Mental health, substance use, and intimate partner problems among pregnant and postpartum suicide victims in the National Violent Death Reporting System

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Abstract

Objectives—Suicide during pregnancy and the postpartum is a tragic event for the victim and profoundly impacts the baby, the family, and the community. Prior efforts to study risks for pregnancy-associated suicide have been hampered by the lack of data sources which capture pregnancy and delivery status of victims. Introduction of the United States National Violent Death Reporting System (NVDRS) offers new insights into violent deaths by linking multiple data sources and allowing better examination of psychosocial risk factors.

Methods—The analysis used data from 17 states reporting to the NVDRS from 2003–2007 to evaluate suicide patterns among pregnant, postpartum, and non-pregnant or postpartum women. Demographic factors, mental health status, substance use, precipitating circumstances, intimate partner problems, and suicide methods were compared among groups.

Results—The 2083 female suicide victims of reproductive age demonstrated high prevalence of existing mental health diagnosis and current depressed mood with depressed mood significantly higher among postpartum women. Substance use and presence of other precipitating factors were high and similar among groups. Intimate partner problems were higher among pregnant and

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postpartum victims. Postpartum women were more likely die via asphyxia as cause of death compared to poisoning or firearms

Conclusions—These findings describe important mental health, substance use, and intimate partner problems seen with pregnancy-associated suicide. The study highlights mental health risk factors which could potentially be targeted for intervention in this vulnerable population.

Keywords

Pregnancy; postpartum; suicide; mental health; intimate partner violence

Introduction

Suicide during pregnancy and the postpartum is an important public health problem with profound impacts on the baby, the family, and the community. The perinatal period is a vulnerable time for maternal mental health, with major depression affecting 13–20% of pregnant and postpartum women and anxiety disorders affecting 10–12%.[1–4] Suicidal ideation is common during pregnancy and postpartum, although suicide completion is lower suggesting that this period may offer some protective effect.[4, 5] However, perinatal suicide is still a potentially-preventable public health issue and a devastating event for families when it occurs. As these women have frequent interaction with the health care system, there may be greater opportunity for providers to intervene if risk factors for self-harm can be better defined.

Unfortunately, efforts to study risks for pregnancy-associated suicide have been hampered by the lack of data sources which capture pregnancy and delivery status of victims.[5–7] Previous suicide surveillance efforts had very limited access to psychiatric status, psychiatric history, and current stressors for the victim which made it difficult to evaluate potential areas of intervention, treatment, or prevention. Introduction of the United States National Violent Death Reporting System (NVDRS) in 2003 has provided new insights into violent deaths.[8] The data set allows close examination of pregnancy-associated suicides across multiple states.[9] The NVDRS is unique in its linkage of data from multiple sources. This permits exploration of demographic information and mode of death but also provides critical details about pregnancy and postpartum status, mental health, substance use, and precipitating circumstances to create a more complete picture of victim characteristics.

We utilized the NVDRS to examine victims of suicides during pregnancy, suicides up to one year postpartum and non-pregnancy-associated suicides and to compare psychiatric history, substance use, methods of suicide, intimate partner problems, and precipitating circumstances among these groups.

Materials and Methods

NVDRS sample

The NVDRS combines information from multiple sources: death certificates, coroner and medical examiner information, toxicology data, and law enforcement reports.[9] We abstracted data from the NVDRS for the years 2003–2007 for 17 states. 16 of these states collect statewide data (Alaska, Colorado, Georgia, Kentucky, Maryland, Massachusetts, New Jersey, New Mexico, North Carolina, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Virginia, and Wisconsin), and one (California) gathers information from a limited number of counties. We excluded cases where the maternal residence was outside of these 17 reporting states. We further limited the analysis to female victims of suicide, who were of plausible reproductive age (15–54).

Definitions

NVDRS defines suicide as "a death resulting from the intentional use of force against oneself."[10] Pregnancy-associated deaths were defined as those occurring during pregnancy or within the first year postpartum, a definition consistent with the Center for Disease Control and the American College of Obstetricians & Gynecologists Maternal Mortality Study Group.[11] Thirty cases with unknown pregnancy or postpartum status were excluded from the analysis. Non-pregnancy-associated deaths were defined as those in which the victim was reported not to be pregnant or postpartum within the year prior to the death. We separated pregnancy-associated deaths into two categories: those in which the victim was pregnant and those which occurred within one year postpartum as we theorized women might have different risks and protective factors during these two periods.

Mental health

Mental health status is assessed by the NVDRS with variables showing whether or not the woman was known to have a depressed mood at time of death, whether she had a known mental health diagnosis excluding alcohol and substance abuse, and whether there was past or present mental health treatment. NVDRS assumes that a current prescription for an antidepressant or other psychiatric medication is evidence for both current mental health problem and current treatment. For women who did not die of intentional overdose, CDC assumes that if antidepressants are found in toxicology testing, the woman had a current mental health disorder; for these women we assumed that prescription antipsychotics in toxicology testing also indicated current mental health disorder. When specific psychiatric diagnoses were available, they were grouped to include mood disorders (unipolar or bipolar disorder, and dysthymia); anxiety disorders (anxiety, post-traumatic stress disorder, obsessive-compulsive disorder); schizophrenia; other mental health disorders (such as eating disorders, attention deficit hyperactivity disorder, mental retardation, and autism, among others); and unknown disorder.

As part of the toxicology testing, NVDRS reports presence of antidepressants. This variable includes medications primarily used for depression but also includes antidepressants used for other clinical conditions (e.g., tricyclic antidepressants are also used for headache prevention and chronic pain, bupropion is also used for tobacco cessation, and trazodone is frequently used for insomnia). We hand-examined the free text results and coded positive for medications listed there where were not otherwise captured in NVDRS codes.

Substance and alcohol use

Substance use identified victims with a known drug or alcohol abuse problem as well victims with drugs or alcohol in their system at the time of death. NVDRS identifies presence of opiates, cocaine, marijuana, or amphetamines. We also reviewed free text of toxicology results for all victims and created additional categories for barbiturates and benzodiazepines. For alcohol, we created a separate variable to indicate victims with a blood alcohol level above 0.08% (80 mg/dL) at the time of death which would suggest some degree of impairment as it represents about three drinks for a 160-pound woman and is the legal limit for adult drivers in all U.S. states.[12]

Precipitating circumstances

Precipitating circumstances were defined by NVDRS coders as events or problems contributing to the suicide and included: presence of a crisis within the last two weeks, the death or suicide of a friend or family member within the past five years, problems with finances, physical health, school, or job, recent criminal/legal problems, and having a relationship problem with someone other than an intimate partner. Given limited sample

size, we combined the precipitating circumstances into a single variable indicating presence or absence of any of 10 circumstances.

Intimate partner problems

We were interested in the association between intimate partner violence and suicide. NVDRS contains a variable for known history of interpersonal violence within the last month but only 26 women of 2083 were positive for this variable which suggested it was not likely capturing the prevalence of IPV. We therefore utilized an NVDRS variable which is coded positive if friction or conflict with a current or former intimate partner appear to have played a precipitating role in the suicide as this captured a much broader population.

Suicide method

Suicide method was classified by NVDRS based on ICD-10 codes. When ICD-10 codes were unknown, we hand-coded free text data from the death certificate to identify cause of death for each victim. If no known cause could be identified from any other variable in the in the chart, and toxicology data were positive, we coded cause as overdose. We narrowed the cause of death to five categories in order to avoid small sample size: firearms, blunt trauma (including jumps and intentional vehicular traumas), poisoning (including ingestions and overdoses), asphyxia (including hanging, strangulation, carbon-monoxide exposure, drowning, or fire), and other/combined methods.

Analysis plan

For our analysis, we used bivariate logistic regression, chi-squared, and ANOVA to compare pregnancy and non-pregnancy-associated suicides in terms of demographics, mental health, substance and alcohol use, precipitating circumstances, and IPV. NVDRS requires suppression of reporting for any cells with less than five deaths although cells with zero deaths may be presented. We used Fisher's Exact Test rather than chi-squared when we had cell size less than five. We performed multivariate logistic regression analysis on significant results to further explore potential predictors for suicide among pregnant and postpartum women. For these analyses, we controlled for demographics (race, age, educational status, marital status), mental health (presence of mental health disorder or current depressed mood), known substance or alcohol abuse history, presence of intimate partner problems as a contributing circumstance, and a combined variable to indicate presence of any of 10 other precipitating circumstances as described previously. Multinomial logistic regression was used to calculate relative risk ratio of different suicide methods among the groups.

Results

Demographics

We limited the NVDRS data to reproductive-age female suicides among the 16 fully-reporting states which gave a sample size of 2083 victims. Of these, 48 (2%) were pregnant at the time of death, 65 (3%) were within one year postpartum, and 1970 (95%) were not pregnant or postpartum. Race was combined into three categories: white, nonwhite, and missing due to small cell size for pregnant and postpartum victims. Groups did not vary by these racial categories. However, pregnant and postpartum women were significantly more likely to have Hispanic ethnicity. Education was significantly different among groups primarily because educational status was more frequently unknown among pregnant and postpartum victims. More than a third of victims were married and this did not differ by pregnancy status. Average age (SD) differed significantly between pregnant (31 years +/−11) and postpartum (32 years +/−11) victims compared with non-pregnancy-associated victims (40 years +/−11).

Mental Health

Among the 2083 victims, 1169 (56%) had a known mental health problem. For those victims with specific diagnoses listed, mood disorders were the most common (95% of victims) followed by anxiety disorders (9%) and schizophrenia (5%). Thirty-two percent had a history of prior suicide attempt. None of the mental health variables differed significantly by pregnancy status.

Current depressed mood was noted for 983/2083 women (47%). Compared with non-pregnant victims, pregnant victims were not significantly different in terms of prevalence of depressed mood. However, postpartum victims had higher odds of current depressed mood in both bivariable analysis (OR: 1.94, CI: 1.16–3.24, p=0.011) and multivariable analysis (OR: 2.13, CI: 1.21–3.73, p=0.009) (Table 2).

Among victims tested for specific drugs, 45% had toxicological evidence of an antidepressant in their system at the time of death and 7% were positive for antipsychotic medications. These numbers did not differ by pregnancy status.

Substance Use

Among all victims, 591 (28%) had a known alcohol or substance dependence or problem at the time of death and this did not vary by pregnancy status. Eighty-two percent of victims had toxicology testing after death and 54% of those tested had a positive result. Among those tested, 6% of victims tested were positive for amphetamines, 25% for benzodiazepines, 5% for barbiturates, 9% for cocaine, 5% for marijuana, 31% for opiates, and 23% had blood alcohol above 0.08% at the time of death. Only presence of benzodiazepines differed significantly by pregnancy status with non-pregnant women more likely to test positive than pregnant or postpartum women (p=0.032, numbers suppressed due to small cell size).

Precipitating Circumstances

We examined associations between current stressors and pregnancy status among victims (Table 2). Currently-pregnant women were more likely than non-pregnant/non-postpartum victims to have had a crisis within the last two weeks in bivariable analysis but once we controlled for confounders (race, marital status, mental health problem, current depressed mood, problem with an intimate partner, alcohol or substance problem, and prior suicide attempt) this was no longer significant. Currently-pregnant women were also significantly more likely to have a relationship problem in with someone other than an intimate partner both in bivariable analysis and in multivariable analysis controlling for the other confounders. None of the other stressors (death or suicide of a friend or family member within the past five years; problems with finances, physical health, school, or job; or recent criminal or legal problems) was significantly different by pregnancy status.

Intimate Partner Problems

In 576 out of 2083 women (28%) with suicide, "problems with a current or former intimate partner" were associated with the suicide. Pregnancy associated suicides had significantly higher odds of being positive for this variable compared with non-pregnancy associated suicides. Currently-pregnant women had higher odds of intimate partner problems in bivariable (OR: 3.31, CI: 1.86–5.90, p<0.0005) and multivariable analysis (3.01, CI: 1.60–5.68, p=0.001). Postpartum women also had higher odds in bivariable (2.72, CI: 1.65–4.47, p<0.0005) and multivariable analysis (OR: 2.48, CI: 1.45–4.24, p=0.001).

Method of Suicide

For all female victims in this analysis, the most common method of suicide was poisoning (overdose or carbon monoxide), followed by firearms, asphyxia (hanging, suffocation, drowning, or fire), and blunt trauma (Table 3). Methods differed by pregnancy status in bivariable analysis (p<0.0005) with pregnant women more likely to utilize firearms, postpartum women to die by asphyxia, and non-pregnant women to choose poisoning or blunt trauma. Using multinomial logistic regression and controlling for potential confounders (race, education, marital status, age, mental health disorder, current depressed mood, intimate partner problems, alcohol or substance abuse, prior suicide attempt), we noted significant differences in choice of suicide method for postpartum women but not currently-pregnant women. Postpartum women had significantly higher risk of suicide by asphyxia (hanging, suffocation, or drowning) compared to self-poisoning (RRR: 2.74, CI: 1.42–5.27, p=0.003) or firearms (RRR: 2.30, CI: 1.20–4.42, p=0.012).

Discussion

Several findings stand out from this analysis. First, mental health disorders and substance abuse are equally prevalent in pregnant and non-pregnant women who commit suicide, and providers should be alert to these risk factors. Second, postpartum women were more likely to have been identified as having depressed mood in the two weeks prior to suicide than other women. Both pregnant and postpartum women were more frequently reported as having problems with a current or former intimate partner. Finally, postpartum women were more likely than other women to die via hanging, suffocation, or drowning, suggesting that when they committed suicide, they chose a relatively lethal method.

Depression is a known risk factor for suicide, and the high prevalence of depression as a mental health diagnosis among women in this study who committed suicide is consistent with prior findings. In a large study of pregnant women, almost 30% of those with screening scores consistent with probable major depression endorsed suicidal ideation.[13] In our analysis, women within their first year postpartum were more likely to have been identified with depressed mood at the time of death compared with other women. It is not known why depressed mood might pose a higher risk in postpartum women compared to other groups, but lack of sleep and stress from infant care may play major roles.

The American College of Obstetricians and Gynecologists (ACOG) reports insufficient evidence to support a firm recommendation for universal antepartum or postpartum depression screening but does strongly encourage screening.[14] ACOG also recommends that women with current depression or a history of major depression have close monitoring and evaluation during pregnancy and postpartum. Treatment guidelines for management of depression during pregnancy are available.[15]

Although NVDRS reports extremely high rates of treatment among all victims with identified mental health disorders, we believe this reflects the NVDRS coding algorithm rather than true rates of treatment. One coding rule (NVDRS coding manual, 19-4, validation rule 0058) directs that patients with mental disorders should be assumed to also be receiving current treatment since "if the person had mental illness, it is unlikely that they did not have current treatment for mental illness."[10] Unfortunately, this is not consistent with current knowledge about mental health disorders and treatment in the United States. A recent study among women of reproductive age demonstrates that only half of women with current serious psychological distress were receiving medicine or treatment.[16] Two studies which assessed depression during pregnancy reported even lower treatment rates of just 14 and 33%.[17, 18] In addition, many women who seek care have inadequate or suboptimal treatment.[18]

Psychiatric disorders carry significant stigma and victims may hide the presence of such diagnoses or thoughts from relatives, colleagues, and even medical providers, leaving no trail for those attempting psychiatric autopsy.[19] Mental health disorders frequently co-exist; the fact that few victims in NVDRS have more than one psychiatric diagnosis suggests significant underreporting of co-morbidities. Kessler (2007) reports that among individuals with a lifetime diagnosis of major depressive disorder, nearly three of four met criteria for another psychiatric disorder including almost 60% with a co-morbid anxiety disorder.[20] Similarly, the 12 month prevalence of anxiety disorders in the U.S. is about 18%, roughly twice the reported rate among the population of suicide victims we examined in the NVDRS.[21]

In our study, postpartum women in particular were noted to select more violent methods for suicide with lower rates of death by overdose. This may reflect less prescription medication consumption during pregnancy or may demonstrate greater intention on death as an outcome. There have been prior reports suggesting pregnant and postpartum women may choose more lethal methods of suicide.[5]

Pregnant and postpartum suicide victims were more likely than non-pregnant women in this study to have been identified as having a problem with a current or former intimate partner. Intimate partner violence during pregnancy has been estimated to affect between 1 and 20% of women.[22–24] It is difficult to ascertain exact incidence of intimate partner violence after a suicide since psychological or sexual violence may be underreported by the victim. Since our variable was defined by NVDRS as problems with an intimate partner rather than violence from an intimate partner, it is difficult to know the relationship between these two and whether information about conflict or friction with an intimate partner predicts or indicates violence. Women with current or recent pregnancy are more likely to have had interaction with an intimate partner than non-pregnant women so this finding may be simply related to greater prevalence of these relationships since we did not measure whether all suicide victims were currently or recently in a partnered-relationship. Alternatively, pregnant or postpartum women may be particularly vulnerable to threats of violence or control from a partner. ACOG recommends screening every pregnant woman for IPV during each trimester and postpartum .[22] Asking about problems with an intimate partner may identify some women at risk or lead to further disclosure about violence, but this has not been investigated. Research is still identifying which interventions reduce rates of intimate partner violence in pregnant and postpartum women; while several studies have shown positive benefits from interventions, results are mixed.[23, 25–27]

This study has several limitations. First, the suicide victim cannot be interviewed after death, so it is impossible to assess for all current mental health disorders, thoughts about intent, or precipitating factors. Second, the toxicology data does not provide quantity of ingestion or whether a specific substance caused the death (i.e., whether the quantity would have been lethal). Third, multiple NVDRS abstractors may lead to differences in how variables are identified or coded. Fourth, since NVDRS assumes that victims with a mental health diagnosis are receiving treatment this variable is not useful in evaluating whether treatment offers any protection against self-harm. Fifth, our evaluation of intimate partner violence was limited to studying women with intimate partner problems which may or may not reflect violent or coercive behaviors. While the NVDRS offers a major advancement in terms of capturing pregnancy status, it likely underestimates early pregnancies which may not be publicly known and may miss postpartum women who do not have custody of their children or had an infant death. NVDRS does not provide data for the entire U.S. so results are not nationally representative.

Conclusions

This analysis of mental health, substance, IPV, and recent stressors associated with suicides during pregnancy and postpartum provides rich data on comorbidities and risk factors. Since mothers and infants in the childbearing years are likely to have frequent contacts with the health system, we urge providers to ask their patients about mental health diagnosis, current depressed mood, and conflict with intimate partners. Women disclosing such issues may signal higher risk for suicide and may need referral for further screening and treatment. Suicide among pregnant and postpartum women is a potentially preventable cause of death, and additional research is needed to understand how interventions addressing the risk factors identified here could improve outcomes among this population.

Acknowledgments

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Table 1

Demographics (n=2083)

Demographics	Not Pregnant or Postpartum n=1970 (95%)	Pregnant n=48(2%)	Postpartum n=65 (3%)	p-value
Race - White - Non-white - Unknown	1735 (88%) 226 (11%) 9 (<1%)	38 (79%) 10 (21%) 0	55 (85%) 10 (15%) 0	p=0.266
Ethnicity [*] - Non-Hispanic - Hispanic - Unknown	1874 (95%) 87 (4%) 9 (<1%)	43 (90%) 5 (10%) 0	53 (82%) 6 (9%) 6 (9%)	p<0.0005
Education [*] - Less than high school - High school or higher - Missing	335 (17%) 1196 (61%) 439 (22%)	5 (10%) 20 (42%) 23 (48%)	8 (12%) 31 (48%) 26 (40%)	p<0.0005
Marital Status - Married - Not married - Unknown	718 (36%) 1243 (63%) 9 (<1%)	18 (38%) 30 (63%) 0	26 (40%) 39 (60%) 0	p=0.933
Mean age	40 (+/−11)	31 (+/−11)	32 (+/−11)	F<0.00005

[*] p<0.05. Percentages may not equal 100% due to rounding. Race compressed into 3 categories due to small cell size.

Table 2

Mental health variables and intimate partner problems among pregnancy- and non-pregnancy-associated suicides. (n=2083)

Variables	Unadjusted Odds Ratios	Adjusted Odds Ratios
Current depressed mood[†] - Non-pregnancy associated - Pregnant - Postpartum	1 0.81 (CI:0.45–1.45, p=0.482) **1.94 (CI:1.16–3.24, p=0.011)**[*]	1 0.88 (CI:0.47–1.65, p=0.693) **2.13 (CI:1.21–3.73, p=0.009)**[*]
Mental Health Diagnosis[†] - Non-pregnancy associated - Pregnant - Postpartum	1 0.71 (CI:0.40–1.26, p=0.247) 0.96 (CI:0.59–1.58, p=0.878)	1 0.84 (CI:0.45–1.57, p=0.586) 0.83 (CI:0.48–1.43, p=0.500)
Crisis in Last 2 Weeks[‡] - Non-pregnancy associated - Pregnant - Postpartum	1 **2.257 (CI:1.25–4.04, p=0.007)**[*] 1.64 (CI:0.96–2.78, p=0.069)	1 1.59 (CI:0.84–3.01,p=0.155) 1.04 (CI:0.58–1.87,p=0.895)
Problem with intimate partner[†] - Non-pregnancy associated - Pregnant - Postpartum	1 **3.31 (CI:1.86–5.90, p<0.0005)**[*] **2.72 (CI:1.65–4.47, p<0.0005)**[*]	1 **2.57 (CI:1.38–4.79, p=0.003)**[*] **1.82 (CI:1.06–3.14, p=0.031)**[*]
Problem with non-intimate partner[‡] - Non-pregnancy associated - Pregnant[*] - Postpartum[*]	1 **2.65 (CI:1.38–5.08, p=0.003)**[*] 0.60 (CI:0.237–1.50, p=0.270)	1 **2.63 (CI:1.33–5.21, p=0.005)**[*] 0.46 (CI:0.18–1.19, p=0.110)

[*] p<0.05

[†] Controls for demographics (race, age, educational status, and marital status), mental health (presence of mental health disorder or current depressed mood), known substance or alcohol abuse history, prior suicide attempt, intimate partner problems, and presence of any of 10 other precipitating circumstances.

[‡] Controls for demographics (race, age, educational status, and marital status), mental health (presence of mental health disorder or current depressed mood), known substance or alcohol abuse history, prior suicide attempt, and intimate partner problems.

Table 3

Suicide methods among pregnancy- and non-pregnancy-associated suicides (n=2083)

Method	Not Pregnant or Postpartum	Pregnant	Postpartum
Poisoning (overdose)	852 (43%)	14 (29%)	16 (25%)
Firearms	536 (27%)	15 (31%)	16 (25%)
Asphyxia (hanging)	423 (21%)	17 (35%)	30 (46%)
Blunt trauma[*]	---	---	---
Other/unknown	11 (1%)	0	0

[*] Blunt trauma numbers suppressed due to small cell size.