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The association between domestic violence during pregnancy and low birth weight or prematurity

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Abstract

Objective: To investigate whether domestic violence during pregnancy is associated with unfavorable infant health outcomes, measured by low birth weight or prematurity.

Methods: This was a prospective cohort study enrolling pregnant women whose prenatal care was provided by 10 basic health units in the city of Campinas, SP, Brazil, between 2004 and 2006. A structured questionnaire was employed that had previously been validated for use in Brazil. Each mother attended a minimum of two and a maximum of three interviews during the prenatal and postnatal periods. Data were analyzed using descriptive statistics. Student's *t* test was used to compare means for birth weight and gestational age between mothers who had suffered domestic violence during the current pregnancy and those who had not. Logistic regression analysis was employed to identify factors associated with low birth weight or prematurity.

Results: During the prenatal and postnatal periods, 89.1% (n = 1,229) of the pregnant women were followed up, 10.9% being lost to follow-up, basically due to changes of address. Mean birth weight was 3,233 g; mean gestational age was 38.56 weeks. A total of 13.8% of the infants had low birth weight or were premature. Conditions associated with risk of low birth weight or prematurity were: mothers who had previously given birth prematurely ($p < 0.005$), who smoked ($p < 0.001$), who delivered by caesarian ($p < 0.001$) and whose partners had a low educational level ($p < 0.008$).

Conclusions: In this study, no statistically significant association was observed between domestic violence perpetrated by partners and low birth weight or prematurity.

J Pediatr (Rio J). 2008;84(1):60-67: Cohort studies, low birth weight newborn infants, premature newborn infants, domestic violence and pregnancy.

Introduction

Domestic violence (DV) during pregnancy has been identified as being an important risk factor affecting the health of the mother and fetus, and it has been described as a severe public health problem. Bibliographic reviews have found prevalence rates of violence during the gestational period of 0.9 to 20.1% and, in the majority of cases, it is the intimate partner (IP) who perpetrates the violence.[1,2]

There is not yet consensus in the specialized literature on the relationship between low birth weight (LBW) and DV during pregnancy. Differences in research methodology may have contributed to the fact that this relationship remains an unknown, since many of the results cannot be compared with each other. This explains the fact that some studies have described positive associations between DV during pregnancy and LBW, prematurity (PM) or both,[3-5] while others have not found any association whatsoever.[6-8]

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Low birth weight can occur as a result of a whole range of biological, behavioral and socioeconomic factors and can be understood as a direct or indirect consequence of these factors. The direct link between violence and LBW can be as a result of abdominal trauma, and the indirect, but no less severe, effects may be the result of drug and alcohol use, stressful conditions and inadequate nutrition.[9] The scientific literature has associated these indirect risks with restricted fetal growth and premature labor, which can culminate in the birth of a newborn infant (NB) with LBW or PM.[10]

Domestic violence against women is characterized by a pattern of coercive behavior affecting their physical and/or sexual health, and also their psychological health. Few investigations have been carried out in Brazil to examine the impact of violence that takes place during pregnancy, the stress it puts on the mother and its repercussions for the birth weight and PM of their babies.[11] The objective of this study was to assess whether DV during pregnancy is associated with unfavorable infant health outcomes, measured by the indicators LBW and/or PM.

Methods

This was a prospective cohort study, enrolling 1,379 pregnant women who received prenatal care at 10 Basic Health Centers (BHC) in the Southwest region of the city of Campinas, SP, Brazil during the years from 2004 to 2006. The study enrolled all pregnant women who gave consent. When the age of the patient was ≤ 19 years, another member of the family, who stated they were responsible for the patient, also signed the free and informed consent form.

Ethical procedures were respected throughout all stages of the study. This research was approved by the Research Ethics Committee at the Universidade Estadual de Campinas (protocol number 116/2004).

The questionnaire employed to obtain information on DV events has been validated for use in Brazil by Schraiber.[12] It includes questions on psychological violence, physical violence and sexual violence and also on the frequency with which these events took place: "once", "several times" or "many times". The question requested information on events that had occurred: "during this pregnancy, the immediate postnatal period and the year prior to becoming pregnant". In this article we will analyze data from questions referring to violence perpetrated by the IP against the patient during her current pregnancy.

The women were interviewed during prenatal consultations, at which point they were invited to take part in the study, irrespective of gestational age. Women who had been pregnant for up to 28 weeks and did not report physical or sexual violence were made appointments to be interviewed again during their third trimester, and once more up to 45 days after the birth. Women who reported episodes of physical or sexual violence during the first interview were requested to return for interview a second time after the birth. When the mother was already in her third trimester at the first interview, a second appointment was made for after the birth, irrespective of whether she had reported violence or not. Therefore, each mother could have had a minimum of two interviews and a maximum of three.

In addition to the section on violence, the questionnaire also included variables related to the demographic and socioeconomic characteristics of the mother and the IP, to maternal reproductive history and the status of the current pregnancy, the postnatal status and what the infant was being fed, and to living conditions and presence of a social network. The women were classified into social strata according the system developed by the Brazilian Association of Market Research Institutes (ANEP - Associação Brasileira de Institutos de Pesquisa de Mercado),[13] called the Brazilian Economic Classification Criteria (Critério de Classificação Econômica Brasil).

The SQR-20-*Self-Report Questionnaire* was administered to all interviewees in order to identify probable mental disorders, adopting the cutoff point ≤ 7 (no) and > 7 (yes).[14] In this analysis, we have included replies given at the first and second interviews, conducted during pregnancy. There were questions on adverse events occurring during this pregnancy in the part of the questionnaire on health problems during the current pregnancy.

Variables relating to the NB were collected at the last interview, with the recently delivered mothers, with these data being taken from the prenatal medical card or from the card given to the child at hospital discharge.

Infants were considered to have LBW when born weighing less than 2,500 g and were defined as premature when their mothers had completed less than 37 week's pregnancy (the dependent variables). The types of violence suffered were analyzed as independent variables and the remaining variables – sociodemographic data (relating to the mother and her partner), history and gestational morbidity – were treated as controls.

The sample defined for this study comprised 1,400 pregnant women selected in the order in which they presented at prenatal consultations, irrespective of how far into pregnancy they were, at all of the 10 BHC in the Southeast Region of Campinas. This region, which has around 200,000 inhabitants, was chosen because of its high degree of dependency on the Brazilian National Health Service (Sistema Único de Saúde), approximately 90% of the population. This sample meets the primary obligatory criteria: to estimate with a reasonable degree of reliability and precision ($\alpha < 0.05$ and $1-\beta < 0.20$) the proportion of this cohort of pregnant women who were the victims of violence and the magnitude of the association between TV and a variety of outcomes, including BP or PM, with an estimated relative risk (RR) of 2, a ratio between those exposed to DV and those not exposed of 1:6 and an

effect on the exposed proportion of 16%, to a 95% confidence level and with a test power of 80; in addition to allowing for follow-up losses of 20%.

In order to investigate any associations between LBW or PM and the different forms of violence against the mothers, tests of association were conducted using the chi-square statistic, followed by multiple analysis using a logistic regression model. Variables were selected for the logistic regression model if they had demonstrated $p < 0.20$ in bivariate analysis. Variables were kept in the final model when statistically significant ($p \leq 0.05$). The measures of risk employed were: RR for bivariate analyses and odds ratios (OR) for the multiple logistic regression analysis. Student's *t* test was used to compare mean birth weights and gestational ages between the subset of women who suffered DV and the subset who had not been victims of this type of violence.

Results

It proved possible to enroll 1,379 of the 1,400 pregnant women planned for. Of these, 1,229 (89.1%) were followed from prenatal through postnatal. The primary reason for losses to follow up was mothers who did not attend prenatal appointments and who could not be located when sought at the addresses provided, followed by women who suffered miscarriages, NB who died, pseudocyesis and women who preferred not to complete interviews.

The infants in this cohort exhibited a mean birth weight of 3,233 g (SD = 522.95), and their mean gestational age at birth was 38.56 (SD = 1.89) weeks. There were 84 (6.1%) NB with LBW, 142 (10.3%) were PM and a total of 190 (13.8%) were LBW and/or PM, which is the case under study here.

The subset of mothers who gave birth to LBW or PM NB had a mean age of 23.2 (SD = 5.2) years of age and 50 (17.5%) of them were adolescents. Ninety-four (16.5%) had spent 8 years or less in education and 95 (16.9%) were defined as in economic classes D or E. One hundred and forty-two pregnant women (16.9%) had no employment other than in the home, and 152 (15.2%) were married or in a stable consensual union. None of these variables exhibited a statistically significant association with BP or PM (Table 1).

Table 2 lists the incidence rates and relative risks for BP or PM. Late start of prenatal care ($p = 0.028$), maternal history of LBW ($p = 0.015$) or PM ($p = 0.003$) children. Cigarette smoking during pregnancy ($p < 0.001$) and current pregnancy delivered surgically increased the risk of NB being LBW or PM.

Of all the characteristics recorded for the women's IPs, only low educational level exhibited increased risk of LBW or PM. The prevalence of LBW or PM among women who had been the victims of violence while pregnant was 14.8%. Although high prevalence rates of violence suffered by the pregnant women in this cohort were observed, no significant association was found between these and LBW or PM (Table 3).

To the same extent, no statistically significant differences were detected between the subset of pregnant women exposed to DV and the subset who were not exposed in terms of mean gestational age or birth weight. The mean gestational age in the exposed group was 38.30 (SD = 1.99) weeks and in the unexposed subset it was 38.65 (SD = 1.81). The children of women exposed to DV while pregnant were born at a mean weight of 3,230 g (SD = 541.26), and the unexposed group's children were born weighing a mean of 3,251 g (SD = 492.55).

Table 4 lists the risk factors for LBW or PM in the cohort studied here. After the logistic regression model had been constructed, it was observed that the following are predictors of LBW or PM: premature delivery of a previous pregnancy ($p = 0.005$), cigarette smoking while pregnant, surgical delivery ($p < 0.001$) and low IP educational level ($p = 0.008$).

Discussion

In Brazil, PM associated with LBW is considered to be an important public health issue due to its significant prevalence, which is around 10%. In Campinas, where this study was carried out, frequencies of 9.7% of LBW and 8.7% of PM were observed in 2004. It is known that both confer increased risk of mortality and compromise the quality of life of many of those who survive.[15] The decision to work with a variable that represents BP and/or PM is justified because the prevalence of low birth weight, in principle, may be associated as much with PM as with interuterine growth restriction.[16]

The results of the cohort study described here do not confirm the initial hypothesis postulated, which was that violence perpetrated against women during pregnancy could lead to an increased risk of infants being born premature or with low birth weight.

However, significant associations were observed between these conditions and smoking during pregnancy, surgical delivery and a history of LBW or PM in previous pregnancies; in common with other studies.[6,10]

The literature review performed for this study did not find any studies that had identified the relationship between LBW or PM and low educational level on the part of the IP, which was observed here. However, in a systematic review, the authors found an association between BP or PM and the IP's profession – increased risk was observed among workers in agriculture, industry and mining and among unemployed people, when compared with technicians or professionals requiring greater specialization.[17]

There is no consensus in the scientific production currently available on the results of analysis of a possible relationship between DV during pregnancy and LBW or PM. A meta-analysis carried out with the objective of verifying the relationship between violence and these conditions at birth found that a positive association existed (OR 1.4; 95%CI 1.1-1.8), concluding that abuse during pregnancy can be part of a

Table 1 - Incidence and raw relative risks for low birth weight or prematurity, according to mothers' sociodemographic characteristics (Campinas, SP, Brazil, 2004-2006)

Variable	Low birth weight or prematurity n = 190	Control n = 1,039	RR	95%CI	p
Marital status					
Married	152	846	0.98	0.92-1.05	0.718
Others	38	193	1.00		
Age (years)					
≤ 19	50	236	1.18	0.88-1.58	0.323
> 19	140	803	1.00		
Skin color					
Black/Brown	90	441	1.18	0.91-1.53	0.250
White/Yellow	100	595*	1.00		
Educational level (years' schooling)					
≤ 8	94	477	1.12	0.86-1.46	0.434
> 8	96	558†	1.00		
Currently employed					
Yes	48	261	1.01	0.74-1.36	0.960
No	142	778	1.00		
Economic class					
D/E	95	468	1.18	0.91-1.54	0.237
C	95	571	1.00		

95%CI = 95% confidence interval; RR = relative risk.
* Skin color was not recorded for three subjects.
† Four subjects did not provide information on their education.

complex interaction between factors that contribute to low birth weight.[5]

Nasir et al.[10] performed a systematic review of the literature in developing countries, selecting six studies: in two of these the authors did find a positive association with low weight. Other cross-sectional studies have found that pregnant women who suffer physical aggression are more likely to have low birth weight and premature children.[9,18]

On the other hand, cohort studies carried out with pregnant women/recently delivered mothers at prenatal clinics have not found an association between physical violence and LBW, violence and PM or even between DV and LBW or PM.[6,19-21] The absence of an association between PM, LBW and violence during pregnancy was also confirmed by a cross-sectional study carried out during the prenatal period.[7] A case-control study carried out to assess the impact of physical abuse during pregnancy was also unable to confirm that these events are a risk factor for LBW or PM.[8]

The results of the investigation reported here do not contradict those of the other studies, but confirm the complexity

Table 2 - Incidence and raw relative risks for low birth weight or prematurity, by maternal reproductive history and reported morbidity during the current pregnancy (Campinas, SP, Brazil, 2004-2006)

Variable	Low weight or prematurity n = 190	Control n = 1,039	RR	95%CI	p
Age at 1st pregnancy (years)					
≤ 19	119	589	1.23	0.94-1.62	0.148
> 19	71	450	1.00		
Start of PN (weeks)					
≤ 12	139	936	1.00	1.05-1.88	0.028
> 12	51	203	1.41		
Problems attending PN consultations					
Yes	10	71	0.79	0.43-1.43	0.520
No	180	968	1.00		
Previous LBW NB					
Yes	13	31	1.98	1.23-3.18	0.015
No	177	1,008	1.00		
Previous PM NB					
Yes	12	23	2.30	1.43-3.71	0.003
No	178	1,016	1.00		
Current pregnancy					
Unplanned	120	699	0.85	0.64-1.11	0.268
Planned	67	320	1.00		
Arterial hypertension					
Yes	16	102	0.87	0.54-1.40	0.665
No	172	935[†]	1.00		
Urinary infection					
Yes	47	240	1.07	0.79-1.45	0.716
No	143	794[‡]	1.00		
Common mental disorder					
Yes	90	536	1.00	0.80-1.35	0.852
No	100	503	1.04		
Feelings of rejection					
Yes	37	146	1.38	1.00-1.91	0.068
No	153	893	1.00		
Hospitalization*					
Yes	35	170	1.13	0.81-1.58	0.552
No	155	869	1.00		
Type of delivery					
Caesarian	96	398	1.52	1.17-1.97	0.002
Vaginal	94	641	1.00		
Smoked cigarettes during pregnancy					
Yes	44	121	1.94	1.45-2.61	< 0.001
No	146	918			

95%CI = 95% confidence interval; LBW = low birth weight; NB = newborn infant; PM = premature; PN = prenatal; RR = relative risk.
* Hospitalized during pregnancy.
[†] Two subjects did not have their blood pressure taken.
[‡] The results of this test were not recorded for five subjects.

Table 3 - Incidence and raw relative risks for low birth weight or prematurity, by profile of intimate partner and types of violence suffered during pregnancy (Campinas, SP, Brazil, 2004-2006)

Variable	Low weight or prematurity n = 190	Control n = 1,039	RR	95%CI	p
Age of IP (years)					
≤ 19	19	82	1.24	0.81-1.90	0.407
> 19	171	957	1.00		
Mother living with IP					
Yes	152	855	0.88	0.64-1.22	0.514
No	38	184	1.00		
Educational level (years' schooling)					
≤ 8	107	467	1.47	1.13-1.92	0.004
> 8	83	572	1.25		
Mother responsible for family					
Yes	13	84	0.86	0.51-1.45	0.661
No	177	955	1.00		
Violence during current pregnancy					
Yes	35	202	0.95	0.67-1.33	0.819
No	155	837	1.00		
PV suffered by mother during this pregnancy					
Yes	35	197	0.97	0.69-1.34	0.941
No	155	842	1.00		
SPV suffered by mother during this pregnancy					
Yes	9	66	0.77	0.41-1.43	0.489
No	181	973	1.00		
Mother witnessed physical violence during childhood					
Yes	69	315	1.25	0.96-1.64	0.119
No	121	724	0.95	0.97-1.48	
Mother suffered physical aggression during childhood					
Yes	39	179	1.20	0.87-1.65	0.321
No	151	860	1.00		
Mother was touched sexually during childhood					
Yes	13	63	1.11	0.67-1.86	0.805
No	177	976	1.00		

95%CI = 95% confidence interval; IP = intimate partner; PV = psychological violence; RR = relative risk; SPV = sexual/physical violence.

of the associations between violence against women and the effects on the health of their NB. The study design, sample size and quality of interview procedures were all adequate for analyzing the hypothesis raised. However, in common with any study that is dealing with the subject of DV, it is not possible to rule out the hypothesis that abuse cases were being underreported, which in turn would lead to underestimation of their effects.

While this study has not confirmed the hypothesis that violence has an adverse effects on conditions at birth, it demonstrates an enormous space for interventions by healthcare services, both in terms of prenatal care for women who are victims of violence and in terms of the adequate management of other factors associated with LBW or PM, which have not been the subject of discussion in this paper.

Table 4 - Logistic regression analysis of factors associated with low birth weight or prematurity (Campinas, SP, Brazil, 2004-2006)

	Low weight or prematurity n = 190 (13.8%)			
Characteristics	**Raw RR***	**Adjusted OR**	**Adjusted IC**	**p**
Mother had previous premature birth	2.85	2.88	1.37-6.06	0.005
Mother smoked during pregnancy	1.99	2.12	1.44-3.17	< 0.00
Caesarian	1.64	1.71	1.25-2.35	< 0.001
Intimate partner spent 8 years or less in education	1.58	1.53	1.11-2.10	0.008

* Relative risks calculated in bivariate analyses.
IC = confidence interval; IP = intimate partner; OR = odds ratio; RR = relative risk.

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