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# Violence against women increases the risk of infant and child mortality: a case–referent study in Nicaragua

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**Objective** To investigate the impact of violence against mothers on mortality risks for their offspring before 5 years of age in Nicaragua.

**Methods** From a demographic database covering a random sample of urban and rural households in León, Nicaragua, we identified all live births among women aged 15–49 years. Cases were defined as those who had died before the age of 5 years, between January 1993 and June 1996. For each case, two referents, matched for sex and age at death, were selected from the database. A total of 110 mothers of the cases and 203 mothers of the referents were interviewed using a standard questionnaire covering mothers' experience of physical and sexual violence. The data were analysed for the risk associated with maternal experience of violence of infant and under-5 mortality.

**Findings** A total of 61% of mothers of cases had a lifetime experience of physical and/or sexual violence compared with 37% of mothers of referents, with a significant association being found between such experiences and mortality among their offspring. Other factors associated with higher infant and under-5 mortality were mother's education (no formal education), age (older), and parity (multiparity).

**Conclusions** The results suggest an association between physical and sexual violence against mothers, either before or during pregnancy, and an increased risk of under-5 mortality of their offspring. The type and severity of violence was probably more relevant to the risk than the timing, and violence may impact child health through maternal stress or care-giving behaviours rather than through direct trauma itself.

**Keywords** Domestic violence; Infant mortality; Maternal welfare; Sex offenses; Sexual partners; Pregnancy complications; Cause of death; Risk factors; Socioeconomic factors; Odds ratio; Case-control studies; Nicaragua (*source: MeSH, NLM*).

**Mots clés** Violence familiale; Mortalité nourrisson; Protection maternelle; Abus sexuel; Partenaire sexuel; Grossesse compliquée; Cause décès; Facteur risque; Facteur socio-économique; Odds ratio; Etude cas-témoins; Nicaragua (*source: MeSH, INSERM*).

**Palabras clave** Violencia doméstica; Mortalidad infantil; Bienestar materno; Delitos sexuales; Parejas sexuales; Complicaciones del embarazo; Causa de muerte; Factores de riesgo; Factores socioeconómicos; Razón de diferencia; Estudios de casos y controles; Nicaragua (*fuentes: DeCS, BIREME*).

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Voir page 15 le résumé en français. En la página 15 figura un resumen en español.

## Introduction

Violence against women has serious consequences for their physical (1, 2) as well as mental health (3–5). Physical violence against women is a major public health problem in many settings, with a lifetime prevalence varying from 20% to 50% (6–10). During pregnancy 1–20 % of women are exposed to violence (11), and there are indications that the severity of violence may increase during pregnancy (12). Unemployment, strained economic resources, a history of family violence, and alcohol abuse have been reported to increase the occurrence of physical violence against women (13, 14).

A few studies, mostly in high-income countries, have suggested that physical violence against pregnant women increases the risk of preterm labour (15) or delivery (16),

fetal distress or death (16–18), and low-birth-weight offspring (19–23).

So far, little is known about the possible effect of violence against women on the survival of their offspring. However, low birth weight is an important risk factor for increased infant mortality (24, 25), and an abused and chronically stressed mother may experience difficulties in coping with the multiple needs of her small child (26).

A recent population-based study in León, Nicaragua, indicated that 40% of women of reproductive age ( $n = 488$ ) had been exposed to physical violence by a partner (27). Among ever-married women ( $n = 360$ ), the lifetime prevalence of physical violence by a current or former intimate partner was 52%, and 27% of women reported having been exposed to violence in the 12 months prior to being interviewed.

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Furthermore, 70% of cases of violence were classified as severe. Violence was associated with poverty, high parity, and a history of marital violence in the partner's family (27). A total of 31% of women exposed to violence were beaten during one or more pregnancies, and 33% reported that beatings were commonly accompanied by forced sex (28). Physical violence from partners also increased the risk of the woman suffering from emotional distress (29), and the children of mothers who had experienced violence were more than twice as likely to suffer from learning, emotional, or behavioural problems compared with children whose mothers had never been so exposed (28).

Using the same population-based sampling frame that was employed in this population-based study in Nicaragua (27), we report here the results of a case-referent study on mortality among under-5-year-olds. The aim was to assess the effect of physical and sexual violence against mothers on the mortality risks of children in this age group.

## Methods

A case-referent study was nested into a demographic database consisting of 9500 households, covering 50 out of the 208 geographical clusters in urban and rural areas of the municipality of León, Nicaragua. The database was established in 1993 by León University and Umeå University by means of a population survey performed on a random sample of households, representing nearly 25% of the population of León. All women aged 15–49 years in the sample were interviewed and detailed information regarding their migration history, birth history, deaths of children, education, employment, and housing conditions was obtained (30). In mid-1996, all households were revisited and information on all the women of reproductive age was updated, including answers to specific questions identifying all births and any deaths of children aged <5 years.

Cases were defined as children born alive to women in the database described above and who died before the age of 5 years, between January 1993 and June 1996. For each case, two referents (alive), matched for sex and age at death, were randomly selected from the database. Initially, 156 children, identified as potential cases, were matched with 312 referents. The mothers of all cases and selected referents were visited and invited to participate in the study. Upon completion of the interviews, it was ascertained that 24 of the cases had actually been stillbirths, and therefore did not meet the inclusion criteria. An additional 15 cases had migrated out of the study area, and three mothers of cases were unable to complete the interview because they were mentally retarded. A further four mothers of cases refused to participate in the complete interview. As a result, 46 of the initial cases and each of their two corresponding referents (92) were excluded from the study. It was not possible to trace 16 mothers of the referents, and one mother of a referent refused to be interviewed (refusal rate among mothers of cases and referents altogether was less than 2%). A total of 110 mothers of cases and 203 mothers of referents were interviewed for the study, resulting in 93 complete triplets (one case and two referents) and 17 pairs with only one referent.

## Interviews

Four trained female Nicaraguan field workers interviewed the mothers in privacy, using a standardized, pretested ques-

tionnaire. Information on the deaths of under-5-year-old children were ascertained by means of a verbal autopsy, including detailed standardized questions previously used in low-income settings (31). Mothers were also asked to provide a narrative account of the circumstances leading to their children's deaths. A diagnosis of the principal cause of death was extracted from this information by two paediatricians through a consensus process. Dates of births and deaths were carefully registered, using a local events calendar.

Physical and sexual violence against mothers was assessed through two groups of questions. The first group dealt with lifetime experiences of physical and sexual violence by any person, including sexual violence in childhood. Women experiencing violence were further questioned about the perpetrator, frequency of violent incidents, and how much they felt that the violence had affected their emotional well-being. The second group of questions was based on the abuse assessment screen (AAS), a five-question instrument that has been used successfully to screen for violence in pregnancy (32), but our instrument differed from the AAS in some important aspects, as follows. Only data on physical and sexual violence by a former or current intimate partner were included, and separate questions were used to determine the severity and temporal sequence of violence. Moderate violence was defined as slaps, pushes and shoves, whereas punches, kicks, bites or blows with objects were classified as severe violence. Forced sexual acts were considered as sexual violence and were classified as severe. Lifetime experiences of partner violence, and violence during the index pregnancy as well as in the year before the child's death (for referents, 12 months prior to the interview) were also assessed. Mothers who experienced any type of violence were also asked to state, using a four-step scale from none to very much, the degree to which they felt that it had affected their emotional well-being. Information was collected about mother's age, parity, educational level, occupation, and social network. Socioeconomic status was estimated using the unsatisfied basic needs assessment method, which measures household access to a series of basic services, such as sanitation, housing conditions, and educational level. This method has been adapted and used for socioeconomic research in Nicaragua (33, 34). Low socioeconomic status was defined as one or more unsatisfied basic needs. Women were also questioned about their breastfeeding habits, use of health services (antenatal care and delivery place), smoking, and alcohol use. Questions addressing child abuse or alcohol use by partners were not included.

## Data analysis

All completed interview forms were reviewed by a field supervisor and inspected by one of the principal researchers. Forms with missing data or inconsistencies were returned to the interviewers for correction. Data were entered and checked by trained personnel under continuous supervision by a principal researcher. Odds ratios for infant and under-5 mortality were calculated using matched analysis. Conditional logistic regression analyses were performed by use of EGRET software version 2.0 (Statistical and Epidemiological Research Corporation, Seattle, WA, USA). A model was developed to evaluate if physical and sexual violence from a current or former partner against the mother was independently associated with increased risk of death of an offspring during the first 5 years of age, adjusting for potential

confounding factors including mother's age, parity, educational attainment, place of residency, and basic needs assessment. The proportion of child deaths attributable to violence was estimated from the frequency of physical and sexual violence among mothers of cases and the odds ratios obtained in the multivariate model. Population-attributable risk was calculated using the following expression:

$$\frac{((\text{proportion exposed among all mothers of cases}) \times (\text{odds ratio} - 1))}{\text{odds ratio}}$$

### Ethics

Data were handled with strict confidentiality. Ethical review and clearance was obtained from the Medical Faculty, University of León, Nicaragua, and the Research Ethics Committee of the Medical Faculty, Umeå University, Sweden. Informed consent was obtained at the community level through meetings with local health organizations, community representatives, and by the participating women. All the women and children who were included in the study were offered free medical or mental health services at the local hospital and psychiatric outpatient clinic.

## Results

### Causes of deaths

A total of 92 (84%) of the 110 deaths identified occurred during the first year of life (Table 1). The commonest causes of death among neonates were complications arising from preterm delivery and low birth weight, while for the older age groups the major causes were infectious diseases, mainly diarrhoea. Five mothers (4%) reported that their children had experienced some kind of trauma, and subsequent evaluations of the circumstances surrounding those deaths indicated that insufficient care or neglect were more likely causes than child abuse.

### Patterns of violence

A total of 61% of the mothers of children who had died (cases) had ever experienced any physical or sexual violence by any person, compared with 37% of referent mothers (Table 2, available only on the online version at: URL: <http://www.who.int/bulletin/>). Sexual violence had been experienced by 26% of the mothers of the cases and 10% of referent mothers. The vast majority of all violence was from a current or former intimate male partner (51% of cases, 33% of referents). Aside from the male partner, there was a wide range of other offenders (non-partner violence), including fathers (7% of mothers of cases and 3% of referents), mothers (5% of mothers of cases and 3% of referents), and other family members, as well as friends or strangers. A total of 17% of mothers of cases, compared with 6% of mothers of referents, had been abused by partners as well as non-partners. Among the women reporting physical violence, 90% classified the violence as severe. Only five mothers had experienced sexual partner violence but no physical partner violence, whereas 20% of mothers of cases and 6% of those of referents had experienced both physical and sexual violence. Violence during the index pregnancy was reported by 21% of the mothers of cases compared with 12% of those of the referents. One mother had adopted her child (a case) and could therefore not give any information regarding the pregnancy. Furthermore, 29% of the mothers of cases and

Table 1. Causes and symptoms prior to death of 110 children who died before the age of 5 years in León, Nicaragua, 1993–6

Causes/symptoms	% of deaths at age:		
	0–29 days (n = 58)	0–11 months (n = 92)	0–59 months (n = 110)
Diarrhoea	2	22	25
Prematurity, low birth weight	43	27	23
Respiratory infections	5	10	12
Fever of unknown origin	14	14	14
Malformations	17	12	10
Asphyxia	14	10	8
Trauma	2	2	4
Unknown	3	3	4
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>

18% of those of the referents had been exposed to violence during the 12 months preceding a child death (cases) or the interview (referents). Only one woman (the mother of a case) reported violence during pregnancy but not during the previous 12 months. Almost all mothers (92%) who had ever experienced any kind of violence reported that it had greatly affected their emotional well-being, and all who had experienced a combination of physical and sexual violence were deeply affected by it. All mothers reporting both sexual and physical violence reported that the latter was severe.

A significant association was found between lifetime experiences of physical and sexual violence towards mothers and mortality among their children (see Table 2, available online). In addition, mother's educational level (no formal education), age (older), parity (multiparity) and area of residence (rural) were associated with higher infant and under-5 mortality (Table 3). Low socioeconomic status was strongly associated with mothers who had no formal education and those living in rural areas. However, no association was found between socioeconomic status and infant or under-5 mortality. Smoking and alcohol consumption were rare (3% and 4%, respectively), and did not differ significantly between mothers of cases and mothers of referents.

Lifetime exposure to violence was more often reported by multiparous mothers and by those of low educational level. No significant association was found between violence and age of mother, employment status of mother or father, place of delivery, breastfeeding practices, basic needs assessment level, or area of residency.

### Mortality risks

The risk of death in infancy or before 5 years of age was more than six times greater if the mother had been exposed to both physical and sexual violence by a current or former partner at any point in her life, even after adjusting for educational, parity, area of residency, and basic needs assessment level (Table 4). No significant interactions were found between violence and mothers' educational attainment, violence and parity, violence and area of residency, or between violence and basic needs assessment in relation to mortality. Mother's age was not

Table 3. Social and demographic characteristics of mothers of 110 cases and 203 referents as risk factors of infant and under-5 mortality in León, Nicaragua, 1993–6

Risk factor	% of cases <sup>b</sup> (n = 110)	% of referents <sup>c</sup> (n = 203)	Odds ratio for deaths at: <sup>a</sup>	
			0–11 months	0–59 months
<b>Educational level</b>				
Formal education <sup>d</sup>	67	86	1.0	1.0
No formal education <sup>e</sup>	33	14	2.3 (1.3–4.3) <sup>f</sup>	3.0 (1.7–5.3)
<b>Parity<sup>g</sup></b>				
1 birth	28	36	1.0	1.0
2–5	51	56	1.1 (0.7–2.0)	1.1 (0.7–1.8)
>5	21	8	3.9 (1.7–9.4)	3.0 (1.4–6.4)
<b>Age (years)</b>				
15–19	18	21	1.0	1.0
20–34	60	72	1.0 (0.5–2.0)	0.9 (0.5–1.8)
35–49	22	7	3.0 (1.3–7.3)	3.4 (1.4–8.2)
<b>Area of residency</b>				
Urban	57	80	1.0	1.0
Rural	43	20	3.1 (1.7–5.8)	3.3 (1.9–5.8)
<b>Basic needs assessment</b>				
Satisfied	26	28	1.0	1.0
Not satisfied	74	72	1.1 (0.6–2.0)	1.2 (0.7–2.1)

<sup>a</sup> Bivariate odds ratio based on matched analysis.

<sup>b</sup> For basic needs, n = 106 for cases.

<sup>c</sup> For basic needs, n = 200 for referents.

<sup>d</sup> 3 years of schooling or more, completed primary school.

<sup>e</sup> 2 years of schooling or less, not completed primary school.

<sup>f</sup> Figures in parentheses are 95% confidence levels.

<sup>g</sup> No. of live births.

included in the final multivariate model due to collinearity between parity and age. Given a causal link between the demonstrated association of violence and mortality, as much as one-fourth (27%) of the under-5 deaths could be attributed to physical or sexual violence by a partner (frequency among cases, 51%; odds ratio, 2.1).

## Discussion

The central finding of the present study was the increased risk of infant and under-5 mortality that was found to be associated with partner violence. Any history of violence was associated with a twofold increase in risk, and children of women who experienced both sexual and physical violence had a sixfold greater risk of death. This association has, to our knowledge, not previously been reported. Nevertheless, recent findings in a survey in rural India have suggested a relation between wife beating and infant death (35).

### Selection bias

It is unlikely that our findings can be attributed to selection bias. Cases were recruited from a representative sample of the community by means of a demographic database that involved home visits to all households. Great efforts were made to identify all deaths in the study population during the reference period. Mothers of cases who did not participate in the study (mostly due to recent migration out of the region) and non-

Table 4. Effect of physical and sexual violence against mothers on infant and under-5 mortality, in León, Nicaragua, 1993–6<sup>a</sup>

Risk factor	Odds ratio for deaths at:	
	0–11 months	0–59 months
<b>Experience of violence</b>		
No physical or sexual violence by anyone	1.0	1.0
Physical or sexual violence by a non-partner only	3.1 (0.9–11.0) <sup>b</sup>	4.1 (1.2–13.7)
Physical or sexual partner violence	2.2 (1.0–4.5)	2.1 (1.1–4.1)
Both physical and sexual partner violence	7.8 (2.5–24.8)	6.3 (2.3–17.1)
<b>Education</b>		
Formal education <sup>c</sup>	1.0	1.0
No formal education <sup>d</sup>	1.4 (0.6–3.0)	2.0 (1.0–3.9)
<b>Parity<sup>e</sup></b>		
1 birth	1.0	1.0
2–5 births	0.8 (0.41.6)	0.9 (0.5–1.6)
>5 births	2.1 (0.7–6.2)	2.0 (0.8–4.8)
<b>Area of residency</b>		
Urban	1.0	1.0
Rural	3.5 (1.7–7.2)	3.4 (1.8–6.7)
<b>Basic needs assessment</b>		
Satisfied	1.0	1.0
Not satisfied	0.9 (0.4–1.8)	0.9 (0.5–1.8)

<sup>a</sup> Based on a multivariate conditional (age and sex matched) logistic regression analyses for infant mortality outcome (92 cases, 169 referents) and under-5 mortality (110 cases, 203 referents).

<sup>b</sup> Figures in parentheses are 95% confidence levels.

<sup>c</sup> 3 years of schooling or more, completed primary school.

<sup>d</sup> 2 years of schooling or less, not completed primary school.

<sup>e</sup> No. of live births.

participating mothers of referents had the same socioeconomic characteristics as those who did participate, thereby minimizing the possibility of selection bias. Furthermore, there were no differences in the socioeconomic characteristics of the mothers of referents and those of women in the overall study population, indicating that the referent sample was representative with respect to those characteristics.

### Underreporting versus overreporting

In general, underreporting of violence is much commoner than overreporting, largely because of the stigma attached to victimization as well as to the fear of reprisals (2, 4, 6, 36). Although mothers who have experienced the trauma of a child death may be more likely to report violence, it seems unlikely that selective overreporting would account for the strength of the associations that we found. Selective underreporting by the mothers of referents is theoretically possible, but does not seem likely, since the level is similar to that previously reported from the study area (37). Recall bias among mothers of cases is also possible, since they were asked to remember events taking place during the 12 months before the child's death, which could have occurred anytime from January 1993 until the study was performed in January to June 1996. In contrast, the mothers of referents were asked about the 12 months prior to the interview. However, any recall bias would most probably lead to an underestimation of abuse among the mothers of cases due to the longer recall period.

### Basic needs assessment

We did not find any significant association between the basic needs assessment level (poverty) and infant or under-5 mortality level, although there was an association between rural mothers and those with low educational attainment and mortality among their offspring. It is possible, however, that the instrument used to estimate unsatisfied basic needs was not sensitive enough to pick up poverty differences.

### Violence against mothers and risk of mortality among their offspring

There are several explanations for the association between physical and sexual violence against mothers and the increased risk of infant and under-5 mortality. First, violence during pregnancy increases the risk of low-birth-weight infants, a well-known risk factor for increased infant mortality (24, 25). Low birth weight may be a direct consequence of violence, for example, in the case of preterm delivery provoked by direct abdominal trauma (17, 38, 39). However, violence may also affect birth weight indirectly, through changes to physiology (increased levels of stress hormones (40–42) and in immunological factors (40, 41)) and behavioural mechanisms (43, 44). This is supported by results from a recent hospital-based case-referent study in León, Nicaragua, which found that, after adjusting for other known risk factors of low birth weight, partner violence against pregnant women increased the risk of low birth weight by a factor of three (45). Maternal stress due to violence may increase women's likelihood of engaging in negative health or coping behaviours, such as smoking and substance abuse (46). However, as only 3% of the mothers reported smoking during pregnancy, it is unlikely that smoking is a factor affecting birth weight in our study.

Violence may also act as a stressor in itself, affecting women's ability to obtain adequate nutrition, rest, exercise and medical care. Several studies have indicated that women experiencing violence during pregnancy are more likely to enter antenatal care late in the pregnancy, and to report having unintended pregnancies (47, 48).

Second, violence may impact child health by diminishing women's access to material as well as internal resources necessary for safeguarding their children's health. Women experiencing physical or sexual violence are likely to suffer from a variety of mental health disorders, including depression, anxiety, and post-traumatic stress syndrome (3, 4). In addition, physical violence is often accompanied by feelings of powerlessness, social isolation, and economic dependency (43, 49, 50). In Nicaragua violence against women has been reported to be closely associated with controlling behaviour on the part of partners (28).

Violence may interfere with the caring capacity of mothers through emotional distress or because they are physically prevented from obtaining care for their children. A study conducted in India found that the children of battered women were more likely to be malnourished and to receive less food than those of women who were not beaten (51).

Third, the child deaths may have been due to direct trauma. Ellsberg et al. found that the children of mothers

who had experienced violence were almost seven times more likely to be physically and sexually abused themselves (28). In our study only five (4%) out of 110 deaths were explained by trauma, and subsequent evaluations of the circumstances surrounding those deaths indicated that insufficient care or neglect were more likely causes than direct trauma. However, we cannot rule out an underreporting of trauma as a cause of death since no questions addressing child abuse were included in order not to blame or distress the respondent.

Our findings indicate that the type and severity of violence were more relevant to the risk of child death than the timing of the abuse or the relationship between the mother and the perpetrator. The highest risk of child death was found among mothers who were victimized by both partners and non-partners, as well as among women who had experienced both physical and sexual partner violence at any time, even compared with women who had experienced severe physical partner violence during the index pregnancy or previous 12 months. This finding lends support to the view that violence impacts child health through maternal stress or caregiving behaviours rather than direct trauma. Previous research in Nicaragua indicates that sexual coercion by partners is generally associated with greater severity of physical as well as emotional violence (28). Therefore it is not known whether the increased risk of child death when sexual and physical violence are combined is due to the specific effect of sexual assault, or whether this represents a more severe level of violence overall. Our findings underscore the extent to which the traumatic effects of violence may persist long after the violence itself has ended.

There are no reasons to assume that the reported association between violence against mothers and increased risks of child mortality are unique for the study area. In any setting, the biological consequences of violence during pregnancy could have a negative impact on pregnancy outcome, although that might be compensated for through better economic resources and widespread health care services.

Our findings indicate that violence against women represents an important public health concern not only for women's health but also for children's survival. This underscores the need for further research to confirm our results and to understand the mechanisms whereby physical and sexual assault increases the risk of child mortality. ■

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**Conflicts of interest:** none declared.

## Résumé

### La violence à l'encontre des femmes augmente le risque de mortalité infantile : une étude cas-témoin au Nicaragua

**Objectif** Étudier les effets de la violence à l'encontre des mères sur les risques de mortalité que présentent les enfants de moins de 5 ans au Nicaragua.

**Méthodes** À partir d'une base de données démographiques couvrant un échantillon aléatoire de foyers urbains et ruraux de la région de Leon, au Nicaragua, nous avons recensé toutes les naissances vivantes chez les femmes âgées de 15 à 49 ans. Les cas ont été définis comme étant les enfants décédés avant l'âge de 5 ans, entre janvier 1993 et juin 1996. Pour chaque cas, deux témoins, appariés pour le sexe et l'âge au moment du décès, ont été choisis dans la base de données. Au total, on a interrogé 110 mères de cas et 203 mères de témoins au moyen d'un questionnaire standard portant sur l'expérience qu'elles avaient de la violence physique et sexuelle. Les données ont été analysées afin de déterminer chez les nourrissons et les enfants de moins de 5 ans le risque de mortalité associé à l'expérience maternelle de la violence.

**Résultats** Au total, 61 % des mères de cas avaient eu l'expérience de la violence physique et/ou sexuelle au cours de leur vie contre 37 % des mères de témoins, et l'on a trouvé une association significative entre ces expériences et la mortalité observée chez leurs enfants. Les autres facteurs associés à une mortalité plus élevée chez les nourrissons et les moins de 5 ans étaient le niveau d'instruction (pas d'instruction), l'âge (avancé) et la parité (multiparité) de la mère.

**Conclusion** Ces résultats laissent à penser qu'il existe une association entre la violence physique et sexuelle à l'encontre des mères, avant ou pendant la grossesse, et un risque accru de mortalité avant 5 ans chez leurs enfants. Ce risque est probablement davantage lié au type et au degré de la violence qu'au moment où elle s'exerce, et celle-ci peut influencer sur la santé des enfants du fait du stress maternel ou des comportements qu'elle engendre au niveau des soins aux enfants, plus que du fait du traumatisme direct.

## Resumen

### La violencia contra las mujeres aumenta el riesgo de defunción infantil: estudio de casos y testigos en Nicaragua

**Objetivo** Investigar las repercusiones de la violencia contra las madres en la mortalidad de sus hijos hasta los 5 años de edad en Nicaragua.

**Métodos** A partir de una base de datos demográficos que abarcaba una muestra aleatoria de hogares urbanos y rurales en Leon (Nicaragua), identificamos a todos los nacidos vivos de mujeres de 15 a 49 años. Se consideraron casos los niños fallecidos antes de alcanzar los 5 años entre enero de 1993 y junio de 1996, y para cada caso se seleccionaron a partir de la base de datos dos testigos, emparejados por sexo y edad en el momento de la muerte. Se entrevistó en total a 110 madres de casos y 203 madres de testigos, utilizando un cuestionario estándar en el que se les preguntaba a las madres si habían sufrido violencia física y sexual. Se analizaron los datos para determinar el riesgo asociado a la experiencia materna de violencia en el caso de la mortalidad de lactantes y menores de 5 años.

**Resultados** Un 61% de las madres de casos habían sufrido a lo largo de su vida violencia física y/o sexual, en comparación con el 37% de las madres de testigos, y la relación entre esa experiencia y la mortalidad de su descendencia era significativa. Otros factores asociados a una mayor mortalidad de lactantes y menores de 5 años fueron la educación de la madre (carencia de estudios escolares), la edad (mayor) y el número de partos (multiparidad).

**Conclusión** Los resultados indican que la violencia física y sexual contra las madres, antes del embarazo o durante el mismo, se asocia a un mayor riesgo de defunción de sus hijos menores de 5 años. Probablemente la naturaleza y la gravedad de los actos violentos contribuyeron al riesgo en mayor medida que el momento en que tuvieron lugar, y tales actos podrían repercutir en la salud del niño no tanto de forma directa como a través del estrés materno o de cambios en el comportamiento de cuidado de los niños.

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## Commentary

## Violence against women and the risk of infant and child mortality

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The preceding paper by Åsling-Monemi et al. tests the hypothesis that violence against women, either before, during, or after pregnancy, increases the risk of child and infant mortality among their offspring. Their findings are startling — after controlling for other possibly confounding factors, the children of women who were physically and sexually abused by a partner were six times more likely to die before the age of 5 years than children of non-abused women, and partner abuse was found to account for around one-third of all deaths of under-5-year-olds in the study region of León, Nicaragua. Among neonates the main proximal causes of death were preterm delivery and low birth weight, and among older age groups infectious diseases. The authors speculate that this relationship between violence and child mortality is mediated through chronic stress of the mother, possibly affecting both the fetus and the care provided to the child.

The paper by Åsling-Monemi et al. is timely and important in view of the recently published *World report on violence and health* (1), which found that interpersonal violence may produce a wide spectrum of health consequences quite apart from deaths and injuries. This means that violence, in addition to warranting preventive attention as a direct cause of physical and psychosocial damage, is also a significant risk factor for other health outcomes, and the stronger the evidence for the size and strength of these risk effects, the stronger the arguments for preventing violence. To claim, albeit in the specific setting of Åsling-Monemi et al.'s study, that one-fourth of all under-5 mortality is causally related to violence against the mothers of the deceased is to claim a massive health risk-effect for violence against women. If this claim is validated for Nicaragua and shown to apply in other countries, it would be a powerful additional argument for increased investment in developing and implementing effective violence-prevention strategies.

The findings reported by Åsling-Monemi et al. are consistent with those of a handful of other studies that have associated violence during pregnancy with premature labour and birth, fetal injury, and low birth weight (2–7). They are also consistent with one other study linking violence during pregnancy to infant death (8). Where Åsling-Monemi et al. go beyond these existing studies is in looking at violence not only during but also after pregnancy, and in attempting to estimate the proportion of all under-5 mortality that could be attributed to violence against mothers.

A strength of the study is the fact that it adjusted for several important confounding variables such as the mothers' age and parity, educational level, employment status, and the

degree to which basic needs were satisfied. However, like all pioneering studies of relatively under-researched areas of public health concern, it suffers from some limitations, as discussed below.

Because the exposure data were obtained retrospectively, the possibility that recall bias accounted for some or all of the reported associations cannot be excluded. Such bias may have arisen because women who were in abusive relationships may have remembered their experiences differently from other women (9). Physical and sexual abuse are widely believed to be detrimental to family functioning and health. Mothers who experienced the loss of a child may have consciously or unconsciously exaggerated their prior level of exposure to abuse if they believed it was related to the child's death, which would artificially inflate the estimate of the risk to infant and child mortality represented by violence towards the mother.

As mentioned by the authors, the study neither collected data on the extent to which the pregnancies were intended nor on child abuse. Without such data it is difficult to test the hypothesis that offspring born to mothers who experience violence before during and after pregnancy will be more likely to die than those borne to mothers who do not experience violence. The population-attributable risk (33% of all under-5 mortality in the study area) reported by the authors must therefore be treated with caution and is most likely to overestimate substantially the true association.

Data on child abuse and pregnancy intendedness would possibly have helped to explain better the relationship between violence towards the mother and subsequent child death. Such information may have also provided useful indications of when to intervene to prevent more effectively abuse and neglect. Examples of early interventions for the prevention of abuse and neglect within the family include the prevention of unintended pregnancies (10) and home visitation in the first 3 years after birth (11, 12). Information on the added risk of death for infants due to abuse by their mothers could potentially and more cost-effectively target violence-prevention interventions.

This is an important study which replicates findings about the relationship between violence against women and infant mortality, and which for the first time attempts to measure the scale of the impact on infant mortality. However, its methodological weaknesses raise major uncertainties about the size of the estimated impact of violence towards mothers on infant mortality. These uncertainties must be resolved through further studies in different settings that use improved methods to test the hypothesis.

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To date, the role of violence as a risk factor for health consequences other than injuries has been studied extensively in respect of the distal consequences of infant and child physical and sexual abuse on adult-onset psychiatric disorders (e.g. depression, anxiety disorders), behavioural problems (e.g. smoking and substance abuse, unsafe sexual practices), and the perpetration of violence (e.g. child maltreatment, youth violence, self-directed violence). Indeed, such is the weight of evidence for child sexual abuse as a risk factor that it is included as such in the *World health report 2002*. Prevention of child abuse through home visitation and parent support are among the most effective violence prevention interventions

known to date (11, 12). Coupled with findings showing the proportion of adult-onset disease attributable to child sexual abuse, the results of such studies are strong arguments for investing in the prevention of child sexual abuse.

It is hoped that, if the findings of the study by Åsling-Monemi et al. are confirmed, and that as similar evidence accumulates for the non-injury health consequences of violence against women, prevention of violence towards women during and beyond pregnancy will be brought even further into the mainstream of public health interventions. ■

**Conflicts of interest:** none declared.

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Table 2. Physical and sexual violence against mothers as risk factors of infant and under-5 mortality in León, Nicaragua, 1993–6

Risk factor	% of cases (n = 110)	% of referents (n = 203)	Odds ratio for deaths at: <sup>a</sup>	
			0–11 months	0–59 months
<b>Experience of physical violence(not including sexual violence)</b>				
No physical violence by anyone	40	64	1.0	1.0
Physical non-partner violence	11	5	2.9 (1.0–8.4) <sup>b</sup>	3.2 (1.2–8.5)
Physical partner violence	32	25	2.1 (1.1–4.0)	2.2 (1.2–3.9)
Both non-partner and partner violence	17	6	5.0 (2.0–12.7)	4.3 (1.9–9.7)
<b>Experience of sexual violence (not including physical violence)</b>				
No sexual violence	74	90	1.0	1.0
Sexual non-partner violence <sup>c</sup>	4	2	3.7 (0.8–16.7)	2.6 (0.7–9.9)
Sexual partner violence	22	8	4.3 (1.9–9.5)	3.2 (1.6–6.3)
<b>Violence by type</b>				
No physical or sexual violence by anyone	39	63	1.0	1.0
Non-partner violence only <sup>c</sup>	10	4	2.9 (1.0–8.6)	3.7 (1.3–10.1)
Physical partner violence	29	25	1.9 (1.0–3.9)	2.1 (1.2–3.8)
Sexual partner violence	2	2	3.6 (0.5–27.6)	2.3 (0.4–15.1)
Both physical and sexual partner violence	20	6	6.5 (2.5–16.7)	5.5 (2.4–12.6)
<b>Physical partner violence by temporal sequence</b>				
No physical violence by partner	51	68	1.0	1.0
Former physical violence <sup>d</sup>	20	13	2.2 (1.1–4.6)	2.1 (1.1–4.1)
Physical violence during last 12 months only	8	6	1.6 (0.5–4.7)	1.9 (0.7–4.8)
Physical violence during index pregnancy and last 12 months <sup>e</sup>	21	12	2.8 (1.3–6.2)	2.5 (1.2–5.0)
<b>Partner violence by severity</b>				
No partner violence	49	67	1.0	1.0
Moderate partner violence <sup>f</sup>	4	3	1.8 (0.5–7.0)	1.9 (0.5–6.8)
Severe partner violence <sup>g</sup>	46	30	2.5 (1.4–4.5)	2.3 (1.4–3.9)
<b>Violence by severity, offender, and temporal sequence</b>				
No severe violence	44	66	1.0	1.0
Non-partner violence only <sup>h</sup>	10	4	2.6 (1.0–7.4)	3.3 (1.3–8.9)
Former severe violence by partner <sup>d, g</sup>	19	13	2.4 (1.1–5.1)	2.4 (1.2–4.6)
Recent severe violence by partner <sup>g, h</sup>	27	17	3.0 (1.4–6.2)	2.8 (1.5–5.4)

<sup>a</sup> Bivariate odds ratios based on matched analysis.

<sup>b</sup> Figures in parentheses are 95% confidence levels.

<sup>c</sup> Includes physical or sexual non-partner abuse; women having experience of both partner and non-partner abuse are included in the partner abuse group.

<sup>d</sup> Prior to index pregnancy and to the last 12 months before child's death (in cases) or to 12 months before interview (referents).

<sup>e</sup> Only one mother (of a case) had experience of violence during pregnancy but not during the last 12 months before child death.

<sup>f</sup> Includes pushes, slaps or throwing objects.

<sup>g</sup> Includes hits, kicks, bites, beating up or forced sex.

<sup>h</sup> During index pregnancy or during the last 12 months before child's death (in cases) or 12 months before interview (referents).