Rates of Hospital Visits for Assault During Pregnancy and the Year Postpartum: Timing Matters

ANGELA NANNINI, FNP, PhD^a

JANE LAZAR, RN, MPH^b

CYNTHIA BERG, MD, MPH^c

MARY BARGER, CNM, MPH,
PhD, FACNM^d

KAY TOMASHEK, MD, MPH^e

HOWARD CABRAL, PhD, MPH^f

WANDA BARFIELD, MD, MPH,
FACNM^c

MILTON KOTELCHUCK, PhD,
MPH^g

ABSTRACT

Objective. To clarify the risk of violence for women during pregnancy and the first year postpartum, we examined the timing of hospital visits for assault among a population cohort of women in Massachusetts.

Methods. Using linked natality and hospital data from 2001 through 2007 for Massachusetts, we examined the timing of hospital (i.e., emergency, inpatient, and observation) visits for maternal assault during seven time periods: the three prenatal trimesters and four three-month postpartum periods. To describe the risk of assault for each of the time periods, we calculated the rate as the number of such visits per 100,000 person-weeks. We used the denominator of 100,000 person-weeks to adjust for variable lengths of gestation and for postpartum periods shortened by subsequent pregnancies.

Results. Rates of hospital visits for maternal assault were highest in the first trimester and lowest in the third trimester, with rates of 16.0 and 5.8 per 100,000 person-weeks, respectively. The four postpartum period rates were higher than the third trimester rate but never reached the levels observed in the first and second trimesters.

Conclusions. These findings suggest a changing rate for assault visits during each prenatal trimester and postpartum period. In addition, the importance of violence prevention strategies as part of women's health care across the life span and the need for preconception care initiatives are reaffirmed.

^aUniversity of Massachusetts Lowell, Department of Nursing, Lowell, MA

^bNortheastern University, Bouvé College of Health Sciences, School of Nursing, Boston, MA

^cCenters for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Division of Reproductive Health, Atlanta, GA

^dUniversity of California San Francisco, School of Nursing, San Francisco, CA

^eCenters for Disease Control and Prevention, Division of Vector-Borne Infectious Disease, Dengue Branch, San Juan, Puerto Rico

^fBoston University School of Public Health, Boston, MA

^gHarvard Medical School, Boston, MA

Address correspondence to: Angela Nannini, FNP, PhD, University of Massachusetts Lowell, Department of Nursing, 3 Solomont Way, Lowell, MA 01854; tel. 978-934-4938; fax 978-934-3006; e-mail <angela_nannini@uml.edu>.

©2011 Association of Schools of Public Health

Some studies have shown that violence increases during pregnancy while others have not,¹⁻⁴ with variations in findings attributed to differences in definition, assessment, and study design.^{3,5} Estimates of the prevalence of violence during pregnancy⁶⁻¹⁴ vary from 1% to 20% for the prepregnancy period and from 3.2% to 8.7% for the postpartum periods.^{6-8,11} Several studies of violence against pregnant women have focused solely on intimate partner violence, while others have not specified the relationship of the perpetrator to the victim or found that the majority of perpetrators were intimate partners.^{8,9}

Unfortunately, studies of violence that have compared pregnancy with time frames before or after pregnancy have not adjusted for different lengths of observation or examined different risk periods within pregnancy or after delivery through the first year postpartum.⁶⁻⁸ None of these studies used linked population data to capture visits for assault occurring in multiple emergency departments (EDs) and inpatient hospitals that may differ from the delivery hospital. The majority of previous studies on intentional injury in pregnancy and postpartum relied on retrospective self-reported information and did not collect information at the time of the injury and follow women until the end of the first year postpartum. Understanding differing risk during pregnancy and postpartum can assist violence prevention strategies in clinical care as well as in the community.

In Massachusetts from 2001 to 2003, 1% of all women with a live birth or fetal death at ≥ 20 weeks of gestation (or ≥ 350 grams) had a hospital visit for assault during pregnancy or in the year postpartum.¹⁵ To clarify the risk of violence in the time around pregnancy, we examined the timing of hospital visits for assault during pregnancy and the first year postpartum among Massachusetts women and calculated the rate of hospital visits for assault per person-weeks of pregnancy. Information about the timing of assaults can help inform prevention strategies.

METHODS

We derived a maternally linked dataset using vital records and hospital utilization data from the Massachusetts Pregnancy to Early Life Longitudinal (PELL) system. PELL is an ongoing data linkage system that contains numerous maternal and early childhood datasets and is maintained through a partnership with the Massachusetts Department of Public Health (MDPH), Boston University School of Public Health, and the Centers for Disease Control and Prevention (CDC). For this study, birth and fetal death certificates from

MDPH were linked to maternal inpatient delivery data from the Massachusetts Division of Health Care Finance and Policy (MDHCFP) employing deterministic and probabilistic methods. Then, using a unique identifier available on all MDHCFP hospital data, the inpatient maternal delivery data were linked to other antenatal and postpartum maternal inpatient stays, observational stays, and ED visits from all licensed acute care hospitals in Massachusetts. Hospital outpatient clinic visit data are not part of this data system.

The study cohort drawn from the PELL data system included all women with a live birth or fetal death at ≥ 20 weeks of gestation (or ≥ 350 grams) in Massachusetts whose pregnancy began after September 30, 2001, and first year postpartum ended before October 1, 2007 ($n=273,345$).

MDPH granted access to these data, and the Institutional Review Boards from Northeastern University and the University of Massachusetts Lowell approved this study.

The pregnancy-associated period was defined, according to the American College of Obstetricians and Gynecologists/CDC Maternal Mortality Study Group, as pregnancy through the first year postpartum.¹⁶ We calculated the beginning of the pregnancy-associated period by subtracting the weeks of gestation reported on the birth or fetal death certificate from the date of the live birth or fetal death. We defined the end date of the pregnancy-associated period as the date of fetal death or live birth plus 364 days or the beginning of a subsequent pregnancy if that date was less than one year after the end of the first pregnancy. We divided this time into seven pregnancy-associated time periods: the three prenatal trimesters and four three-month postpartum periods.

We identified women with one or more hospital visits for an assault during the pregnancy-associated period; these visits were defined by the presence of Supplementary Classification of External Causes of Injury and Poisoning code (E-code) indicating "intentional injuries inflicted by others" (E960-E968) in one of 15 fields available for coding the diagnosis. A data field that specified the relationship of the perpetrator to the woman was missing in 80% of these visits and was not analyzed. Missing perpetrator codes of an even greater magnitude (92%) were found by Weiss et al.¹⁷ The 39 assaulted women who had two deliveries during the pregnancy-associated period were excluded to ensure that observations in the analytic sample were statistically independent. Each assault visit was assigned to the appropriate pregnancy-associated time period using the dates of the assault visit, conception, and pregnancy outcome. We examined the timing of

hospital visits for assault reported and the distribution of these visits by time period with 95% confidence intervals. We performed all statistical analyses using SAS® version 9.1.¹⁸

To describe the risk of assault for each of the time periods, we calculated the rate of hospital visits for assault among the study cohort per 100,000 person-weeks. We calculated the denominator based on the number of weeks of pregnancy in each of the seven time periods experienced by all women in the study cohort. By presenting assault rates per 100,000 person-weeks, we were able to adjust for different lengths of observation (i.e., those caused by variable lengths of gestation) and for postpartum periods shortened by subsequent pregnancies.

RESULTS

Of the 273,345 women in our cohort, 2,559 (0.9%) had a total of 2,880 hospital visits for assault. Most of these women had one such visit, but 10.4% ($n=267$) had two or more visits. In comparison with the total cohort, women with an assault visit were disproportionately non-Hispanic black or Hispanic, younger than 25 years of age, unmarried, less educated, and publicly insured (Table 1). ED visits without an inpatient admission accounted for 94% of all assault visits (data not shown).

Nearly one in four hospital visits for assault during the pregnancy-associated period occurred in the first trimester of pregnancy (Table 2). The rate for such visits was highest in the first trimester (16.0 per 100,000 person-weeks), decreasing to a low of 5.8 per 100,000 person-weeks in the third trimester. Rates for the postpartum period were higher than in the third trimester but below the level of the second and first trimesters.

DISCUSSION

Pregnancy is a time of change for a woman as well as her partner, and this change may include a redefinition of their relationship.^{19,20} Whether or not the change in risk of assault requiring a hospital visit during pregnancy is associated with a change in the relationship of the pregnant woman and her partner is not known and requires further study. However, the striking decrease in the rate of hospital visits for assault that we found from the first to the third trimester of pregnancy may contribute to differing perceptions of the risk of violence in pregnancy. Because the threshold for admitting a pregnant woman and providing fetal monitoring drops as a pregnancy progresses, this decline in the hospital

visit rate for assault might be seen as counterintuitive; however, our data reflect care-seeking behavior that is usually, but not always, tied to severity.

One study has suggested that the risk of homicide may be higher in early pregnancy²¹ and, thus, the higher rate of hospital visits early in pregnancy could be a proxy for more severe nonfatal assaults during this early period. Regardless, the higher rates of assault visits early in pregnancy justify beginning prevention initiatives before pregnancy. The demographics of assaulted women in this study were consistent with

Table 1. Sociodemographic characteristics of women with pregnancy-associated hospital visits for assault, compared with the total cohort: Massachusetts, 2001–2007

	All women ($n=273,345$) Percent ^a	Women with any assault visit ^b ($n=2,559$) Percent ^a
Maternal race/ethnicity		
Hispanic	13.3	25.2
Non-Hispanic white	69.1	45.5
Non-Hispanic black	8.0	23.0
Asian or Pacific Islander	7.3	1.8
Other/unknown ^c	2.3	4.6
Maternal age (in years)		
≤19	6.5	24.7
20–24	15.6	38.4
25–29	24.0	21.6
30–34	31.6	9.2
≥35	22.4	6.1
Maternal education		
<High school	12.0	35.6
High school graduate	24.1	41.0
≥Some college	63.5	23.1
Unknown	0.1	0.3
Insurance at delivery ^d		
Private	63.3	12.4
Public	35.6	86.7
Other	0.6	0.6
Marital status		
Married	69.3	15.6
Unmarried	30.5	83.4
Unknown	0.2	0.3

^aPercentages may not add up to 100 due to rounding.

^bExcludes 39 assaulted women with two deliveries who had assault visits associated with both deliveries. A total of 267 (10.4%) women had more than one assault visit related to a pregnancy-associated period.

^cOther race/ethnicity includes American Indian and other.

^dPrivate insurance includes commercial, nongovernment managed care/health maintenance organization, and other private insurance; public insurance includes Medicaid, Medicare, Healthy Start, and other government insurance; and other insurance includes self-pay and missing/unknown insurance.

Table 2. Distribution and rates of hospital visits for assault during the pregnancy-associated period: Massachusetts, 2001–2007^{a,b}

Variables	Number of assault visits (n=2,880)	Percent (95% CI)	Rate ^c
Pregnancy trimester			
First	712	24.7 (23.7, 25.8)	16.0
Second	519	18.0 (17.1, 19.0)	11.7
Third	206	7.2 (6.5, 7.8)	5.8
Postpartum period (in months)			
1–3	296	10.3 (9.5, 11.0)	7.1
4–6	334	11.6 (10.8, 12.4)	8.1
7–9	429	14.9 (14.0, 15.8)	10.5
10–12	384	13.3 (12.5, 14.2)	9.7

^aThe pregnancy-associated period was defined as pregnancy through the first year postpartum.

^bData are from the Massachusetts Division of Health Care Finance and Policy. The data represent hospital, observation stay, and emergency department visits for fiscal years 2002–2007 (October 1, 2001, to September 30, 2007).

^cPer 100,000 person-weeks

CI = confidence interval

other studies^{7,21} and dictate the need to continue initiatives to reach women at the highest risk for violence.

Our findings, using longitudinally linked data, help us to locate the times women are most at risk for assault.

Limitations

Our use of hospital visit data placed several limitations on their interpretation. As shown in other studies,^{12,21} we assumed the perpetrator of the majority of assaults in pregnancy was an intimate partner. However, the perpetrator code was missing on 80% of these hospital visits and the E-codes used for assault by another person do not specify the relationship of the assailant. Therefore, we were unable to estimate the exact number of assaults perpetrated by an intimate partner.

Additionally, our study data did not include assault visits before pregnancy, so we were unable to examine the risk of assault prior to conception and compare it with subsequent risk in pregnancy and postpartum periods. The women we studied had a delivery with an outcome ≥ 20 weeks of gestation, so our findings cannot be generalized to pregnant women who experienced a fetal loss at < 20 weeks of gestation. As with any longitudinal population cohort, some women who had a delivery in Massachusetts did not reside in the state for the entire study period, and our methods did not capture out-of-state hospital utilization. We assumed that the number of these “lost” hospital assault visits would be small and would have the most influence on assault rates at the beginning of pregnancy and the end of the first year postpartum—the periods that already had the highest rates.

Finally, our data may have underestimated the actual number of assault injuries, as many assaulted women

either do not seek health care or do not disclose the intentional nature of their injuries.^{8,22} Still, we posit that hospital visits for assault represent a certain level of severity and that their timing may mirror the timing of violence during the pregnancy-associated period.

CONCLUSIONS

Despite our underestimation of assaults, using linked population data is superior to using unlinked hospital data for two reasons. First, it identifies the timing more specifically because the date of the assault visit can be calculated with respect to the linked date of delivery or the estimated date of conception. Also, our methods enabled the identification of postpartum assaults and more complete detection of assault visits in pregnancy. Previous research of injury hospital visits in pregnancy has shown that 40% of visits did not have an additional code to indicate pregnancy and would have been missed in unlinked data.¹⁵

Our population-based findings, which indicate that assault risk is highest early in pregnancy—perhaps before a woman seeks any prenatal care—reinforce the need for violence prevention as part of preconception care.^{23,24} The striking decline in risk as pregnancy progresses and subsequent steady climb in the postpartum period underscores that safety concerns are ongoing through a woman’s life span and require solutions “outside the box” of clinical care. At the same time, assurances for accessible services to populations at risk are needed.

This study was supported by the Division of Reproductive Health, National Center for Chronic Disease Prevention and Health

Promotion, Centers for Disease Control and Prevention (CDC) contract #200-2006-M-15729 and the Massachusetts Pregnancy to Early Life Longitudinal Database, Association of Schools of Public Health/CDC #S3485-23/24. The findings and conclusions in this article are those of the authors and do not necessarily represent the views of CDC.

REFERENCES

1. Lipsky S, Holt VL, Easterling TR, Critchlow CW. Police-reported intimate partner violence during pregnancy: who is at risk? *Violence Vict* 2005;20:69-86.
2. Moore M. Reproductive health and intimate partner violence. *Fam Plann Perspect* 1999;31:302-6.
3. Burch RL, Gallup GG Jr. Pregnancy as a stimulus for domestic violence. *J Family Violence* 2004;19:243-7.
4. Kantor GK, Jasinski JL, Aldarondo E. Sociocultural status and incidence of marital violence in Hispanic families. *Violence Vict* 1994;9:207-22.
5. Jasinski JL. Pregnancy and domestic violence: a review of the literature. *Trauma Violence Abuse* 2004;5:47-64.
6. Silverman JG, Decker MR, Reed E, Raj A. Intimate partner violence around the time of pregnancy: association with breastfeeding behavior. *J Womens Health (Larchmt)* 2006;15:934-40.
7. Saltzman LE, Johnson CH, Gilbert BC, Goodwin MM. Physical abuse around the time of pregnancy: an examination of prevalence and risk factors in 16 states. *Matern Child Health J* 2003;7:31-43.
8. Martin SL, Mackie L, Kupper LL, Buescher PA, Moracco KE. Physical abuse of women before, during, and after pregnancy. *JAMA* 2001;285:1581-4.
9. Gazmararian JA, Lazorick S, Spitz AM, Ballard TJ, Saltzman LE, Marks JS. Prevalence of violence against pregnant women [published erratum appears in *JAMA* 1997;277:1125]. *JAMA* 1996;275:1915-20.
10. Cokkinides VE, Coker AL, Sanderson M, Addy C, Bethea L. Physical violence during pregnancy: maternal complications and birth outcomes. *Obstet Gynecol* 1999;93(5 Pt 1):661-6.
11. Bacchus L, Mezey G, Bewley S, Haworth A. Prevalence of domestic violence when midwives routinely enquire in pregnancy. *BJOG* 2004;111:441-5.
12. Bacchus L, Mezey G, Bewley S. Domestic violence: prevalence in pregnant women and associations with physical and psychological health. *Eur J Obstet Gynecol Reprod Biol* 2004;113:6-11.
13. Amaro H, Fried LE, Cabral H, Zuckerman B. Violence during pregnancy and substance use. *Am J Public Health* 1990;80:575-9.
14. Campbell JC, Poland ML, Waller JB, Ager J. Correlates of battering during pregnancy. *Res Nurs Health* 1992;15:219-26.
15. Nannini A, Lazar J, Berg C, Tomashek K, Cabral H, Barger M, et al. Injury: a major cause of pregnancy-associated morbidity in Massachusetts. *J Midwifery Womens Health* 2008;53:3-10.
16. Atrash HK, Rowley D, Hogue CJ. Maternal and perinatal mortality. *Curr Opin Obstet Gynecol* 1992;4:61-71.
17. Weiss HB, Ismailov RM, Lawrence BA, Miller TR. Incomplete and biased perpetrator coding among hospitalized assaults for women in the United States. *Inj Prev* 2004;10:119-21.
18. SAS Institute, Inc. SAS[®]: Version 9.1. Cary (NC): SAS Institute, Inc.; 2003.
19. Bouchard G, Boudreau J, Hebert R. Transition to parenthood and conjugal life: comparisons between planned and unplanned pregnancies. *J Family Issues* 2006;27:1512-31.
20. Buist A, Morse CA, Durkin S. Men's adjustment to fatherhood: implications for obstetric health care. *J Obstet Gynecol Neonatal Nurs* 2003;32:172-80.
21. Krulewitch CJ, Pierre-Louis ML, de Leon-Gomez R, Guy R, Green R. Hidden from view: violent deaths among pregnant women in the District of Columbia, 1988-1996. *J Midwifery Womens Health* 2001;46:4-10.
22. Poole GV, Martin JN Jr, Perry KG Jr, Griswold JA, Lambert CJ, Rhodes RS. Trauma in pregnancy: the role of interpersonal violence. *Am J Obstet Gynecol* 1996;174:1873-7.
23. Johnson K, Posner SF, Biermann J, Cordero JF, Atrash HK, Parker CS, et al. Recommendations to improve preconception health and health care—United States. A report of the CDC/ATSDR Preconception Care Work Group and the Select Panel on Preconception Care. *MMWR Recomm Rep* 2006;55(RR-6):1-23.
24. Lu MC, Kotelchuck M, Culhane JF, Hobel CJ, Klerman LV, Thorp JM Jr. Preconception care between pregnancies: the content of prenatal care. *Matern Child Health J* 2006;10(5 Suppl):S107-22.