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Intimate Partner Violence and Miscarriage

Examination of the Role of Physical and Psychological Abuse and Posttraumatic Stress Disorder

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Despite research documenting high rates of violence during pregnancy, few studies have examined the impact of physical abuse, psychological abuse, and posttraumatic stress disorder (PTSD) on miscarriage. Secondary analysis of data collected by the Chicago Women's Health Risk Study permitted an exploration of the relationships among physical abuse, psychological abuse, PTSD, and miscarriage among 118 primarily ethnic minority women. The interaction between maximum severity of abuse and age provided the best multivariate predictor of miscarriage rate, accounting for 26.9% of the variance between live birth and miscarriage outcome. Mean scores of psychological abuse, physical violence, forced sex, and PTSD were significantly higher in the miscarriage group than in the live birth group. Women who experience physical violence and psychological abuse during pregnancy may be at greater risk for miscarriage. Prospective studies can confirm findings and determine underlying mechanisms. Routine screening for traumatic stress and PTSD may reduce rates of miscarriage.

Keywords: *posttraumatic stress disorder; PTSD; psychological abuse; physical abuse; miscarriage*

Intimate partner violence (IPV) during pregnancy is a pervasive problem that may increase a woman's vulnerability for an unfavorable birth

outcome. For pregnant women in the United States, the occurrence of violence has been reported to range from 7% to 20%, depending on the definition (Bullock & McFarlane, 1989; Campbell, Poland, Waller, & Ager, 1992; Gazmararian et al., 1996). There is also a growing literature suggesting that posttraumatic stress disorder (PTSD) is a highly prevalent disorder in women who are exposed to IPV, with reported rates of PTSD ranging between 19% and 84% (Astin, Ogland-Hand, Coleman, & Foy, 1995; Cascardi, O'Leary, Lawrence, & Schlee, 1995; Kubany et al., 1996). Although a few studies have examined IPV and depression during pregnancy (Campbell et al., 1992; Martin, Kilgallen, Dee, Dawson, & Campbell, 1998), none have examined how physical and psychological abuse with PTSD may affect the outcome of a woman's pregnancy.

The impact of physical abuse during pregnancy is perhaps better understood than the role of psychological abuse or PTSD. Exposure to physical violence during pregnancy can have particularly serious health consequences for both the mother and the fetus. Physical assault during pregnancy can result in placental separation; antepartum hemorrhage; fetal fractures; rupture of the uterus, liver, or spleen; preterm labor (Saltzman, 1990); low-birth-weight babies; and risk for urinary tract infections, sexually transmitted diseases, and poor prenatal care (Bullock & McFarlane, 1989; McFarlane & Parker, 1994; Murphy, Schei, Myhr, & Du Mont, 2001; Schei, Samuelsen, & Bakketeig, 1991). Research also suggests an association between IPV and preterm labor, premature delivery (Petersen et al., 1997), and miscarriage (Berenson, Wiemann, Wilkinson, Jones, & Anderson, 1994).

Research has started to examine the role of psychological abuse within IPV relationships. A few recent studies examining samples of battered women suggest that the effects of psychological abuse in combination with physical abuse are more damaging to women than are the effects of physical

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abuse alone (Follingstad, Hause, Rutledge, & Polek, 1992; Sackett & Saunders, 1999; Street & Arias, 2001), whereas other studies have found the effects of physical abuse stronger on outcomes such as depression (Campbell, Kub, Belkap, & Templin, 1997). Because physical abuse and psychological abuse often coexist, it is difficult to determine their independent effects on pregnancy outcomes. However, it is important to examine the role of physical and psychological stress on female reproductive health to understand if adverse pregnancy outcomes result directly from psychological abuse during pregnancy or indirectly from psychosocial stress related to posttrauma sequelae (Seng et al., 2001).

The notion that psychosocial factors such as stress can result in miscarriage is controversial, with limited evidence to support it. The idea that traumatic experiences and PTSD have a role in the etiology of adverse medical conditions such as chronic degenerative diseases has been established, but the exact nature of that role is not entirely clear (Schnurr & Jankowski, 1999). The contributions of physical violence, psychological abuse, and PTSD to adverse reproductive health have only recently been examined. The few studies examining emotional states during pregnancy have found that maternal stress can result in miscarriage (Boyles et al., 2000; O'Hare & Creed, 1995). Studies that have found a relationship between stress and miscarriage often postulate that neuroendocrine changes (dysregulation of cortisol, vasopressin, oxytocin, etc.) precipitated by a stress response can cause miscarriage (Friedman & McEwen, 2003). This finding is consistent with scientific models predicting that biological changes associated with chronic psychological stress and PTSD increase the risk for miscarriage and congenital abnormalities (Regan, Braude, & Trembath, 1989).

To date no study has examined the independent association between physical abuse, psychological abuse, PTSD, and rates of miscarriage. Miscarriage is considered the most common negative outcome of pregnancy, occurring in about 12% to 21% of intrauterine clinically recognized pregnancies (Gabbe, Niebyl, & Simpson, 1996). Although the best medical explanation for about half these miscarriages may be associated with chromosomal abnormalities (Gabbe et al., 1996), stress may have an important role in the other half.

The objective of this article is to explore the relationship between IPV and miscarriage. Specifically, it examines the relationship among psychological abuse, physical abuse, PTSD, and miscarriage, and it offers suggestions for future research to further the understanding of the possible direct and indirect association between IPV and miscarriage. For this study, we hypothesized that psychological and physical abuse independently predict

higher rates of miscarriage, and together they are accumulatively the best predictor of miscarriage such that exposure to both physical violence and psychological abuse (controlling behavior; harassment and stalking) is more detrimental for women than is exposure to either alone. In addition, we hypothesized that PTSD, independent of other factors, predicts rates of miscarriage.

Method

The data that are analyzed in this study consist of an archive database from the Chicago Women's Health Risk Study (CWHRS) research project (Block, 2000). Data for the CWHRS were collected in an attempt to identify risk factors for death or life-threatening violence among women who experience violence at the hand of an intimate partner. Medical sites were chosen through convenience sampling on the basis of their locations in neighborhoods with high rates of intimate partner homicide. The study was approved and supervised by the institutional review board of each site. Women were asked to give signed consent to the screener and to the detailed interview. Screening and interview procedures were developed by working closely within the separate clinics of each medical site so that the woman's safety, privacy, and confidentiality would be ensured (Block, 2000; Block, Engel, Naureckas, & Riordan, 1999a, 1999b).

About 2,740 women patients were screened as they entered the hospital or clinic for any reason (baby checkup, automobile accident, etc.) via a short questionnaire containing three questions about the following issues: physical violence, sexual violence, and being afraid to go home. Interviews were conducted with all women who were older than 17 who answered *yes* to at least one screening question and with a random sample of women who were older than 17 who answered *no* to all three questions and were in a intimate relationship in the past year. The interview rate was as follows: 86% of eligible women screened positive; 27% of women screened negative but had experienced abuse before the prior year; and 9% of women screened negative. Older screened women were significantly less likely to be interviewed, but the woman's language or racial/ethnic group made no difference. A considerable number of women who screened negative interviewed positive (22%), and some who screened positive interviewed negative (9%). After the interviews, 500 women were categorized as *abused in the past year*, and 205 were categorized as *not abused in the past year* and thus became the comparison group.

Of the 703 interviewed women for whom pregnancy information is available, 76 (11%) were pregnant at the initial interview; 126 (18%) had been pregnant in the past year; 4 were currently pregnant and had been pregnant in the past year; and 1 had been pregnant twice in the past year. For this article, we focus on the 131 who had been pregnant at least once in the past year. Of these 131 women, 89 had had one or two live births; 29 had had one or two miscarriages; 1 had had a live birth and a miscarriage; and 12 had had an abortion. (Abortion versus miscarriage was indicated in the interview; that is, the CWHS did not collect medical record data.) For purposes of this analysis, we excluded the 12 women who indicated that the pregnancy had ended with an abortion (see Table 1). In sum, this analysis is based on a selection of 119 women from the 705 women in the CWHS clinic/hospital sample—those who had been pregnant in the past year and for whom the pregnancy had not ended in abortion. The outcome of the pregnancy or pregnancies included one or more live birth for 89 women, one or more miscarriages for 29, and a live birth and a miscarriage for 1. For this analysis, we included the woman who had had both a live birth and a miscarriage in the miscarriage group, which resulted in 30 women who had had a miscarriage and 89 who had had a live birth but not a miscarriage in the past year.¹ One woman who had had a live birth was excluded because her PTSD information was missing, thus leaving 118 women in the sample. Table 2 presents sociodemographic information.

Instruments

Power and Control Scale. The Power and Control Scale (Johnson & Sacco, 1995) is a five-item dichotomous-format scale (*yes/no*) that was developed for the Violence Against Women Survey (Johnson, 1996). It measures emotionally abusive and controlling acts through five questions that ask whether a statement describes one's husband or partner. Items refer to the man's insisting on knowing her whereabouts, calling her names or putting her down, jealously guarding her interactions with other men, limiting her contacts with family and friends, and denying her access to the family finances. These items were developed with assistance from Toronto's METRAC (Metro Action Committee on Violence Against Women and Girls) and were based on a dating audit that METRAC developed for young women. Statistics Canada (1993) then tested these items in focus groups of women across Canada and on two large pilot tests of representative samples of women. This validation was further conducted with the Violence

Table 1
Characteristics of Clinical/Hospital Sample
and Comparison Group

Characteristics	Abused in Past Year	Not Abused in Past Year	Total
Pregnancy status			
Yes, now	45	31	76
Yes, in past year	98	28	126
Pregnant twice in past year	1	0	1
No	349	141	490
Yes in past year; also pregnant now	3	1	4
Pregnancy ended just before prior year	4	2	6
Don't know, might be	0	1	1
Missing	0	2	2
Total	500	205	705
Pregnancy outcome			
Live birth	64	24	88
Miscarriage	26	2	28
Abortion	9	3	12
Two miscarriages in past year	1	0	1
Miscarriage and live birth	1	0	1
Two live births	1	0	1
Not pregnant in past year	398	174	572
Missing	0	2	2
Total	500	205	705

Against Women Survey (Johnson, 1996). For the entire CWHRS sample, the reliability coefficient (Cronbach's alpha) is .82; for the subset of 118 women, the reliability coefficient is also .82. For the CWHRS, items were edited slightly to become gender neutral.

Harassment in Abusive Relationship: A Self-Report Scale. The Harassment in Abusive Relationship: A Self-Report Scale (HARASS; Brockmeyer & Sheridan, 1998; Humphreys & Campbell, 2003; Sheridan, 2001) is a 19-item Likert-style self-report instrument with a dual response of frequency (Often subscale) and perceived severity (Distress subscale). Content and face validity for the HARASS was established during instrument development, with Cronbach's alpha coefficient reliability scores for the Often and Distress subscales at .89 and .92, respectively (Sheridan, 1998). Construct validity was supported by moderate (but not redundant) correlations with the Danger Assessment and the Index of Spouse Abuse in Anglo and African American samples of sheltered battered women and battered women living in the community. For the entire CWHRS sample, the

Table 2
Selected Demographic and Clinical Characteristics of
118 Respondents Who Reported a Live Birth or
a Miscarriage in the Previous Year

	Live Birth (<i>n</i> = 88)	Miscarriage (<i>n</i> = 30)	<i>t</i> (<i>df</i>)	<i>p</i>
Mean age	25 years	29 years	-3.063 (117)	.003
Median age	25 years	28 years		
	<i>n</i> (%)	<i>n</i> (%)	χ^2 (<i>df</i>)	
Age 18 to 29	69 (81)	16 (19)	9.186 (2)	.010
Age 30 to 39	19 (63)	11(37)		
Age 40 to 41	1 (25)	3 (75)		
Ethnicity			6.697 (3)	.082
African American / Black	58 (72)	23 (28)		
White or other	9 (100)	0 (0)		
Latina/Hispanic	21 (81)	5 (19)		
Multiracial	1 (33)	2 (67)		
Relationship with partner ^a			10.464 (9)	.107
Boyfriend or fiancé	35 (74)	12 (26)		
Ex-boyfriend, former fiancé	25 (68)	12 (32)		
Current husband	13 (81)	3 (19)		
Ex- or former husband	0 (0)	2 (100)		
Current commonlaw	10 (91)	1 (9)		
Ex-commonlaw	4 (100)	0 (0)		
Current same-sex partner	1 (100)	0 (0)		

a. The relationship given is with the intimate partner who has abused her in the past year (physical violence or threat of violence). This person is not necessarily her current intimate partner nor the father of the child. A respondent with two or more abusive partners was asked to choose the partner who was responsible for the "incidents that bothered [her] the most." Women who were not abused in the past year and who had multiple relationships in the past year were asked to choose "the one [they] currently spend the most time with and feel closest to."

19 HARASS items have an alpha reliability coefficient of .86; for the 118 women analyzed here, the 19 HARASS items have an alpha reliability coefficient of .88.

Intimate Partner Violence Experienced in the Previous Year. Intimate Partner Violence Experienced in the Previous Year (Johnson & Sacco, 1995) is an 11-item modified version of the Conflict Tactic Scale (Straus, 1979), originally constructed for the Violence Against Women Survey (Johnson, 1996). The CWHRS interview asked each woman whether each of the 11 types of violence had happened to her in the past year, at the hands

of an intimate partner. In addition, each woman who responded *yes* to any of these items was asked to complete a calendar history covering the previous 12 months, in which the participant would mark on a calendar the important events in her life and each incident that had occurred, with details about each incident. Response to the modified Conflict Tactic Scale items defined whether a woman was in the abused group or the comparison group. Therefore, by definition, none of the comparison group women answered *yes* to any of these items. A summary variable, maximum violence severity, was constructed using both the responses to the 11 types of violence and the calendar history.

Danger Assessment. Danger Assessment (Campbell, 1995) is an 18-item dichotomous-response format (*yes/no*) of risk factors associated with intimate partner homicide. Although no cutoff score has been published, a score of 9.30 was found in abused women versus 0.75 in nonabused women, thereby supporting discriminant group validity. Studies using the Danger Assessment demonstrated internal consistency reliability of .60 to .86 (Campbell, 1995; McFarlane et al., 1998; Stuart & Campbell, 1989). Test–retest reliability has ranged from .89 to .94 (Stuart & Campbell, 1989). Convergent construct validity has been supported in the majority of the studies (Campbell, 1995).

Posttraumatic Stress Disorder Symptom Scale. The Posttraumatic Stress Disorder Symptom Scale (Foa & Tolin, 2000) is a 17-item scale used to assess severity of PTSD symptoms. Foa and Tolin (2000) provided evidence supporting reliability and validity data, with test–retest reliability at .80. The scale correctly identified the PTSD status of 94% of the participants (per the Structured Clinical Interview for *DSM-IV*–Axis I Disorders; First, Spitzer, Gibbon, & Williams, 1997), with a sensitivity of .88 and a specificity of .96.

Statistical Analyses

We examined differences across two groups of women: One group reported a history of miscarriage in the previous year, and the other reported a live birth. For both groups, descriptive analyses were computed for age, education, and ethnicity. Next, we examined the proportion of women who endorsed a history of psychological, physical, and sexual abuse items, according to the outcome of their pregnancy. We completed a series of two-by-two cross-tabulations with analysis of proportions to compute the chi-square statistic with Yates correction. Next, we conducted binary logistic

regression analyses, with (a) simultaneous entry of all six variables (physical abuse, Power and Control, HARASS, PTSD, age, and forced sex) to examine their independent contributions and (b) forward entry based on maximum likelihood ratio estimates, with psychological abuse, physical abuse, age, forced sex, PTSD diagnosis and severity, and their interactions as the indicator variables and with being positive for miscarriage as the dependent variable. Associated statistics, including chi-square and Wald test, as well as odds ratios and confidence intervals, are presented for the final model. The significance value chosen for a two-tailed test was .05. Correlations between predictor variables were analyzed to determine problems associated with multicollinearity and singularity. The Danger Assessment was not included in the logistic regression analysis, because of problems associated with singularity. The correlations between the six remaining variables ranged from .03 to .72, deemed acceptable for the purpose of the logistic regression (Tabachnick & Fidell, 2001). Finally, to explore the possible effects of curvilinear relationships and confounding on the multivariate analysis, we ran a new set of cross-tabulations showing how the relationship of violence severity to miscarriage risk changes with each dependent variable.

Results

Table 3 presents the results of the frequency analyses of types of violence and the maximum severity of violent incidents that occurred in the past year. Some acts of violence are significantly more likely to have occurred at least once in the miscarriage group than in the live birth group. For instance, a greater proportion of the miscarriage group disclosed having been forced into sex, beaten up, choked, threatened with a gun, or being hit by an object. Only 16% of pregnant CWHRS women who denied being forced into sex had a miscarriage, compared to 43% of women who said they had been forced into sex in the past year. Furthermore, the likelihood of miscarriage versus live birth increases significantly as the level of violence increases. Whereas 7.7% of the 26 women who had experienced no violence or threat of violence in the past year had a miscarriage and 13.3% of the 30 women who had experienced violence but no severe or life-threatening incident had a miscarriage, 38.7% of the 62 women who had experienced at least one severe or life-threatening incident had a miscarriage.

Miscarriage was also related to indicators of psychological abuse. On the HARASS, total mean scores were significantly higher in the miscarriage group than in the live birth group, 3.97 versus 6.77, $t = 3.251$, $df = 116$,

Table 3
Maximum Violence and Types of Intimate Partner Violence
Experienced at Least Once in the Previous Year—
Prevalence Rates of Endorsed Items

Violence in the Past Year	Live Birth (<i>n</i> = 88) <i>n</i> (%)	Miscarriage (<i>n</i> = 30) <i>n</i> (%)	χ^2 (<i>df</i>)	<i>p</i>
Maximum severity of violence in the past year			12.396 (2)	.002
No physical violence or threat of violence	24 (92)	2 (8)		
Violence but not life threatening or severe	26 (87)	4 (13)		
Severe or life-threatening violence	38 (61)	24 (39)		
In the past year, an intimate partner . . .				
1. Threatened to hit you with a fist or anything else that could hurt you?	46 (53)	23 (77)	5.220 (1)	.022
2. Thrown anything at you that could hurt you?	30 (34)	18 (60)	6.224 (1)	.013
3. Pushed grabbed or shoved you?	57 (65)	25 (83)	3.631 (1)	.057
4. Slapped you?	42 (48)	21 (70)	4.460 (1)	.035
5. Kicked, bit, or hit you with a fist?	38 (43)	19 (63)	3.638 (1)	.056
6. Hit you with an object that could hurt you?	23 (26)	17 (57)	9.060 (1)	.003
7. Beaten you up, for example, hit you repeatedly?	30 (34)	18 (60)	6.224 (1)	.013
8. Choked you?	32 (37)	20 (67)	6.974 (1)	.005
9. Threatened to or used a knife on you?	16 (18)	10 (34)	3.239 (1)	.072
10. Threatened to or used a gun on you?	9 (10)	8 (29)	5.715 (1)	.017
11. Forced you into any sexual activity you did not want to do, by threatening you, holding you down, or hurting you in some way?	24 (27)	18 (60)	10.453 (1)	.001

$p = .002$. Consistent with our other findings, 15% of women who reported in response to the HARASS item that they did not feel that their partner would again force them into sex had a miscarriage, compared to 44% of women who affirmed this question, $\chi^2 = 12.561$, $df = 1$, $p < .001$. On the Power and Control Scale, total mean scores were significantly higher in the miscarriage group than in the live birth group (2.70 versus 3.67), with 23.5% of the 17 women scoring 0 (the minimum Power and Control score) having had a miscarriage, compared to 44.1% of the 34 women scoring 5 (the maximum score), $\chi^2 = 12.783$, $df = 5$, $p = .026$. A positive response to many of the Danger Assessment items is also associated with a higher risk of miscarriage group. Whereas 15% of women who denied that their partners had ever forced them to have sex had a miscarriage, 39% of women who affirmed forced sex had a miscarriage, $\chi^2 = 9.285$,

$df = 1, p = .002$. Similarly, the risk of miscarriage was higher for women who said that there had been an increase in the frequency of physical violence in the previous year, 44% versus 16%, $\chi^2 = 10.139, df = 1, p = .001$; that there had been an increase in the severity of physical violence in the previous year, 38% versus 18%, $\chi^2 = 5.522, df = 1, p = .019$; that the partners controlled most of the women's daily activities, 37% versus 15%, $\chi^2 = 6.642, df = 1, p = .010$; and that the partners were violently and constantly jealous, 32% versus 16%, $\chi^2 = 4.064, df = 1, p = .044$.

Rates of PTSD diagnosis were high for both the miscarriage group and the live birth group, with a 53% prevalence rate for the entire subsample; but PTSD diagnosis was significantly higher in the miscarriage group than in the live birth group, 67% versus 45%, $\chi^2 = 4.028, df = 1, p = .045$. However, only one of the PTSD symptom clusters was significantly higher in the miscarriage group, that of reexperiencing; specifically, 7% versus 24% affirmed zero of the five reexperiencing items, and 50% versus 20% affirmed all five, $\chi^2 = 11.526, df = 5, p = .042$.

For the binary logistic regression models, scores were pooled for both groups (Table 4). These analyses confirmed that the interaction between the maximum severity of physical violence in the past year and the woman's age was significant for predicting miscarriage. Once maximum violence severity and age had been accounted for, other variables, such as forced sex, Power and Control score, harassment and stalking, and PTSD, did not matter. Violence severity was a strong predictor of miscarriage. Age was also a strong predictor, with only 19% of the 85 women aged 18 to 30 having a miscarriage, compared to 37% of the 30 women aged 31 to 40 and 75% of the four women aged 41 and older. Together, they accounted for 26.9% of the variance (Nagelkerke's R^2) in whether the women had live births or miscarriages.

Discussion

These findings suggest that pregnant women who experience IPV are at increased risk for miscarriage and that the more severe the violence, the greater the risk. Violence severity and the woman's age were such strong predictors that the influence of other factors that had strong zero-level relationships—Power and Control score, HARASS score, forced sex, and PTSD—disappeared in a multivariate analysis. This finding differs with that of previous research suggesting an additive effect such that exposure to

Table 4
Binary Logistic Regression Analyses Predicting Miscarriage

	β	<i>SE</i>	Wald	<i>p</i>	OR
Physical abuse (maximum severity)	1.096	0.485	5.102	.024	2.991
Power and Control score	-0.065	0.203	0.104	.748	0.937
HARASS score	0.021	0.079	0.073	.786	1.022
PTSD diagnosis	0.287	0.581	0.244	.621	1.332
Age	0.095	0.038	6.087	.014	1.100
Forced sex	0.368	0.564	0.427	.514	1.446
Constant ^a	-5.496	1.354	16.468	.0002	
Woman's Age \times Maximum Severity of Abuse (total)	0.053	0.013	17.071	.0001	1.068
Constant ^b	-3.208	0.622	26.575		

Note: $N = 118$. Model R^2 (Nagelkerke) = .269, $df = 1$. OR = odds ratio; HARASS = Harassment in Abusive Relationship: A Self-Report Scale; PTSD = posttraumatic stress disorder.

a. Method of entry: All variables entered into logistic regression model to determine independent values.

b. Method of entry: Forward stepwise, based on maximum likelihood estimate. Model statistics for prediction of miscarriage, $\chi^2 = 23.808$, $df = 1$, $p = .0001$.

both physical violence and psychological abuse (controlling behavior; harassment and stalking) is more detrimental for women than is exposure to either alone; however, a closer look at the data suggests otherwise (Table 5). The generally strong effect of maximum violence severity on the risk of miscarriage occurs only for women who have experienced severe levels of controlling behavior in the past year, have experienced forced sex, or have a PTSD diagnosis (the HARASS score did not have an effect). For example, the effect of violence severity on miscarriage risk is not significant for women who do not have a PTSD diagnosis, but it is highly significant for women who do. These findings reflect the difficulty of disentangling and empirically examining the independent effects of physical abuse from psychological abuse and other risk factors, because of the highly complex nature of abusive relationships.

The significantly higher rates of forced sex consistently found in the lives of women in the miscarriage group (71%), compared to women in the live birth group (41%), who have been experiencing severe or life-threatening violence suggests that women with a recent history of forced sex may be at particular risk for miscarriage—in particular, women who have been experiencing severe levels of other violence. This finding warrants future investigation.

Table 5
Risk Factors and Percentage of Miscarriage Versus Live Birth
(*n*) by Maximum Severity of Violence in the Past Year

Risk Factors		No Violence % (<i>n</i>)	Violence but Not Severe or Life Threatening % (<i>n</i>)	Severe or Life- Threatening Violence % (<i>n</i>)
Power and Control score ^a	0, 1, or 2	9.1 (22)	25.0 (12)	0.0 (8)
	3, 4, or 5	0.0 (4)	5.6 (18)	44.4 (54)
Posttraumatic stress disorder diagnosis ^b	No	10.5 (19)	18.8 (16)	21.7 (23)
	Yes	0.0 (7)	7.1 (14)	48.7 (19)
Forced sex in past year ^c	No	7.7 (26)	14.3 (21)	24.1 (29)
	Yes	0.0 (0)	11.1 (9)	51.5 (33)
Partner controls most activities ^d	No	9.1 (22)	18.2 (22)	21.7 (23)
	Yes	0.0 (2)	0.0 (7)	50.0 (34)
Partner constantly violently jealous ^e	No	5.9 (17)	18.8 (16)	23.5 (17)
	Yes	11.1 (9)	7.1 (14)	44.4 (45)
Woman's age group ^f	18 to 29	10.0 (20)	5.0 (20)	28.9 (45)
	30 to 41	0.0 (6)	30.0 (10)	64.7 (17)

Note: Effects of violence severity on miscarriage risk are contingent on posttraumatic stress disorder, controlling behavior, and forced sex but not on the woman's age group.

a. Chi-square of violence severity and risk of miscarriage is not significant for 0, 1, or 2; for 3, 4, or 5, $\chi^2 = 11.319$, $df = 2$, $p = .003$.

b. Chi-square of violence severity and risk of miscarriage is not significant for no diagnosis of posttraumatic stress disorder; for a diagnosis of posttraumatic stress disorder, $\chi^2 = 11.975$, $df = 2$, $p = .003$.

c. Chi-square of violence severity and risk of miscarriage is not significant for women who did not experience forced sex in the past year; for women who did experience forced sex, $\chi^2 = 4.714$, $df = 1$, $p = .030$.

d. Chi-square of violence severity and risk of miscarriage is not significant for women who said that their partners did not control most of their daily activities; for women who answered yes, $\chi^2 = 8.510$, $df = 2$, $p = .014$.

e. Chi-square of violence severity and risk of miscarriage is not significant for women who said that their partners were not violently and constantly jealous; for women who answered yes, $\chi^2 = 8.927$, $df = 2$, $p = .012$.

f. Chi-square of violence severity and risk of miscarriage is significant for younger and older women; for women aged 18 to 29, $\chi^2 = 6.504$, $df = 2$, $p = .039$; for women aged 30 to 41, $\chi^2 = 8.508$, $df = 2$, $p = .014$.

Although rates of PTSD were significantly higher in the miscarriage group than in the live birth group, the effect of PTSD diagnosis was not significant in a multivariate analysis. This appears to be the result of a contingent effect of PTSD. The significant effect of violence severity on miscarriage risk occurs only for women who have a PTSD diagnosis. These findings have

important clinical implications. Women's health care providers should consider screening for IPV early in prenatal care (McFarlane & Parker, 1994). Identification and early intervention may lead to prevention of adverse pregnancy outcomes such as miscarriage. In the case of repeat miscarriage, a detailed psychosocial history should be taken to determine the possible contribution of physical or psychological abuse.

In addition, these findings are important in light of recent research linking IPV during pregnancy with increased femicide risk. According to research by McFarlane, Campbell, Sharp, and Watson (2002), women abused during pregnancy were at a threefold increased risk of femicide. When the worst abuse, attempted or completed femicide, occurred during pregnancy, infant viability was 50% for abused controls and attempted femicides. According to McFarlane et al., IPV during pregnancy should be viewed as a sign of a particularly dangerous batterer with associated risks that are detrimental for both maternal and infant mortality.

The results of this study should be interpreted with caution. Women in this sample reported high levels of IPV, psychological abuse, and PTSD. Although this sample included a nonabused comparison group, the rates of abuse and PTSD in the entire sample are higher than what we would expect to find in the general population. In addition, the present analysis does not utilize the longitudinal CWHRS data. Future investigations using a well-defined comparison group of pregnant women without abuse histories and PTSD may allow for a greater detection of the differential effects of physical and psychological abuse and PTSD in pregnancy outcomes. Future investigation should also include assessment of the level of IPV-related physical injury that women experience; doing so would better disentangle the underlying mechanism through which physical abuse contributes to miscarriage independent of psychological abuse. Prospective research that examines underlying biological mechanisms, such as immunologic and endocrine factors, may also contribute to a better understanding of the connection among psychological abuse, PTSD, and increased rates of miscarriage.

Note

1. Four women had given birth, and two women had had a miscarriage just before the prior-year window. These women were counted as being not pregnant in the past year and were therefore not included in the analysis for this article. One of these women had had a miscarriage a week before the prior-year window, which was caused by her partner's stomping her in the stomach because she was trying to leave the relationship.

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