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Risk of Spontaneous Preterm Birth in Relation to Maternal Exposure to Intimate Partner Violence During Pregnancy in Peru

Sixto E. Sanchez[1,2], **Andrea V. Alva**[3], **Guillermo Diez Chang**[4], **Chungfang Qiu**[5], **David Yanez**[3], **Bizu Gelaye**[3,6], and **Michelle A. Williams**[3,5,6]

[1]Universidad San Martin de Porres, Lima, Peru

[2]Department of Obstetrics and Gynecology, Hospital Nacional dos de Mayo, Peru

[3]University of Washington, Multidisciplinary International Research Training Program, Seattle, Washington, USA

[4]Department of Obstetrics and Gynecology, Hospital Edgardo Rebagliati Martins, Lima, Peru

[5]Center for Perinatal Studies, Swedish Medical Center, Seattle, WA, USA

[6]Department of Epidemiology, Harvard School of Public Health, Boston, MA, USA

Abstract

Objective—Intimate partner violence (IPV) is increasingly recognized as an important cause of maternal and perinatal morbidity. We assessed the relation between IPV and risk of spontaneous preterm birth (PTB) among Peruvian women.

Methods—The study was conducted among 479 pregnant women who delivered a preterm singleton infant (<37 weeks gestation) and 480 controls (≥37 weeks gestation). Participants' exposure to physical and emotional violence during pregnancy was collected during in-person interviews conducted after delivery and while patients were in hospital. Odds ratios (aOR) and 95% confidence intervals (CI) were estimated from logistic regression models.

Results—The prevalence of any IPV during pregnancy was 52.2% among cases and 34.6% among controls. Compared with those reporting no exposure to IPV during pregnancy, women reporting any exposure had a 2.1-fold increased risk of PTB (95% CI 1.59–2.68). The association was attenuated slightly after adjusting for maternal age, pre-pregnancy weight, and other covariates (OR=1.99; 95% CI: 1.52–2.61). Emotional abuse in the absence of physical violence was associated with a 1.6-fold (95% CI 1.21–2.15) increased risk of PTB. Emotional and physical abuse during pregnancy was associated with a 4.7-fold increased risk of PTB (95% CI 2.74–7.92). Associations of similar directions and magnitudes were observed when PTB were sub-categorized according to clinical presentation or severity.

Conclusion—IPV among pregnant women is common and is associated with an increased risk of PTB. Our findings and those of others support recent calls for coordinated global health efforts to prevent violence against women.

Keywords

Preterm birth; intimate partner violence; pregnant women; Peru

Corresponding Author: Professor Michelle A. Williams, Department of Epidemiology, Kresge Building, 9th Floor, 677 Huntington Avenue, Boston, MA 02115, Telephone: (617) 432-1050, Facsimile: (617) 667-7805, mawilliams@hsph.harvard.edu.

INTRODUCTION

Intimate partner violence(IPV), abuse directed towards women by their male partners, is a common and significant global public health problem(1) that has appropriately been receiving increased attention from clinical and public health investigators. Most studies from North America, Scandinavia, and Europe indicate that 1.8 to 8.3% of pregnant women report experiencing IPV during pregnancy (2–4). In low and middle income countries, IPV directed against pregnant women is reported to be considerably more common with estimated prevalence ranging from 15% to 71% (1, 5, 6). In the World Health Organization multi-country study of domestic violence Peru was reported to have a high prevalence of IPV (1, 5). Additionally, a recent survey of lifetime and current pregnancy IPV was conducted among 2,394 women in Lima, Peru (6). Their lifetime prevalence of any IPV was 45.1%. The prevalence of any IPV during pregnancy was 21.4%. The prevalence of physical and sexual violence during pregnancy were 11.9% and 3.9%, respectively (6).

Women exposed to IPV during pregnancy are at increased risk of having pregnancies complicated by vaginal bleeding, placental abruption, hypertensive disorders of pregnancy (4, 7, 8), urinary tract and kidney infections (4, 9–11). Exposed women are also more likely to have vaginal or cervical infections (12), to be seropositive for HIV (13) and to be victims of suicide or homicide (14, 15). Furthermore, studies of the relationships between IPV and perinatal outcomes suggest that newborns delivered to women exposed to IPV are at risk of being preterm, to suffer from intrauterine growth retardation, and have increased risks of early neonatal mortality (4, 16–18). Importantly, available evidence suggests that preterm birth is the leading cause of perinatal morbidity and mortality (19).

Given this body of published evidence and given our earlier observations that the lifetime prevalence of any IPV (physical, psychological, or sexual violence) was 45% among women giving birth in Lima, Peru (6), we evaluated the relationship between maternal exposure to IPV and PTB risk, using data from a large case-control study of preterm birth risk factors among Peruvian women. We also examined the specific role of physical violence and emotional violence in relation to risk of PTB.

METHODS

Study population and selection of cases and controls

This case-control study was conducted among women who delivered live births at the Hospital Nacional Dos de Mayo, the Instituto Nacional Materno Perinatal de Lima, and the Hospital Edgardo Rebagliati Martins in Lima, Peru, from January 2009 through July 2010. The main objective of this study was to evaluate the effect of exposure to IPV on risk of PTB. This study was approved by the institutional review board of each participating institution. Cases were women with singleton pregnancies who spontaneously delivered before completed 37 weeks of gestation (22–36 weeks of gestation). Spontaneous preterm delivery cases were identified by daily monitoring of all new deliveries at postpartum wards of participating hospitals. Of the 515 eligible cases approached, 479 (93%) agreed to participate in the study. Controls were women who delivered a singleton infant at term (≥37 weeks of gestation) and were selected from the same hospital of delivery. An eligible control, delivering immediately after a case patient, was approached and recruited for the study. Of the 546 eligible controls approached, 480 (88%) agreed to participate in the study. All participants provided written informed consent.

Data collection and analytical variable specification

After obtaining informed consent, enrolled participants were asked to take part in a 45-minute in-person interview. Trained research personnel used a standardized, structured

Spanish-language questionnaire to elicit information regarding maternal socio-demographic, lifestyle habits, medical and reproductive histories. Participants' labor and delivery medical records and prenatal medical records were also reviewed by trained research fellows (obstetricians) who used a standardized abstraction form. Information abstracted from medical records included participants' medical and reproductive histories, blood pressure values, pregnancy complications, and condition of the newborn.

The diagnosis of preterm delivery was made using American College of Obstetricians and Gynecologists (ACOG) guidelines (20). Gestational age was based on the date of the last menstrual period and was confirmed by an ultrasound examination during perinatal visits before 20 weeks. Using detailed information collected from medical records, we categorized preterm delivery cases according to the two pathophysiological groups previously described (i.e., spontaneous preterm labor and delivery and preterm premature rupture of membranes) (21). Spontaneous preterm labor and delivery cases were comprised of women whose medical records indicated a physician diagnosis of spontaneous labor onset (with intact fetal membranes) and delivery prior to the completion of 37 weeks gestation. Preterm premature rupture of membranes cases were comprised of women whose medical records indicated a physician diagnosis of rupture of fetal membranes (prior to the onset of labor) and delivery prior to the completion of 37 weeks gestation. Women who delivered prior to 37 completed weeks of gestation as a result of medical intervention were not eligible for this study. We also categorized preterm delivery cases according to gestational age at delivery (i.e., very preterm delivery, defined as delivery prior to the completion of 34 weeks gestation; moderate preterm delivery, defined as delivery between 34 and 36 weeks gestation).

Information collected during the interviews included maternal age, marital status, employment status during pregnancy, medical history, smoking, and alcohol consumption during pregnancy. Maternal exposure to IPV was determined using a partner abuse interview scale (22) by response to the question: "*During the last six to nine months (during your pregnancy) how often did your current partner or boyfriend do any of the following things to you?* The list of potential offences were as follows: (*i*) threatened you in any way; (*ii*) caused a serious injury during a fight that you had; (*iii*) kicked, pushed, shoved or slapped you; (*iv*) insulted or embarrassed you in front of others; (*v*) sworn or cursed at you; (*vi*) treated you like an inferior; (*vii*) yelled and screamed at you; (*viii*) monitored and accounted for your whereabouts; (*ix*) been jealous or suspicious of your friends; (*x*) accused you of having an affair; (*xi*) interfered in your relationships with other family members, and (*xii*) kept you from doing things to help yourself. Possible responses for each of these offences were as follows: never; rarely (1 or 2 times per month); sometimes (almost weekly); and often (all the time). Women who reported never experiencing any of these offenses during pregnancy were classified as never exposed to physical or emotional violence during pregnancy. Women who experienced at least one of the offenses were classified as having "ever" experienced **any IPV** during the index pregnancy. Women having ever experienced IPV during pregnancy were further sub-classified according to the frequency and type of violence experienced. Those who reported experiencing violence < 2 times per month were classified as being rarely victimized. Those who reported experiencing violent episodes ≥ 2 times per month were classified as being frequently victimized. Those who reported having been kicked, pushed, shoved, slapped, or having suffered a serious injury during a fight with an intimate partner were classified as being victims of physical violence. Those reporting other offenses were classified as experiencing emotional violence. Because only a small number of women reported being physically abused only (physical abuse without concurrent emotional abuse) we were ultimately able to only classify participants as follows: Never; Emotional abuse only; and Emotional and physical abuse combined.

Statistical analysis

The distribution of maternal socio-demographic characteristics, medical and reproductive histories according to preterm and term delivery status was examined. To estimate the relative association between maternal exposure to IPV and risk of preterm delivery, logistic regression procedures were performed to calculate maximum likelihood estimates of odds ratios (OR) and 95% confidence intervals (95% CI), adjusted for potential confounding (23). Confounding was assessed by entering potential confounders into a logistic model one at a time, and then comparing the unadjusted and adjusted ORs. We considered the following variables as possible confounders in these analyses: maternal age, parity, marital status, maternal educational attainment, pre-pregnancy weight, planned pregnancy, use of prenatal care services, employment status, cigarette smoking, alcohol consumption, and use of illicit drugs during pregnancy. Final logistic regression models included covariates that altered unadjusted ORs by at least 10% (23). These analytical procedures were also used in stratified analyses designed to assess risk of sub-types of preterm delivery (i.e., spontaneous preterm labor and delivery, preterm premature rupture of membranes, very preterm delivery, moderate preterm delivery and mild preterm delivery). All analyses were performed using STATA 9.0 statistical software (Stata, College Station, Texas, USA). All continuous variables are presented as mean ± standard deviation (SD). All reported *P*-values are two tailed, and confidence intervals were calculated at the 95% level. Prior to initiating the study, we estimated that a study size of 400 cases and an equal number of controls would be sufficient (>85% power) for estimating odds ratios of ≥2.0 if exposure frequencies were ≥10%, and if significance was set at 0.05.

RESULTS

Characteristics of the two study groups are summarized in Table 1. Cases and controls were similar with regards to maternal age, primiparity, education level, employment status, alcohol use during pregnancy, and pre-pregnancy weight. Compared with controls, PTB cases were less likely to have planned the pregnancy, received prenatal care, and have taken prenatal or multivitamins. PTB cases, as expected, were more likely to deliver low birth weight infants.

Table 2 shows both unadjusted and adjusted OR's and 95% CI's of PTB according to maternal exposure to IPV during pregnancy. The prevalence of any IPV during pregnancy was 34.6% for controls and 52.2% for PTB cases. After adjusting for maternal age, pre-pregnancy weight, unplanned pregnancy, prenatal or multivitamin use during pregnancy and alcohol consumption during pregnancy, IPV was associated with PTB. Women exposed to any IPV during pregnancy had approximately a two-fold increased odds of spontaneous PTB (aOR=1.99; 95% CI 1.52–2.61) comparing to women who were not exposed to IPV.

We next examined risk of PTB in relation to the frequency and type of violence experienced during pregnancy. Compared with women not exposed to IPV during pregnancy, participants who reported being abused <2 times/month had a 1.7-fold increased risk of PTB (aOR=1.70; 95% CI 1.26–2.29). Those participants who reported being abused ≥2 times/month had an almost 3-fold increased risk PTB (aOR=2.97; 95% CI 1.93–4.57). Emotional abuse in the absence of physical violence was associated with a 1.6-fold (aOR=1.61; 95% CI 1.21–2.15) increased risk of PTB. Exposure to both emotional and physical abuse during pregnancy was associated with a 4.7-fold increased risk of PTB (aOR=4.66; 95% CI 2.74–7.92).

Patterns of associations were similar regardless of whether we assessed PTB in aggregate or stratified into spontaneous preterm labor (sPTL) and preterm premature rupture of membranes (PPROM) subgroups. However, adjusted ORs were less precise (as reflected by

relatively wider 95% CIs) for subgroup analyses (Table 3). Finally, we assessed risk of moderate (34–36 weeks) and very PTB (<34 weeks) in relation to maternal exposure to IPV. As shown in Table 4, exposure to any IPV was associated with a 2.1-fold increased risk of very PTB (adjusted OR=2.08; 95% CI 1.49–2.93). Any IPV was also associated with moderate PTD (adjusted OR=1.92; 95% CI 1.40–2.63). The strengths of associations increased with increased frequency and severity of abuse.

DISCUSSION

Exposure to IPV during pregnancy was associated with a 2-fold increase in risk of PTB in this case-control study of Peruvian women. Risk of PTB was particularly elevated among women who reported experiencing violent episodes ≥2 times monthly (aOR=2.97), and among those who reported experiencing emotional and physical abuse (aOR=4.66). Associations of similar directions and magnitudes were observed when PTB were sub-categorized according to clinical presentation (e.g., sPTL or PPROM) or severity (e.g., very or moderate PTB).

The prevalence of IPV in our study of Peruvian pregnant women is high (34.6% among controls and 52.2% among PTB cases). These frequencies are consistent with those reported from a WHO Study on Women's Health and Domestic Violence against Women (1, 5) where investigators reported a 50% lifetime prevalence of IPV among Peruvian women. We are unaware of studies that have assessed PTB risk in relation to maternal exposure to IPV during pregnancy among Peruvian women. Our finding of increased risks of PTB associated with maternal exposure to IPV, however, is consistent with most (4, 11, 24–31), though not all previous epidemiologic studies (7, 32, 33). For instance Coker *et al* (26) in their study of women attending family practice clinics in Columbia, South Carolina found that those who experienced physical or emotional abuse had a 1.7-fold increased risk of preterm delivery (RR=1.7; 95% CI: 1.1, 2.6]). Similarly Silverman *et al* (4) in their study among women residing in 26 US states reported that experience of IPV was associated with increased risk of preterm delivery (OR=1.37; 95% CI: 1.16–1.61). Importantly, previous studies showed that women who reported experiencing any IPV during pregnancy are more likely to deliver preterm than their non-abused counterparts (26). Exposure to severe violence was significantly associated with PTB (RR=2.7, 95% CI 1.7–4.4) and very PTB (RR=4.6, 95% CI 1.6–13.6) (34). However, Janseen *et al* (7), in their study among residents of Vancouver British Columbia did not observe a statistically significant association of exposure to IPV during pregnancy with preterm labor (OR=1.42: 95% CI: 0.49–4.18) or delivery (OR=1.35: 95% CI: 0.67–2.56). Differences in study population characteristics, operational definitions of IPV, failure to verify pregnancy outcomes with medical records and limited sample size could account for some of the discrepancies in results of previous studies (26).

The results of the present study should be interpreted while taking into consideration several potential limitations. First, our analyses are based on cross-sectionally collected data which may be subject to recall bias. Longitudinal studies are needed to re-examine the potential causal relation between maternal exposure to IPV and subsequent PTB risk. Second, our assessment of maternal IPV exposure was limited only to the period during pregnancy. Results from Silverman et al (4) indicate the potential importance of assessing maternal experience with IPV during multiple time points including those before and during the index pregnancy. Third, despite our overall large sample size, inferences from sub-group analyses (e.g., by severity of preterm birth and/or severity and frequency of IPV exposure) were hindered by small numbers as reflected by our wide 95% confidence intervals. Lastly, although we adjusted for multiple confounding factors, as with all observational studies, we cannot exclude the possibility of some residual confounding.

Several biological mechanisms may plausibly account for the observed associations of maternal exposure to IPV and risk of PTB. For instance, PTB risk among victims of violence may be mediated through psychosocial emotional and physical stress, depression, anxiety, isolation, decreased social support, and low self-esteem (35). Increased hypothalamic-pituitary-adrenal (HPA) activity (36, 37), a robust pathophysiological biomarker associated with affective disorders, is regarded as one important mechanism for observed associations between maternal psychiatric symptoms (e.g., anxiety disorders) and preterm delivery (38). Several investigators have documented altered plasma cortisol, β-endorphin corticotrophin releasing hormone, and serotonin concentrations in pregnant women with mood and anxiety disorders (39). Chronic systemic inflammation and related endothelial dysfunction, as reflected by elevated plasma C-reactive protein, other pro-inflammatory markers and altered concentrations of cell adhesion molecules have been observed among individuals with clinical depression and stress secondary to exposure to violence(40). Endothelial dysfunction and inflammatory cytokines all seem to be implicated in the pathogenesis of placental insufficiency, abruptio placentae and preterm birth (41). In addition, acute injury to the abdomen may be one acute pathway that contributes to the increased risk of PTB among IPV victims. Additional information from clinical studies designed to assess neuroendocrine, hemodynamic and vascular effects of maternal exposure to IPV are needed before any firm conclusions can be drawn about these mechanistic hypotheses.

IPV may also influence PTB risk through multiple indirect pathways. Victims of IPV may be less likely to access prenatal care, and may engage in unhealthy behaviors including increased alcohol consumption, cigarette smoking and illicit drug use. Support for this thesis comes from studies showing that abused pregnant women have significantly higher levels of stress and less support from partner and women who are not abused (21, 42, 43). Available data also indicate strong associations between history of abuse with increased frequencies of unhealthy behaviors such as alcohol or drug use during pregnancy (44), and inadequate prenatal care or late entry to prenatal care (45, 46). Additional studies are needed to disentangle the independent and joint effect of IPV exposure and these risk factors on PTB risk.

Our results, combined with those reported by others(6), confirm the high prevalence of IPV among pregnant Peruvian women. These results also suggest that the risk of PTB, a leading cause of perinatal mortality worldwide, is increased in women abused during pregnancy. Prospective studies that more fully characterize the type, intensity and frequency of abuse, as well as studies that explore interventions to reduce the occurrence of IPV are warranted. In the meantime, continued efforts to introduce and/or enhance antepartum IPV screening and prevention programs in obstetric services will likely benefit pregnant women and their newborns. Additionally, population-based efforts to change the notion that violence is a normal and an acceptable part of human relationships (1) must be component of a comprehensive violence prevention effort.

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Table 1

Socio-Demographic and Reproductive Characteristics and Infant Outcomes in the Study Population, Lima, Peru, 2009–2010

	Control (N=480)		Case (N=479)		
Characteristics	**n**	**%**	**n**	**%**	**p-value**
Maternal Age at Delivery (years) *	28.3 ± 6.5		28.2 ± 6.6		0.74
Maternal Age at Delivery (years)					
<20	42	8.8	49	10.2	0.49
20–29	235	49.0	228	47.6	
30–34	94	19.6	107	22.3	
≥35	109	22.7	95	19.8	
Primiparity	199	41.5	205	42.8	0.68
High School Education or Lower	335	69.8	319	66.6	0.29
Employed during Pregnancy	195	40.6	177	37.0	0.24
Planned Pregnancy	209	43.5	152	31.7	<0.001
No Prenatal Care	19	4.0	75	15.7	<0.001
No Prenatal Vitamin	68	14.2	119	24.8	<0.001
Smoked during Pregnancy					
No	426	88.8	410	85.6	0.14
Yes	54	11.2	69	14.4	
Alcohol use during Pregnancy	157	32.7	150	31.3	0.64
Illicit Drug use during Pregnancy	0	0.0	3	0.6	---
Pre-pregnancy Weight (kg)	58.0 ± 9.8		56.7 ± 10.0		0.04
Infant Birth Weight (grams)	3393 ± 462		1999 ± 663		<0.001
Low Birth Weight Infant (<2500 grams)	14	2.9	381	76.5	<0.001

* Mean ± SD (SD: standard deviation)

Table 2

Odds Ratio and 95% CI of Preterm Birth According to Maternal Exposure to Intimate Partner Violence During Pregnancy, Lima, Peru, 2009–2010

Exposure parameters	Controls (n = 480)		ALL PTB (n = 479)		Unadjusted OR		Adjusted OR	
	n	%	n	%		(95% CI)		(95% CI)
Any IPV During Pregnancy								
No	314	65.4	229	47.8	1.00	(referent)	1.00	(referent)
Yes	166	34.6	250	52.2	2.07	1.59–2.68	1.99	1.52–2.61
Frequency of IPV During Pregnancy								
None	314	65.4	229	47.8	1.00	(referent)	1.00	(referent)
Rarely (< 2 times/month)	129	26.9	162	33.8	1.72	1.29–2.29	1.70	1.26–2.29
Sometimes/Often	37	7.7	88	18.4	3.26	2.14–4.96	2.97	1.93–4.57
P-value for Trend						<0.001		<0.001
Type of IPV **								
None	314	65.4	229	47.8	1.00	(referent)	1.00	(referent)
Emotional Abuse Only	145	30.2	171	35.7	1.62	1.22–2.14	1.61	1.21–2.15
Emotional & Physical Abuse	20	4.2	78	16.3	5.35	3.18–8.99	4.66	2.74–7.92

* Adjusted for maternal age, pre-pregnancy weight, unplanned pregnancy, prenatal vitamin and alcohol consumption during pregnancy

** Only 1 case and 1 control reported isolated physical abuse (without emotional abuse)

Table 3

Odds Ratio and 95% CI of Preterm Birth Sub-Types According to Levels of Maternal Exposure to Intimate Partner Violence During Pregnancy, Lima, Peru, 2009–2010

Exposure parameters	Controls (N=480)	SPTL (N = 245)		PPROM (N = 234)	
	n	n	OR* (95% CI)	n	OR* (95% CI)
Any IPV During Pregnancy					
No	314	123	1.00 (referent)	106	1.00 (referent)
Yes	166	122	1.88 (1.36–2.59)	128	2.12 (1.53–2.95)
Frequency of IPV During Pregnancy					
None	314	123	1.00 (referent)	106	1.00 (referent)
Rarely (< 2 times/month)	129	77	1.56 (1.09–2.24)	85	1.86 (1.29–2.67)
Sometimes/Often	37	45	2.94 (1.79–4.82)	43	3.02 (1.83–5.00)
P-value for Trend			<0.001		<0.001
Type of IPV **					
None	314	123	1.00 (referent)	106	1.00 (referent)
Emotional Abuse Only	145	86	1.57 (1.11–2.22)	85	1.67 (1.17–2.39)
Emotional & Physical Abuse	20	36	4.18 (2.30–7.59)	42	5.19 (2.88–9.36)

*Adjusted for maternal age, pre-pregnancy weight, unplanned pregnancy, prenatal vitamin and alcohol consumption during pregnancy

**Only 1 case and 1 control reported isolated physical abuse (without emotional abuse)

Table 4

Odds Ratio and 95% CI of Preterm Birth Severity According to Levels of Maternal Exposure to Intimate Partner Violence During Pregnancy, Lima, Peru, 2009–2010

Exposure parameters	Controls (N=480)	<34 weeks (N = 213)		34–36 weeks (N = 266)	
	n	n	OR* (95% CI)	n	OR* (95% CI)
Any IPV During Pregnancy					
No	314	99	1.00 (referent)	130	1.00 (referent)
Yes	166	114	2.08 (1.49–2.93)	136	1.92 (1.40–2.63)
Frequency of IPV During Pregnancy					
None	314	99	1.00 (referent)	130	1.00 (referent)
Rarely (< 2 times/month)	129	75	1.81 (1.25–2.63)	87	1.61 (1.14–2.29)
Sometimes/Often	37	39	3.01 (1.80–5.04)	49	2.95 (1.81–4.79)
P-value for Trend			<0.001		<0.001
Type of IPV **					
None	314	99	1.00 (referent)	130	1.00 (referent)
Emotional Abuse Only	145	79	1.71 (1.19–2.46)	92	1.54 (1.09–2.17)
Emotional & Physical Abuse	20	34	4.69 (2.55–8.63)	44	4.64 (2.60–8.28)

*Adjusted for maternal age, pre-pregnancy weight, unplanned pregnancy, prenatal vitamin and alcohol consumption during pregnancy

**Only 1 case and 1 control reported isolated physical abuse (without emotional abuse)