 [95% CI:

TABLE 3 Descriptive Statistics According to Any Experience of Maternal IPV Victimization for Singleton Children 0 to <12 Months and 12 to <60 Months of Age With Married Mothers in the 2005–2006 National Family Health Survey

Variable	Age 0 to <12 mo		Age 12 to <60 mo	
	No Maternal IPV	Any Maternal IPV	No Maternal IPV	Any Maternal IPV
Total, *N* (%)	4703 (100.0)	2450 (100.0)	18 889 (100.0)	11 577 (100.0)
Mortality status, *n* (%)				
Alive	4528 (96.3)	2326 (94.9)	18 743 (99.2)	11 430 (98.7)
Dead	175 (3.7)	124 (5.1)	146 (0.8)	147 (1.3)
Gender, *n* (%)				
Female	2325 (49.4)	1222 (49.9)	8961 (47.4)	5501 (47.5)
Male	2378 (50.6)	1228 (50.1)	9928 (52.6)	6076 (52.5)
Birth order, *n* (%)				
First	1600 (34.0)	500 (20.4)	6322 (33.5)	2705 (23.4)
Second	1407 (29.9)	622 (25.4)	5603 (29.7)	3039 (26.3)
Third	709 (15.1)	466 (19.0)	3084 (16.3)	2175 (18.8)
Fourth	417 (8.9)	338 (13.8)	1777 (9.4)	1462 (12.6)
Fifth or greater	570 (12.1)	524 (21.4)	2103 (11.1)	2196 (19.0)
Age, mean ± SD, mo	5.6 ± 3.3	5.5 ± 3.3	35.5 ± 13.9	36.0 ± 13.7
Mother's age at birth, *n* (%)				
<17 y	204 (4.3)	126 (5.1)	1074 (5.7)	882 (7.6)
17–19 y	825 (17.5)	426 (17.4)	3538 (18.7)	2231 (19.3)
20–24 y	1841 (39.2)	927 (37.8)	7405 (39.2)	4444 (38.4)
25–29 y	1201 (25.5)	596 (24.3)	4641 (24.6)	2531 (21.9)
≥30 y	632 (13.4)	375 (15.3)	2231 (11.8)	1489 (12.9)
Maternal autonomy (aspects), *n* (%)				
0	940 (20.0)	541 (22.1)	3111 (16.5)	2050 (17.7)
1	550 (11.7)	380 (15.5)	2104 (11.1)	1562 (13.5)
2	601 (12.8)	330 (13.5)	2330 (12.3)	1659 (14.3)
3	711 (15.1)	360 (14.7)	2973 (15.7)	1983 (17.1)
4	1901 (40.4)	839 (34.2)	8371 (44.3)	4323 (37.3)
Mother's height, *n* (%)				
<145.0 cm	502 (10.7)	318 (13.0)	1781 (9.4)	1420 (12.3)
145.0–149.9 cm	1206 (25.6)	681 (27.8)	4457 (23.6)	3157 (27.3)
150.0–154.9 cm	1484 (31.6)	799 (32.6)	6121 (32.4)	3822 (33.0)
155.0–159.9 cm	908 (19.3)	432 (17.6)	3954 (20.9)	2082 (18.0)
≥160 cm	397 (8.4)	144 (5.9)	1744 (9.2)	727 (6.3)
Missing data	206 (4.4)	76 (3.1)	832 (4.4)	369 (3.2)
Mother's occupation, *n* (%)				
Not working	3480 (74.0)	1579 (64.5)	12 600 (66.7)	6656 (57.5)
Nonmanual	194 (4.1)	58 (2.4)	1063 (5.6)	398 (3.4)
Agricultural	751 (16.0)	595 (24.3)	3631 (19.2)	3045 (26.3)
Manual	278 (5.9)	218 (8.9)	1595 (8.4)	1478 (12.8)
Mother's education, *n* (%)				
None	1548 (32.9)	1321 (53.9)	6667 (35.3)	6154 (53.2)
1–5 y	621 (13.2)	397 (16.2)	2506 (13.3)	1867 (16.1)
6–8 y	791 (16.8)	347 (14.2)	2986 (15.8)	1668 (14.4)
9–10 y	802 (17.1)	253 (10.3)	3275 (17.3)	1211 (10.5)
11–12 y	425 (9.0)	68 (2.8)	1470 (7.8)	397 (3.4)
≥13 y	516 (11.0)	64 (2.6)	1985 (10.5)	280 (2.4)
Father's education, *n* (%)				
None	945 (20.1)	823 (33.6)	3989 (21.1)	3794 (32.8)
1–5 y	638 (13.6)	453 (18.5)	2580 (13.7)	2096 (18.1)
6–8 y	795 (16.9)	437 (17.8)	3030 (16.0)	2075 (17.9)
9–10 y	1113 (23.7)	441 (18.0)	4412 (23.4)	2122 (18.3)
11–12 y	481 (10.2)	136 (5.6)	2013 (10.7)	778 (6.7)
≥13 y	731 (15.5)	160 (6.5)	2865 (15.2)	712 (6.2)
Wealth, *n* (%)				
First (lowest) quintile	704 (15.0)	701 (28.6)	2696 (14.3)	3018 (26.1)
Second quintile	760 (16.2)	602 (24.6)	3070 (16.3)	2675 (23.1)
Third quintile	948 (20.2)	510 (20.8)	3862 (20.5)	2495 (21.6)

TABLE 3 Continued

Variable	Age 0 to <12 mo		Age 12 to <60 mo	
	No Maternal IPV	Any Maternal IPV	No Maternal IPV	Any Maternal IPV
Fourth quintile	1122 (23.9)	443 (18.1)	4346 (23.0)	2268 (19.6)
Fifth (highest) quintile	1169 (24.9)	194 (7.9)	4915 (26.0)	1121 (9.7)
Caste, *n* (%)				
General class	1648 (35.0)	648 (26.5)	6832 (36.2)	3222 (27.8)
Scheduled caste	750 (16.0)	574 (23.4)	2925 (15.5)	2647 (22.9)
Scheduled tribe	877 (18.7)	400 (16.3)	3291 (17.4)	1759 (15.2)
Other backward class	1428 (30.4)	828 (33.8)	5841 (30.9)	3949 (34.1)
Religion, *n* (%)				
Hindu	3148 (66.9)	1724 (70.4)	12 727 (67.4)	8199 (70.8)
Muslim	709 (15.1)	441 (18.0)	2851 (15.1)	2125 (18.4)
Christian	600 (12.8)	175 (7.1)	2386 (12.6)	807 (7.0)
Sikh	86 (1.8)	27 (1.1)	351 (1.9)	123 (1.1)
Other/missing data	160 (3.4)	83 (3.4)	574 (3.0)	323 (2.8)
Toilet, *n* (%)				
None	1736 (36.9)	1330 (54.3)	7235 (38.3)	6097 (52.7)
Latrine	442 (9.4)	251 (10.2)	1731 (9.2)	1096 (9.5)
Flush	2071 (44.0)	682 (27.8)	8906 (47.2)	3766 (32.5)
Other	454 (9.7)	187 (7.6)	1017 (5.4)	618 (5.3)
Water source, *n* (%)				
Unprotected	725 (15.4)	421 (17.2)	2806 (14.9)	1822 (15.7)
Protected well or spring	1545 (32.9)	1164 (47.5)	6427 (34.0)	5305 (45.8)
Truck or bottle	64 (1.4)	24 (1.0)	256 (1.4)	166 (1.4)
Tap	1993 (42.4)	699 (28.5)	8673 (45.9)	3871 (33.4)
Other	376 (8.0)	142 (5.8)	727 (3.9)	413 (3.6)
Location, *n* (%)				
Large city	842 (17.9)	338 (13.8)	3516 (18.6)	1884 (16.3)
Small city	302 (6.4)	111 (4.5)	1256 (6.7)	589 (5.1)
Town	754 (16.0)	317 (12.9)	3027 (16.0)	1573 (13.6)
Village	2805 (59.6)	1684 (68.7)	11 090 (58.7)	7531 (65.1)

1.13–1.30]), ≥3 types of physical IPV (RR: 1.30 [95% CI: 1.19–1.43]), physical IPV injury (RR: 1.15 [95% CI: 1.05–1.27]), or psychological IPV (RR: 1.11 [95% CI: 1.02–1.21]). Analyzing mutually exclusive categories of IPV types, we found that physical IPV only (RR: 1.21 [95% CI: 1.10–1.32]) and multiple types of IPV (RR: 1.18 [95% CI: 1.08–1.29]) were associated with child death.

Infant Death

Maternal experiences of any IPV (RR: 1.24 [95% CI: 1.01–1.53]), psychological IPV (RR: 1.33 [95% CI: 1.05–1.70]), sexual IPV (RR: 1.41 [95% CI: 1.09–1.83]), physical IPV (RR: 1.24 [95% CI: 1.01–1.53]), and ≥3 types of physical IPV (RR: 1.36 [95% CI: 1.01–1.82]) were associated with higher rates of infant death (Table 4). Maternal experience of multiple types of IPV was associated with child death (RR: 1.49 [95% CI: 1.17–1.90]).

Older Child Death

The only significant association of IPV with older child death (Table 4) was that of maternal experience of ≥3 types of physical IPV (RR: 1.44 [95% CI: 1.09–1.89]). We found a marginally significant association between any physical IPV and older child death (RR: 1.25 [95% CI: 1.00–1.56]).

IPV and Child Gender Interaction

We found no evidence that maternal IPV had different mortality implications for male and female children (Table 5). Among all children <60 months of age, we found no significantly different effects for male children in separate models investigating any maternal IPV (RR: 0.92 [95% CI: 0.81–1.06]; $P = .24$) or the number of types of physical IPV (RR: 0.97 [95% CI: 0.92–1.03]; $P = .31$). We found comparable results by using age-stratified models for infant death and older child death.

Child Mortality Rates and Other Covariates

We found increased mortality rates among children <60 months of age with mothers who had a nonmanual (RR: 1.50 [95% CI: 1.22–1.83]), agricultural (RR: 1.30 [95% CI: 1.19–1.42]), or manual (RR: 1.43 [95% CI: 1.28–1.59]) occupation, had no education (RR: 2.38 [95% CI: 1.74–3.26]), or had high levels of decision-making autonomy (RR: 1.21 [95% CI: 1.10–1.33]) (Table 6). We found decreased mortality rates among children with mothers who were ≥160 cm tall (RR: 0.78 [95% CI: 0.65–0.93]) or were ≥30 years of age when the child was born (RR: 0.46 [95% CI: 0.39–0.56]).

DISCUSSION

The results of this study provide evidence of a robust relationship between physical IPV and death among children <60 months of age but no evidence of an interaction between IPV and child gender. Our finding of a strong association of physical IPV with infant death is consistent with the findings of a previous local study in India[16] but contrary to the results of another study, which found no relationship.[15] Other studies found mixed evidence for an association between maternal IPV and child death in other developing countries.[37–39] The current research expands on those previous studies by using a large national sample from India and finding an association between IPV and older child death.

Women who are abused are more likely to suffer physical or psychological illnesses,[5] which are associated

TABLE 4 Adjusted RRs and 95% CIs for Associations Between Different Aspects of Maternal IPV Victimization and Death for Singleton Children 0 to <60 Months of Age With Married Mothers in the 2005–2006 National Family Health Survey

Measure of Maternal IPV	RR (95% CI)		
	All Ages	Age 0 to <12 mo	Age 12 to <60 mo
Any IPV			
No (reference)	1.00	1.00	1.00
Yes	1.17 (1.09–1.26)	1.24 (1.01–1.53)	1.15 (0.92–1.44)
Any physical IPV			
No (reference)	1.00	1.00	1.00
Yes	1.21 (1.13–1.30)	1.24 (1.01–1.53)	1.25 (1.00–1.56)
No. of types of physical IPV			
0 (reference)	1.00	1.00	1.00
1	1.15 (1.04–1.27)	1.23 (0.92–1.64)	1.10 (0.80–1.51)
2	1.15 (1.01–1.31)	1.08 (0.76–1.52)	1.15 (0.75–1.78)
≥3	1.30 (1.19–1.43)	1.36 (1.01–1.82)	1.44 (1.09–1.89)
Physical IPV injury			
No (reference)	1.00	1.00	1.00
Yes	1.15 (1.05–1.27)	1.23 (0.87–1.76)	1.31 (0.96–1.77)
Sexual IPV			
No (reference)	1.00	1.00	1.00
Yes	1.03 (0.93–1.15)	1.41 (1.09–1.83)	1.05 (0.74–1.49)
Psychological IPV			
No (reference)	1.00	1.00	1.00
Yes	1.11 (1.02–1.21)	1.33 (1.05–1.70)	1.03 (0.76–1.40)
Type of IPV			
None (reference)	1.00	1.00	1.00
Physical only	1.21 (1.10–1.32)	1.05 (0.79–1.41)	1.18 (0.91–1.54)
Sexual only	0.85 (0.64–1.11)	1.46 (0.86–2.46)	0.77 (0.24–2.46)
Psychological only	1.06 (0.87–1.30)	1.02 (0.57–1.81)	0.71 (0.34–1.49)
Multiple types	1.18 (1.08–1.29)	1.49 (1.17–1.90)	1.23 (0.91–1.65)

Models were adjusted for gender, birth order, age, mother's age at birth, maternal autonomy, mother's height, mother's occupation, mother's education, father's education, wealth, caste, religion, household toilet, household drinking water source, household location, and state.

with decreased attention to the health needs of children.[12] Children of parents with serious physical[40] or psychological[41] health conditions are less likely to receive preventive health care, which puts them at higher risk of serious, potentially fatal illnesses. Abused women also are less likely to seek health care services,[42] which could affect child health outcomes.

Stress from witnessing IPV tends to produce potentially harmful physiologic reactions, such as atypical cortisol production patterns, in children.[13,43] Research from developing countries has found that child exposure to family violence is associated with increased levels of poor nutritional outcomes,[10,11] respiratory infections,[44] diarrhea,[44] and asthma.[45]

Maternal reports of IPV could represent the child's own experience of violence. Children are at increased risk of child abuse if they live in households in which either physical[14] or psychological[46] IPV takes place. Abuse of children can result in potentially life-threatening illnesses such as malnutrition[47] and sexually transmitted infections.[48] The most severe form of child abuse, however, is child murder,[49] a phenomenon associated with unequal, male-dominated, gender relationships in India.[50]

The stronger association of maternal IPV with infant death, compared with child death, suggests increased vulnerability among newly born infants. Previous findings indicated that physical abuse during pregnancy was associated with higher prevalence rates of poor birth outcomes, including low birth weight, preterm delivery, and reduced breastfeeding after birth.[51] Therefore, a child born to an abused mother may be physiologically preprogrammed to be at higher risk of death,[52] even if the abuse does not continue after the child is born.

Although the associations between physical IPV and infant and child death seem to be robust, the associations of psychological and sexual IPV with child death are less strong. Only a very small proportion of children had mothers who reported either psychological or sexual IPV without also reporting physical IPV, and those children had no

TABLE 5 Adjusted RRs and 95% CIs for Associations of Interactions Between Maternal IPV Victimization and Gender With Death for Singleton Children 0 to <60 Months of Age With Married Mothers in the 2005–2006 National Family Health Survey

Variable	RR (95% CI)		
	All Ages	Age 0 to <12 mo	Age 12 to <60 mo
Any IPV			
No (reference)	1.00	1.00	1.00
Yes	1.22 (1.10–1.35)	1.26 (0.93–1.71)	1.27 (0.93–1.73)
Gender			
Female (reference)	1.00	1.00	1.00
Male	1.09 (0.99–1.20)	1.29 (0.99–1.68)	0.84 (0.61–1.15)
Gender × any IPV			
Main effects (reference)	1.00	1.00	1.00
Male × any abuse	0.92 (0.81–1.06)	0.97 (0.66–1.42)	0.81 (0.51–1.28)
No. of types of physical IPV, 1-unit increase	1.11 (1.06–1.16)	1.07 (0.94–1.22)	1.19 (1.05–1.35)
Gender			
Female (reference)	1.00	1.00	1.00
Male	1.11 (0.98–1.26)	1.16 (0.81–1.67)	1.00 (0.65–1.54)
Gender × number of types of physical IPV, male ×1-unit increase	0.97 (0.92–1.03)	1.05 (0.89–1.25)	0.87 (0.72–1.04)

Models were adjusted for child's birth order, child's age, mother's age at birth, maternal autonomy, mother's height, mother's occupation, mother's education, father's education, wealth, caste, religion, household toilet, household drinking water source, household location, and state.

greater mortality rate than did children whose mothers were not abused. In addition, although previous research found disproportionately high female child mortality rates in India,[53] we found no evidence that IPV confers increased mortality risk on girls, compared with boys.

The cross-sectional design represents a limitation of this study. Although a cross-sectional method is an indirect technique for assessing mortality rates, this design is considered to be a standard demographic procedure and has been validated for these purposes.[54] Although there may be some concern regarding the temporal ordering of IPV and child death in cross-sectional studies, previous research showed that IPV perpetration in India is a relatively stable phenomenon that has its roots in environmental conditions such as community wife-beating norms,[55] regional gender inequality,[56] and childhood exposure to family violence.[57]

Because IPV is by nature a private phenomenon and one that is often stigmatized, women may be reluctant to reveal their abuse status. The method used in this study, namely, personal interview, is considered to be the most accurate for this type of IPV research.[58] In addition, to ascertain physical, psychological, and sexual IPV, this study used multiple, behaviorally specific questions, which are considered the best methodologically for eliciting correct responses.[59] Much care and preparation went into the design and execution of the interviews, to create a safe atmosphere in which respondents would feel comfortable discussing this issue.

Another limitation of this study is that the outcome, child death, was measured through maternal report. Although a mother is not likely to forget the death of a child, it is possible that she may misreport this information in-

TABLE 6 Adjusted RRs and 95% CIs for Associations of Any Maternal IPV Victimization and All Covariates With Death Among Singleton Children 0 to <60 Months of Age With Married Mothers in the 2005–2006 National Family Health Survey

Variable	RR (95% CI)		
	All Ages	Age 0 to <12 mo	Age 12 to <60 mo
Any IPV			
No (reference)	1.00	1.00	1.00
Yes	1.17 (1.09–1.26)	1.24 (1.01–1.53)	1.15 (0.92–1.44)
Gender			
Female (reference)	1.00	1.00	1.00
Male	1.05 (0.98–1.13)	1.28 (1.05–1.56)	0.75 (0.60–0.94)
Birth order			
First (reference)	1.00	1.00	1.00
Second	0.86 (0.78–0.95)	0.78 (0.60–1.02)	1.33 (0.89–1.98)
Third	0.97 (0.86–1.09)	0.66 (0.47–0.93)	1.83 (1.17–2.88)
Fourth	1.07 (0.93–1.23)	0.71 (0.49–1.01)	1.93 (1.14–3.25)
Fifth or greater	1.17 (1.01–1.36)	0.61 (0.41–0.91)	2.47 (1.49–4.08)
Age, 1-mo increase	0.85 (0.84–0.85)	0.43 (0.38–0.49)	0.91 (0.90–0.92)
Mother's age at birth			
<17 y (reference)	1.00	1.00	1.00
17–19 y	0.77 (0.69–0.87)	0.89 (0.61–1.29)	0.67 (0.41–1.08)
20–24 y	0.62 (0.54–0.70)	0.80 (0.55–1.16)	0.40 (0.23–0.68)
25–29 y	0.48 (0.41–0.55)	0.78 (0.51–1.20)	0.32 (0.18–0.57)
≥30 y	0.46 (0.39–0.56)	0.87 (0.54–1.42)	0.30 (0.16–0.56)
Maternal autonomy (aspects)			
0 (reference)	1.00	1.00	1.00
1	1.04 (0.92–1.18)	1.46 (1.06–2.03)	0.80 (0.51–1.25)
2	1.12 (1.00–1.27)	1.06 (0.74–1.53)	1.09 (0.72–1.63)
3	1.26 (1.13–1.42)	1.50 (1.08–2.08)	1.35 (0.92–1.97)
4	1.21 (1.10–1.33)	1.29 (0.97–1.71)	0.98 (0.70–1.38)
Mother's height			
<145.0 cm (reference)	1.00	1.00	1.00
145.0–149.9 cm	0.83 (0.75–0.91)	0.78 (0.58–1.04)	0.85 (0.59–1.22)
150.0–154.9 cm	0.78 (0.70–0.86)	0.78 (0.58–1.05)	0.70 (0.49–1.00)
155.0–159.9 cm	0.77 (0.69–0.87)	0.64 (0.44–0.93)	0.63 (0.41–0.98)
≥160 cm	0.78 (0.65–0.93)	0.64 (0.38–1.11)	0.95 (0.57–1.60)
Missing data	0.76 (0.62–0.93)	0.55 (0.28–1.07)	1.11 (0.64–1.93)
Mother's occupation			
Not working (reference)	1.00	1.00	1.00
Nonmanual	1.50 (1.22–1.83)	1.37 (0.81–2.30)	1.13 (0.44–2.89)
Agricultural	1.30 (1.19–1.42)	1.59 (1.23–2.05)	1.02 (0.76–1.36)
Manual	1.43 (1.28–1.59)	1.65 (1.21–2.26)	1.16 (0.80–1.68)
Mother's education			
≥13 y (reference)	1.00	1.00	1.00
11–12 y	1.52 (1.10–2.09)	1.16 (0.50–2.67)	1.18 (0.20–7.08)
9–10 y	1.58 (1.15–2.15)	1.14 (0.53–2.47)	1.64 (0.34–7.93)
6–8 y	1.80 (1.32–2.46)	1.29 (0.58–2.87)	1.40 (0.28–7.03)
1–5 y	2.08 (1.52–2.84)	1.18 (0.53–2.62)	2.49 (0.52–11.92)
None	2.38 (1.74–3.26)	1.05 (0.47–2.32)	3.95 (0.84–18.60)
Father's education			
≥13 y (reference)	1.00	1.00	1.00
11–12 y	1.07 (0.86–1.32)	1.18 (0.67–2.06)	1.87 (0.60–5.83)
9–10 y	1.08 (0.90–1.31)	1.51 (0.95–2.42)	1.67 (0.58–4.82)
6–8 y	1.04 (0.86–1.27)	1.31 (0.81–2.12)	1.79 (0.61–5.26)
1–5 y	1.17 (0.96–1.42)	1.39 (0.84–2.31)	2.59 (0.89–7.54)
None	1.12 (0.92–1.36)	1.28 (0.79–2.09)	2.10 (0.72–6.11)
Wealth			
Fifth (highest) quintile (reference)	1.00	1.00	1.00
Fourth quintile	0.99 (0.85–1.16)	1.14 (0.74–1.76)	0.99 (0.51–1.93)
Third quintile	0.96 (0.81–1.15)	1.09 (0.68–1.74)	1.05 (0.52–2.11)
Second quintile	1.01 (0.84–1.22)	1.02 (0.59–1.76)	1.21 (0.58–2.54)
First (lowest) quintile	0.92 (0.75–1.13)	1.01 (0.58–1.79)	1.23 (0.56–2.68)

TABLE 6 Continued

Variable	RR (95% CI)		
	All Ages	Age 0 to <12 mo	Age 12 to <60 mo
Caste			
General class (reference)	1.00	1.00	1.00
Scheduled caste	1.01 (0.90–1.12)	1.06 (0.78–1.44)	1.14 (0.77–1.68)
Scheduled tribe	0.98 (0.85–1.12)	0.85 (0.57–1.28)	1.33 (0.82–2.16)
Other backward class	0.90 (0.81–1.00)	0.87 (0.65–1.17)	0.94 (0.64–1.37)
Religion			
Hindu (reference)	1.00	1.00	1.00
Muslim	0.86 (0.77–0.96)	1.01 (0.73–1.41)	0.84 (0.55–1.29)
Christian	1.09 (0.90–1.33)	1.02 (0.58–1.78)	1.23 (0.65–2.33)
Sikh	1.15 (0.80–1.66)	2.11 (0.78–5.69)	0.49 (0.12–2.09)
Other/missing data	0.96 (0.76–1.22)	1.10 (0.62–1.97)	1.54 (0.72–3.29)
Toilet			
None (reference)	1.00	1.00	1.00
Latrine	1.09 (0.93–1.28)	1.13 (0.72–1.77)	1.25 (0.76–2.07)
Flush	1.00 (0.89–1.13)	1.28 (0.92–1.78)	0.65 (0.42–1.00)
Other	1.09 (0.87–1.37)	1.49 (0.91–2.44)	1.11 (0.58–2.13)
Water source			
Unprotected (reference)	1.00	1.00	1.00
Protected well or spring	0.94 (0.85–1.05)	0.94 (0.70–1.26)	0.89 (0.64–1.24)
Truck or bottle	1.12 (0.78–1.60)	1.59 (0.52–4.84)	1.03 (0.29–3.71)
Tap	0.97 (0.86–1.09)	0.75 (0.54–1.03)	0.84 (0.58–1.22)
Other	0.65 (0.50–0.85)	0.35 (0.19–0.67)	0.50 (0.19–1.31)
Location			
Large city (reference)	1.00	1.00	1.00
Small city	1.14 (0.95–1.36)	1.37 (0.79–2.39)	1.57 (0.85–2.93)
Town	1.01 (0.87–1.18)	1.61 (1.02–2.55)	1.05 (0.58–1.90)
Village	0.97 (0.84–1.12)	1.52 (0.96–2.39)	1.02 (0.60–1.72)

All models contained fixed effects for states, to account for the multistage sampling procedure.

tentionally. In addition, the cause of death for each child was not ascertained, which made it impossible to determine the mechanisms of death that account for the increased mortality rates seen among children of abused mothers. Future studies on this topic should aim to verify maternal reports by using death certificates and should collect information regarding causes of death, to provide more data about the mechanisms involved in this process.

CONCLUSIONS

IPV is a major health problem that is widespread around the world[60] and is especially common in India.[7] Although it has been documented in all types of households, IPV is most strongly associated with socioeconomic,[19,61] demographic,[62] and contextual[55,56] disadvantages. Exposure to IPV among socially marginalized groups may aggravate the negative effects of cumulative disadvantages on poor child health outcomes. Workers in the fields of medicine, public health, public policy, and public security should act to eliminate IPV, to improve health outcomes and to reduce social health disparities. Future studies should investigate the influence of potential mechanisms mediating the association of IPV and child death.

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