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Exploring posttraumatic stress disorder symptom profile among pregnant women

Julia S. Seng[a], **Sheila A.M. Rauch**[b,c], **Heidi Resnick**[d], **Caroline D. Reed**[a], **Anthony King**[c], **Lisa Kane Low**[e], **Melnee McPherson**[a], **Maria Muzik**[c], **James Abelson**[c], and **Israel Liberzon**[c]

[a]University of Michigan, Institute for Research on Women and Gender

[b]VA Ann Arbor Healthcare System, Research Service

[c]University of Michigan Medical School, Department of Psychiatry

[d]Medical University of South Carolina

[e]University of Michigan, School of Nursing

Abstract

Posttraumatic stress disorder (PTSD) is more prevalent in perinatal than general samples of women (6–8% versus 4–5%). To explore potential causes, we examined the symptom profiles of women belonging to two separate samples: a perinatal clinic sample (n = 1,581) and a subsample of women in a similar age range from the U. S. National Women's Study (n = 2,000). Within the perinatal sample, risk ratios were higher for all 17 PTSD symptoms among women with current PTSD compared with unaffected women, suggesting that higher rates are not likely due to measurement error. The younger age and greater social disadvantage in the perinatal clinic sample contributed only a small proportion of variance in symptom levels compared with extent of trauma exposure and pre-existing PTSD. Compared with the national study sample's symptom profile, the perinatal sample had higher rates of occurrence of five symptoms: detachment, loss of interest, anger and irritability, trouble sleeping, and nightmares. This analysis confirms that PTSD rates are higher in perinatal samples, which is likely due to exacerbation of pre-existing PTSD among women of a younger age and greater social disadvantage. Further elucidation is warranted, including identifying triggers and determining if there are needs for pregnancy-specific interventions.

Keywords

posttraumatic stress; trauma exposure; PTSD symptom profile; pregnancy; prevalence

Introduction

With one exception to date, reports of point prevalence of posttraumatic stress disorder (PTSD) in samples of pregnant women are higher than the 4–5% range found among women in representative national samples [1–4] (see Table 1). Despite fairly consistent findings of higher prenatal PTSD prevalence, little research has examined reasons for increased PTSD symptomatology among pregnant women. The purpose of this paper is to theoretically and empirically explore the question of increased prenatal PTSD prevalence.

Correspondence concerning this article should be addressed to Julia Seng, Ph.D., C.N.M., F.A.A.N., Institute for Research on Women and Gender, University of Michigan, G120 Lane Hall, 204 S. State Street, Ann Arbor, MI 48109-1290; phone: 734-647-4291; fax: 734-647-4279; jseng@umich.edu.

Theoretical considerations based on literature

Literature review suggests three potential causes of increased PTSD symptomatology in pregnancy: 1) psychological and physiological aspects of pregnancy could trigger PTSD, 2) normal psychosomatic phenomena of pregnancy could be reported as psychiatric symptoms, and 3) samples may differ with respect to demographic characteristics associated with increased risk for PTSD.

Psychological aspects of pregnancy may increase vulnerability to active PTSD. This may be particularly true when PTSD is the result of childhood sexual trauma or intrafamilial abuse,[5–8] previous pregnancy loss,[9, 10] or prior traumatic birth [11] or when pregnancy is a result of sexual assault.[12] Inherent physical aspects of pregnancy such as increased breast sensitivity and fetal movement are potentially triggering.[6] So are inherent psychological processes, such as preparing for motherhood and feeling attachment to the fetus.[13]. Routine aspects of prenatal care, including vaginal and breast examinations, can be triggers, especially for sexual trauma survivors. Labor itself, especially medicalized labor can exacerbate a sense of powerlessness and vulnerability, which can trigger PTSD symptoms.[5] Limited prospective evidence is available; however, investigations conducted postpartum have correlated pre-existing PTSD with experiencing birth as a traumatic event and have identified potential triggers: pain, feelings of powerlessness, negative interactions with health care providers, unmet expectations for labor, and medical interventions.[14]

Physical changes of pregnancy, especially cardiovascular, respiratory, gastrointestinal, and renal system alterations, also could affect the experience of PTSD symptoms.[15] Increased heart and respiratory rates, shortness of breath, and nausea all occur during pregnancy. These somatic changes might resemble physical sensations associated with anxiety. Since somatic, emotional, and cognitive processes interact, it is possible that women, especially those pregnant for the first time, could misattribute these physical sensations to PTSD hyperarousal and activate the interactive cycle of aroused hypervigilence, reexperiencing, and numbing.

Neuroendocrine changes are pervasive during pregnancy and could also impact PTSD expression. Pregnancy is associated with alterations in the hypothalamic-pituitary-ovarian (HPO) axis, particularly increases in plasma concentrations of progesterone and estrogen, which can modulate mood and cognition. Pregnancy also is associated with changes in the hypothalamic-pituitary-adrenal (HPA) axis, including increases in plasma adrenocorticotropic hormone and cortisol, and a large increase in plasma corticotropin-releasing hormone, especially in the third trimester (from placental secretion).[15] In addition to being a stress hormone, cortisol appears to affect memory, salience, social cognition, negative mood,[16] alertness, and sleep.[17] It is possible that the altered hormonal milieu of both HPA and HPO axes in pregnancy could affect the expression of PTSD symptoms by increasing frequency and emotional intensity of traumatic memories, which in turn affect mood, motivation, social cognition, sleep, and concentration.

Pregnancy factors also could influence reporting of PTSD symptoms on research instruments, leading to measurement error. Historically, this was found to be the case with perinatal depression. Commonly used depression screening tools such as the Beck Depression Inventory [27] and the Hospital Anxiety and Depression scale [28] lacked validity in pregnancy and lead to over-diagnosis as pregnant women often reported somatic experiences (e.g., fatigue) that could mistakenly be scored as indicators of perinatal depression. These concerns have been addressed by the development of perinatal-specific depression measures, validated for use in pregnancy.[12] Adaptations made to these instruments include elimination of misleading or inappropriate items such as questions about weight change, body image change, somatic preoccupation, and work difficulty, and emphasis on more prototypical

depression symptoms such as agitation, irritability and anxious preoccupation. Theoretically, PTSD measures could potentially share the same vulnerability as depression measured did for over-diagnosing disorder. However this seems less likely with PTSD than with depression. PTSD diagnostic measures usually reference the symptoms as related to a traumatic event, which would seem to decrease the likelihood of pregnant women misunderstanding the intent of the questions.

Finally, women who are pregnant may differ from the general population in ways that increase likelihood that they will have PTSD. They are usually younger. The median age in the US (not differentiated by gender) was 36.4 years in the 2000 census.[18] Whereas the median age of US first time mothers was 24.6 in 2000. This varies by race, with non-Hispanic white women 3.6 years older than non-Hispanic black women (25.9 years versus 22.3 years).[19] Therefore, for African Americans the interval between trauma exposure, which peaks in the 16–20 year age range,[20] and pregnancy is shorter, providing less recovery time. African Americans are slightly more likely to be included in pregnant populations (15% of live US births in 2000 versus 13% of the overall US population) [21] and they are more likely to be included in public clinic settings (e.g., 19.6% of clients in Women, Infant, and Children (WIC) nutrition program offices).[22] The studies of PTSD prevalence in pregnant women to date often have used public sector prenatal clinics or maternal support program settings for recruitment, often in large cities. Young age, urban residence, poverty, African American race, and low educational attainment are previously identified predictors of both trauma exposure and PTSD.[3, 23] Thus, it could be that young age and sociodemographic disadvantage are more reasonable explanations for higher PTSD rates in perinatal samples than any aspect of pregnancy itself.

Given these theoretical reasons to expect higher symptom reporting and the generally consistent findings of higher point prevalence across perinatal samples, exploration of symptom profiles and sources of variance explained are warranted. To begin this process of exploration, we examined PTSD symptom profiles using data from two large samples of women, assessed with the same PTSD measure (the PTSD Module from the National Women's Study).

Methods

This paper presents a secondary analysis of cross-sectional data from two samples: 1,581 pregnant women from a perinatal study, known as the STACY Project, and 2,000 women in a similar age range from the National Women's Study (NWS). We explored four research questions.

1. Within the perinatal study sample, to what extent are pregnant women who meet diagnostic criteria more likely to endorse each symptom than those who are not affected by PTSD in pregnancy? Are there any symptoms where the relative risk does not differ to a statistically significant extent, suggesting that women—PTSD affected or not—report this symptom when they are pregnant?
2. Within the perinatal study sample, what assessments would have value for finding current PTSD cases?
3. What is the point prevalence rate in the perinatal sample compared with the point prevalence rate in the NWS? How do the conditional risks for current PTSD diagnosis compare across the two samples given the same trauma exposure (completed rape)?
4. Comparing the two samples, which of the 17 PTSD symptoms are most likely to be driving the increased point prevalence found in the perinatal sample? Are they the

same symptoms with the highest disparity in reporting between affected and non-affected women within the perinatal study sample?

Description of the two studies and PTSD measure

The STACY Project is a prospective, nested case-cohort study of the effects of PTSD on childbearing outcomes (R01 NR008767, Psychobiology of PTSD & Adverse Outcomes of Childbearing). Approval for this study was granted by the Institutional Review Boards of the three health systems where the obstetric patient participants were recruited. The clinics are located in the Midwestern United States, one in a university town and two serving an urban area. Details of recruitment and survey procedures are published elsewhere [24] and summarized here.

Eligible women (n=3,148) were at least 18 years old, expecting a first infant, at less than 28 weeks' gestation upon entry to the study, and able to speak English. Women initiating prenatal care were invited to participate by obstetric nurses who conducted the obstetric intake health history interviews. Interested eligible women (*n*=2,689) provided contact information. Of these, the survey research organization reached 2,048. Of these, 1,581 were confirmed to be eligible, gave informed consent, and completed the standardized telephone interview, which included demographic information, a trauma history, and psychiatric diagnostic measures. Although this is a longitudinal study, all data in this analysis are from the initial interview, which took place prior to 28 weeks gestation.

The National Women's Study (NWS) provides data to address the comparative research questions. The NWS was conducted to determine the prevalence of PTSD in a representative sample of U.S. women, with an emphasis on determining rates of PTSD in relation to crime victimization.[1] That study, approved by the Institutional Review Board of the Medical University of South Carolina, conducted standardized telephone interviews using a random digit dialing process to obtain a representative sample. The study included an over-sampling of 2,000 women, targeting a young adult age range (18–34 years).

Research on the NWS PTSD module[1] has provided support for concurrent validity, internal consistency, and temporal stability.[1, 25–28] The NWS PTSD module was also validated in the Diagnostic and Statistical Manual IV (DSM IV) PTSD Field Trial against a well-established structured diagnostic interview administered by trained mental health professionals [29], where the inter-rater kappa coefficient was 0.85 for the diagnosis of PTSD.[27]

The STACY Project implemented the NWS PTSD module without modification except that all participants were assessed for lifetime and current PTSD, whether or not they disclosed a trauma exposure, whereas the NWS only assessed PTSD among trauma-exposed women. The different research purposes of the two studies dictated use of different trauma history measures. The NWS collected information about a range of trauma exposures, but data collection focused on obtaining in-depth information related to crime victimization. The STACY Project used the Life Stressor Checklist, [30] a tool developed for use with women that asks about a list of experiences which have the potential to be traumatic. Queries about completed rape were conducted with the same wording in both studies. Demographic characteristics were assessed with similar survey items in both studies.

Analysis plan

The analysis for research question #1 used only the data within the perinatal study and had two parts. We used the chi-square test to compare rates of symptom endorsement (Yes, No) by PTSD diagnostic status (PTSD+, PTSD-) to determine risk ratios as well as relative risk ratios and bivariate odds ratios for each of the 17 PTSD symptoms. Given the large sample

size and large number of statistical tests (for each of the 17 symptoms), a conservative *p* value of less than .003 was required for interpreting differences as statistically significant based on a Bonferroni correction ($p < .05 /17$ tests). We then repeated the analysis using logistic regressions to determine odds ratios adjusted for cumulative sociodemographic risk factors, sum of reported types of trauma exposures, and whether she met diagnostic criteria for past (lifetime) PTSD.

The analysis for research question #2 also used perinatal study data only. It involved cross-validation of a predictive case-finding (screening) model on a randomly selected "training" set of half the sample. We used a logistic regression to determine the relative proportion of variance in current PTSD diagnosis accounted for by a parsimonious number of factors which a clinician could assess at intake to maternity care. We then forced those coefficients into a version of the model equation to run on the "test" set. From this set we then created a cross-tabulation of the real PTSD diagnosed cases and the model-predicted PTSD cases and calculated sensitivities and specificities in order to determine likelihood ratios. We repeated this process, fitting coefficients from the test set model back onto data in the training set. The factors in the models were cumulative sociodemographic risk factors for PTSD; history of childhood abuse, history of prior traumatic medical procedure, abortion/miscarriage, or life-threatening illness; and the symptom from each PTSD cluster most likely to reported by pregnant women and not likely to be a symptom of pregnancy: DSM-IV symptoms B1 (unwanted memories), C5 (feelings of detachment), and D2 (anger/irritability) based on the findings from research question #1.

For question #3 we used data from both studies. We examined rates of completed rape within each sample. We then conducted a chi-square test and a t-test to determine if the risk for PTSD differed between the two samples when the trauma exposure of completed rape was queried in the same way across studies. Because the NWS only assessed PTSD symptoms in women who reported a traumatic event ($n = 1,379$), for this research question, we excluded from the analysis the 101 women in the STACY project who reported no traumatic events (n=1,480).

For research question #4 we compared symptom profiles across the two studies to determine which symptoms most likely were driving the higher point prevalence in the perinatal sample. We also considered if these were the same symptoms reported by PTSD-affected and non-affected women within the perinatal study. Again, for this research question, we completed the analysis on only the trauma-exposed subsets for which PTSD symptom data are available in both studies.

Results

Perinatal study analyses

The first sets of results are from analyses conducted *within the perinatal study sample*. Table 2 presents demographic, trauma history, and psychiatric diagnostic status descriptions for all 1,581 STACY participants, with bivariate comparisons of those who meet current PTSD diagnostic criteria (7.9%, n=125) and those who do not. PTSD-negative women are more likely to have no demographic risk factors for PTSD (45.4% have the mode of 0). They have a mean of 4.3 trauma exposures, a 13.3% rate of having had PTSD in the past, and a 10.3% rate of current depression. Women with PTSD were more likely to have multiple demographic risk factors (33.6% have the mode of 4). They had a mean of 9.1 trauma exposures, and more than three times the rate of meeting diagnostic criteria for depression (35.2%). All of these differences were significant at $p < .001$.

For Research Question #1 we considered whether the likelihood of PTSD-diagnosed pregnant women reporting a symptom was significantly greater for all 17 symptoms or whether some reporting rates differed (Table 3). Relative risk that pregnant women with current PTSD will report symptoms is greater across the board. Relative risk ratios vary from 17.7 (avoiding people, places, and activities) to 3.3 (amnesia). When cumulative demographic disadvantage and cumulative trauma exposure are taken into account in a logistic regression model for each symptom, the adjusted odds ratio for reporting the symptom was always increased if the woman had PTSD in the past. The higher likelihood conveyed by past PTSD ranged from 10-fold increased likelihood (detachment, unwanted memories) to a low of 3-fold increased likelihood (amnesia, exaggerated startle, hypervigilence, trouble sleeping). Table 3 depicts the symptoms in rank order, beginning with those mostly likely to be reported by women with a history of PTSD. Intrusive re-experiencing and avoidance and numbing symptoms are most prevalent. The first hyperarousal symptom, anger and irritability, appears in the 8th position.

For Research Question #2 we considered the independent contributions to a screening model of characteristics associated with predicting current PTSD diagnostic status in a previous analysis.[24] Since PTSD is underdiagnosed, and it is unlikely that many pregnant women in prenatal settings will know if they have ever had PTSD, we included in the model factors that could be gleaned by very brief screening using two trauma history questions and three PTSD symptom questions. Thus, the model covariates were cumulative sociodemographic risk factors for PTSD; history of childhood abuse, history of prior traumatic medical procedure, abortion/miscarriage, or life-threatening illness; and the symptom from each PTSD cluster most likely to be reported by pregnant women and not likely to be a symptom of pregnancy: DSM-IV symptoms B1 (unwanted memories), C5 (feelings of detachment), and D2 (anger/irritability). The choice of symptoms to use as screening items was based on the findings from research question #1. We entered the sociodemographic risk index into the model, even though it is not an independently significant predictor because, in a preliminary step-wise model estimated on the entire sample, it accounted for 9% of variance prior to addition of trauma history and symptom profile predictors, and thus may have a role to play as an adjusting factor. We did not include disclosure of current (adult) abuse in the screening model because it was not an independently significant predictor when child abuse and medical trauma were included. These 6 factors account for 67.2% of variance in the training sample and in the testing sample account for 62.9% of variance in risk for meeting PTSD diagnostic criteria early in first pregnancy, based on Nagelkirke's R squared. The symptom questions are the strongest predictors of the diagnosis. Respective training and test odds ratios all were significant with 6.9 and 3.3 for anger/irritability, 10.8 and 6.0 for unwanted memories, and 11.3 and 28.6 for detachment. Only the 28.6 odds ratio for detachment is outside the 95% confidence interval derived when the model is applied to the full sample (n=1,581). Childhood abuse or neglect history and traumatic medical or reproductive experiences contribute additional, but smaller, predictive value to the screening model (e.g., odds ratios from 1.6 to 4.4). As Tables 4 A and B illustrate, these factors function as predictors with similar efficiency in both of the cross-validation samples, with positive likelihood ratios of 24.4 29 and negative likelihood ratios of .47 and .52.

Across study comparative analyses

The analyses for Research Questions #3 and #4 involved comparison between the trauma-exposed sub-samples of women in the perinatal (STACY, n=1,480) and general (NWS, n=1,397) studies (comparative demographic characteristics found in Table 5). The higher trauma rate in STACY (93.6% versus 68.9% in the NWS) is consistent with use of a trauma history questionnaire that asked about a large number (29) of common, but potentially traumatic events (i.e., death of a loved one). To keep our analyses parallel, the rest of the

results section reports analyses conducted on only the subsets of women who reported a trauma exposure.

Research Question #3 required comparing point prevalence rates for PTSD across studies and considering relative risk for PTSD given the same trauma exposure. The point prevalence of PTSD in STACY's entire sample was 7.9% (125 of 1,581 total) and the point prevalence among the trauma-exposed women was 8.4% (125 of 1,480 trauma-exposed). It is important to note that no STACY participant became PTSD-negative because she did not meet the trauma exposure criteria. Thus, although the procedure was different, there was no effect on PTSD assessment. The point prevalence was 3.1% in the total NWS sample (62 out of 2,000), and 4.4% (61 out of 1,397) in the NWS trauma-exposed subsample. The mean number of past-month symptoms of trauma-exposed STACY participants currently meeting full diagnostic criteria was 10.2 (SD = 2.5), compared to a mean of 1.7 symptoms (SD = 2.2) among those not currently meeting diagnostic criteria ($t = -36.4$; $df = 1, 141.5$; $p<.001$, equal variances not assumed). The mean number of past-month symptoms of trauma-exposed NWS participants in this young adult oversampled group was 9.69 (SD = 2.59) among those currently meeting diagnostic criteria and 1.3 (SD = 1.87) among those not currently meeting diagnostic criteria ($t = -25.17$; $df = 1, 63.98$; $p<.001$, equal variances not assumed).

The only traumatic event queried with the same wording in both studies was adult sexual assault. As a preliminary exploration, we calculated relative risk for meeting current PTSD diagnostic criteria given the trauma exposure of completed rape (Table 6). Rates of PTSD among those who reported the trauma exposure of completed rape were 31.2% in the trauma-exposed STACY subsample and 7.5% in the trauma-exposed NWS subsample. The odds ratio for having PTSD after rape in STACY was 4.9 compared with other trauma-exposed women in STACY and 2.3 in the NWS. This represents a 3.4 relative risk ratio for current PTSD among rape survivors in STACY compared to those in the NWS. This difference in conditional risk for PTSD given the same trauma exposure suggests that there are differences in the samples themselves—whether due to demographics, to greater extent of trauma exposure and past PTSD, to pregnancy physiology, or to pregnancy-related triggers—that must be considered since the measures on these items were the same.

Finally, to address Research Question #4, the rates of reporting the 17 symptoms in both studies are depicted in Table 7. No symptoms are reported at statistically significantly lower rates in the perinatal sample after correction for multiple tests. Six symptoms were reported at statistically significantly higher rates. These six symptoms are distributed across all three symptom clusters. They include three arousal symptoms (problems sleeping, anger or irritability, trouble concentrating), two numbing symptoms (loss of interest, detachment), and one re-experiencing symptom (repeated nightmares). The mean number of symptoms in the avoidance/numbing and hyperarousal symptom clusters was higher. The higher mean number in the re-experiencing cluster did not reach statistical significance after correction for multiple tests ($p = .008$). The overall mean number of symptoms was higher in the perinatal study, with a mean of 2.4 versus 1.7 symptoms overall.

Returning to Table 2, where symptom reporting by PTSD-diagnosed and not diagnosed pregnant women was compared, we see that the six symptoms pregnant women report more than a general sample of women are distributed broadly down the rank-ordered list. Detachment is the symptom most strongly associated with past PTSD, after controlling for demographics and trauma history. The other symptoms (loss of interest, anger and irritability, trouble concentrating, and repeated nightmares) are in the middle of the ranking, with trouble sleeping last, indicating it is least strongly associated with past PTSD. Nevertheless, even this somatic symptom with the weakest association with past PTSD

(adjusted OR = 3.2) has a 4.3-fold relative risk of being reported by a woman with current PTSD compared to one who is not affected during pregnancy.

Discussion

Conclusions

The analyses conducted within the perinatal study sample indicate that past PTSD is more strongly predictive (96% of the explained variance) of higher symptom reporting than either demographic or trauma history factors (4.3% of the explained variance). Examination of the adjusted odds ratios of past PTSD with current symptom reporting shows that its influence ranges from a very strong odds ratio (adjusted OR=10.3) for reporting detachment, to an important, but less striking odds ratio (adjusted OR=3.2) for reporting trouble sleeping. Cross validation of a parsimonious screening model indicated that gathering information about past child abuse or neglect, the three most highly reported PTSD symptoms in pregnancy (one from each cluster in the diagnostic criteria), and prior traumatic medical experiences provides excellent specificity and reasonable sensitivity for deciding which women in maternity care should be further assessed with diagnostic tools. The determination of positive likelihood ratios of 24.4 and 29 supports the use of this screening approach. Positive responses on these items allow a provider to conclude the woman is at a largely increased risk for PTSD.[x]

The across-study analysis found that the perinatal sample reported several PTSD symptoms across all three clusters at higher rates: detachment, loss of interest, anger and irritability, trouble concentrating, repeated nightmares, and trouble sleeping. The comparative analysis also found higher conditional risk in the perinatal sample of PTSD in relation to the trauma exposure of completed rape, suggesting that additional characteristics of the perinatal sample, such as demographic profile, other trauma history elements, rate of lifetime PTSD, pregnancy physiology, or pregnancy-specific triggers all could affect symptom reporting and current diagnosis rates.

The apparent specificity to PTSD of symptom reporting, and the higher rate of PTSD diagnosis in the perinatal sample suggests exacerbation of PTSD symptomatology in the context of pregnancy. The finding of consistently high point prevalence in our study (7.9%) and across others, [31–33] with use of varied PTSD instruments, further supports the conclusion that existing measures likely are validly finding exacerbation of pre-existing PTSD during pregnancy. However, these data cannot entirely dismiss the alternative hypothesis, that PTSD-affected women report pregnancy-specific phenomena as psychiatric symptoms, pointing toward the need for additional research.

Strengths and limitations

Strengths of this analysis are apparent. The PTSD symptom measure used was the same in both studies, and validation research indicated it is highly specific to PTSD, [27] and our assessment of sensitivity and specificity affirms this. The large samples of trauma-exposed women provided adequate power to determine that the increased symptoms in the perinatal study sample did not occur by chance. Application of the Bonferroni correction for multiple tests set a very stringent level ($p<.003$) for concluding that symptom rates differed. With these strengths, results of this comparative study provide solid direction to guide future studies.

The analyses conducted in this study were also hampered by limitations. First, these are *post hoc* analyses conducted on data that are informative but are not designed to link each reported symptom to trauma exposure, nor to explain *why* rates of PTSD would be higher in pregnancy. Second, we did not model the effects of pregnancy directly by combining data

sets. Pregnancy status of the NWS sample was not queried, nor were pregnant women excluded. Therefore, we estimate that approximately 5% of that sample may have been pregnant, because approximately 5% of the female population of childbearing age is pregnant at any one time.[34] Presence of 5% pregnant women in the NWS sample would introduce error in a conservative direction by slightly decreasing differences between the two studies' samples. Finally, 15 years separate the diagnostic interviews conducted for the two projects. History theoretically could account for increased symptom reporting.[35] In this interim, awareness of PTSD likely has increased, and increased reporting might follow increased awareness. Although this flaw cannot be dismissed from consideration, it is worth noting that some of the hallmark PTSD symptoms (e.g., flashbacks, psychological distress and physical reactivity at reminders of the trauma) did not occur at higher rates in the later study's sample, as would be expected if greater awareness were sensitizing reporting.

Research Implications

Studies are needed which include and identify pregnant and non-pregnant women so that differences in PTSD risk can be studied directly and demographic differences controlled for within adjusted models. Studies that include multiparous women likely should include prior traumatic birth and loss of a child as additional predictors. Using the predictive model presented here, a pregnancy-specific screening tool could be tested for psychometric performance and made available for clinical use.

Immediate clinical implications

Based on these exploratory analyses, we recommend that existing PTSD self-report symptom checklists with established reliability and validity, commonly used in health care settings, are appropriate to use in maternity care settings. Higher prevalence of PTSD in pregnant women suggests that perinatal settings may be a key location for delivering PTSD services within the health system. This study confirms higher levels of symptomatology manifesting in pregnancy, primarily among women already affected by PTSD. Clinicians can screen for PTSD in pregnancy by assessing two history factors (childhood abuse and traumatic medical experiences) and three PTSD symptoms (feeling detached from others, unwanted memories of the trauma, and anger or irritability) with 65% to 75% specificity and go on to use a full 17-item measure to assess diagnostic status. Women with detachment and anger symptoms may be especially at risk for bonding and parenting difficulties. Interventions that target pregnancy-specific traumatic stress reactions may decrease the psychological and social impact of trauma on the mother. It may also moderate the biological impact of traumatic stress on the maternal-fetal dyad by adding supports to balance the allostatic load of PTSD and comorbidities.[36]

The extensive comorbidity of major depression with PTSD (in 35.2% of PTSD cases versus 10.3% of non-PTSD cases, OR = 4.7, $p < .001$) suggests that programs implemented in recent years to address perinatal depression could be treating many women who have undiagnosed PTSD. Modifying the content of such programs to include intervention for PTSD and other trauma-spectrum disorders (e.g., dissociation, somatization, and interpersonal sensitivity) could obviate the need for new programs and potentially improve the impact of existing approaches.

Although the past decade has seen increased attention to birth as an index trauma resulting in significant incidence of postpartum PTSD, much less research has focused on the phenomenon of PTSD in the prenatal period from pre-pregnancy trauma exposures. This analysis suggests that several PTSD symptoms are reported at higher rates by pregnant women. Since even partial or subsyndromal posttraumatic stress has been associated with adverse health outcomes generally,[37] it is very important to address exacerbation of PTSD

both for its own sake and for the ways it may contribute to adverse perinatal and early parenting outcomes.

Current Knowledge on This Subject

- PTSD is more prevalent among pregnant women than in the general population of women.
- PTSD is often chronic or recurring, and it has been associated with physical morbidity across the lifespan.
- PTSD also has been associated with intergenerational transmission and so seems important to address prior to or during the childbearing year.

What this Study Adds

- This study confirms higher PTSD prevalence in a diverse sample of U.S. women in prenatal care.
- Analysis of symptom profiles suggests that higher diagnostic rates are not due to loss of specificity in measurement.
- The two symptoms pregnant women with PTSD report most frequently are detachment and anger/irritability, which may have implications for bonding and parenting.
- Screening using two history factors (childhood abuse and traumatic medical experiences) and three PTSD symptoms (detachment, unwanted memories, and anger/irritability) could find cases among pregnant women with a positive likelihood ratio greater than 24.

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J Psychosom Obstet Gynaecol. Author manuscript; available in PMC 2011 June 27.

Table 1

Summary of studies that measured prenatal PTSD point prevalence

Reference [5–11]	Location	Sample Profile	Recruitment	Trauma history	Trauma type, rate	PTSD measure	Incidence
Ayers, 2001; To determine if women develop PTSD from a traumatic birth	Antenatal clinics in London, UK	n=289 Mean age 30 36 wks 6 wks pp 6 months pp	English-speaking, 16 to 36 wks, planning normal labor	Specific traumatic history not elicited with MMPI	Prenatal, not described	In pregnancy- MMPI-2-PTSD; Postpartum- PTSD Symptom Scale	Current PTSD: 8.1%
Loveland Cook, 2004; To estimate prevalence of PTSD in economically disadvantaged pregnant women	Rural Missouri and St. Louis, USA	n=744 Mean age 22 Any gestation Diverse	English speaking, Medicaid-eligible women from WIC	Diagnostic Interview Schedule	diverse trauma exposure	Diagnostic Interview Schedule	Current PTSD: 7.7%
Morland, 2007; To look at relationship between PTSD and perinatal health	Hospital OB clinic & OB offices in Oahu, USA	n=101 Mean age 27 First trimester Diverse	Women between ages 18–35 seeking prenatal care	Traumatic Life Events Questionnaire	60% had an abuse history; majority of exposures were violence	PTSD Checklist- Civilian Version	Current PTSD: 16%
Rodriguez, 2008; To describe factors related to PTSD and depression in women with or without partner violence	Non-profit Prenatal clinics in Los Angeles, USA	n=210 Mean age 28 >= 12 wks All Latinas	Adult, self-identified Latinas	Abuse Assessment Screen, Trauma History Q're, ACE Study Q're	44% had history of intimate partner abuse; Other diverse trauma exposure	PTSD Checklist, Civilian Version	Current PTSD: 11.4%
Smith MV, 2006; To look at symptoms of PTSD in sample of low-income pregnant women	3 federally funded OB clinics in New Haven, USA	n=948 Mean 26 wks Diverse	English, Spanish speaking women in prenatal care	11-question event list from CIDI	Lifetime exposure to trauma: 29.3%- diverse trauma exposure	PTSD module from MINI	Current PTSD: 3.5%
Ferri, 2007; To look at effects of violence & depression on neonatal outcomes	Hospital in São Paulo, Brazil	n=930 Recruited 4–48 hrs after delivery	Consecutive teen (age 11–19) admitted for OB care	Californian Perinatal Assessment	21.8% ; violence was only assessed trauma	CIDI 2.1 version	Current PTSD: 9.8%
Mezey, 2005; To look at association between violence and trauma and PTSD symptoms	Maternity Services in London, UK	n=200 Mean age 31 47% antenatal 53% postnatal Diverse	English-speaking, age >= 16, postnatal & antenatal wards	Abuse Assessment Screen	60.5% with at least one traumatic event; violence was only assessed trauma	Posttraumatic Diagnostic Scale	Current PTSD: 6.5%

Table 2

Demographic, trauma history, and PTSD characteristics within the STACY sample by diagnostic status.

	STACY sample n=1,581			
	PTSD negative	**PTSD positive**	**Test statistic**	***p***
	n=1,456	**n=125**		
	92.1%	**7.9%**		
Cumulative sociodemographic risk factors for PTSD*			$X^2 = 72.8$, df = 5	<.001
0	45.4	8.8		
1	10.5	8.8		
2	8.1	15.2		
3	11.2	20.0		
4	17.0	33.6		
5	7.8	13.6		
Mean number of disadvantages (SD)	1.7 (1.8)	3.0 (1.5)	t = −9.5, df = 158.1,	<.001
Mean number of trauma exposures reported (out of 29 queried)	4.3 (3.2)	9.1 (4.4)	t = −11.8, df = 1, 135.0	<.001
Mean number of PTSD symptoms (SD)	1.6 (2.1)	10.2 (2.5)	t = −36.9, df =1, 139.7	<.001
Proportion with prior PTSD diagnosis	13.3	100% by definition		
Proportion with depression diagnosis	10.3	35.2	$X^2 = 66.2$, df = 1 OR = 4.7, RR = 3.4	<.001

*Demographic risk factors for PTSD: young age, African American race, poverty, low education, living in a high crime area.

Table 3

Rank ordering of PTSD symptom reported by non-affected versus PTSD-diagnosed pregnant women in the perinatal study, showing relative risk ratio and logistic regression odds ratios for the adjusted independent associations of disadvantage, trauma, and prior PTSD with reporting each symptom.*

Symptom	PTSD negative n=1,456 %	PTSD positive n=125 %	RR	OR for SES	OR for Trauma **	OR for Prior PTSD	Nagl R2	Rank ***
C5 Detachment****	7.5	80.8	10.8	1.6	1.1	10.3	.371	1
B1 Unwanted memories	8.9	76.8	8.6	1.6	1.1	10.1	.375	2
C6 Numbing	4.0	52.8	13.3	1.6	1.1	7.7	.302	3
C2 Avoid activities, people, places	2.5	44.0	17.7	1.4	1.1	7.6	.305	4
B4 Psychological distress	3.6	48.0	13.2	1.3	1.1	7.0	.281	5
C7 Foreshortened future	6.9	52.8	7.7	1.1	1.1	6.6	.203	6
C4 Loss of interest	8.5	71.2	8.3	1.5	1.1	6.3	.297	7
D2 Anger and irritability	20.8	86.4	4.2	1.6	1.1	5.3	.349	8
C1 Avoid thoughts or feelings	10.4	84.8	8.1	1.5	1.2	5.2	.374	9
B5 Physical reactivity	8.0	67.2	8.4	1.2	1.1	5.0	.260	10
D3 Trouble concentrating	9.0	60.0	6.7	1.3	1.1	4.5	.197	11
B3 Flashbacks	4.1	30.4	7.5	1.4	1.1	3.9	.189	12
B2 Nightmares	6.9	47.2	6.8	1.3	1.1	3.9	.205	13
C3 Amnesia	11.6	37.6	3.3	0.8	1.2	3.4	.207	14
D5 Exaggerated startle	6.5	44.8	6.9	1.5	1.1	3.3	.219	15
D4 Hypervigilence	5.8	51.2	8.9	1.6	1.2	3.2	.284	16
D1 Trouble sleeping	16.5	70.4	4.3	1.2	1.1	3.2	.174	17

* Logistic regressions adjusted for prior PTSD diagnosis, cumulative number of trauma exposures, and cumulative sociodemographic disadvantage.

** Cumulative trauma exposure p is between .004 and .040 (but not significant after Bonferroni correction) for B1, B3, C4, C5, C6, C7, and D3, and the p value for cumulative SES stress is .013 for C7. All other relationships on this table are significant at $p < .001$.

*** Rank is assigned by PTSD OR in logistic regression model, with ties broken by ranking the symptom with higher relative risk for PTSD higher.

**** Highlighted symptoms are those reported by the perinatal sample statistically significantly more frequently than by the national sample (see Table 7).

Table 4

A and B: Cross-validation of predictive (i.e., screening) model.

Prediction matrix when regression equation using training model coefficients was applied to test set:

		Actual PTSD diagnosis		
		0	1	Sensitivity = 28 / 28 + 24 = 28 / 52 = 53.8% Specificity = 715 / 715 + 16 = 715 / 731 = 97.8% Positive Likelihood ratio = 0.538 / (1–0.978) = 24.45 Negative Likelihood ratio = (1 – 0.538) / 0.978 = 0.47
n=783 Predicted PTSD Diagnosis	0	715 (91.3%)	24 (3.1%)	
	1	16 (2.0%)	28 (3.6%)	

Prediction matrix when regression equation using testing model coefficients is applied to training set:

		Actual PTSD diagnosis		
		0	1	Sensitivity = 36 / 36 + 37 = 36 / 73 =49.3% Specificity = 710 / 710 + 12 = 710 / 722 = 98.3% Positive Likelihood ratio = 0.493 / (1–0.983) = 29 Negative Likelihood ratio = (1 – 0.493) / 0.983 = 0.52
n=795 Predicted PTSD Diagnosis	0	710 (89.3%)	37 (4.7%)	
	1	12 (1.5%)	36 (4.5%)	

Table 5

Comparison of demographic characteristics measured with similar items across both studies.

Proportions in each category	STACY	NWS	Test statistic	*p*
	n=1,480	n=1,397		
	%	%		
Age groups			$X^2 = 95.4$, df = 2	<.001
<20	15.8	7.4		
20–30	60.0	54.1		
>30	24.2	38.5		
Education*			$X^2 = 211.2$, df = 3	<.001
Less than high school	6.8	11.6		
High school	40.9	38.7		
At least some college	29.5	44.1		
At least some graduate school	22.5	5.3		
Employment*			$X^2 = 46.5$, df = 3	<.001.
Working outside the home	59.8	64.7		
Not working outside the home	25.7	24.0		
Student (full or part time)	17.6	9.2		
Disabled/pregnancy-related leave	2.3	0.4		
Partnered	59.1	61.5	$X^2 = 1.7$, df = 1	.999
Racial identity*			$X^2 = 559.5$, df = 4	<.001
African American	46.5	10.2		
European American	45.8	84.7		
Latina	4.3	7.7		
Asian	5.9	1.6		
Others^	5.0	3.3		
Resident of central city	47.6	22.1	$X^2 = 403.4$, df = 1	<.001

*Categories do not always total 100% due to multiple responses or declining the question.

^Others include Native Hawaiians, Pacific Islanders, Alaska Natives, and Native Americans.

†Chi-square tests calculated via http://faculty.vassar.edu/lowry/newcs.html, accessed 10/23/2008

Table 6

Conditional risk for current PTSD compared across the two study samples of trauma-exposed women.

	STACY n=1,480	**NWS n=1,397**	**Test statistics***
Rate of completed rape	10.4% (n=154)	24.8% (n=347)	X2 = 103.1, df = 1, p <.001
Proportion with PTSD	32.1% (n=39)	7.5% (n=26)	X2 = 23.0, df = 1, p <.001
Odds ratio (95% CI) of PTSD risk	4.9 (3.2, 7.5)	2.3 (1.4, 3.4)	Relative risk ratio is 3.4
Mean # symptoms reported (SD)	4.7 (4.4)	2.6 (3.1)	t = 14.7, df = 2875, p <.001

* T-tests and chi-square tests conducted via http://faculty.vassar.edu/lowry/newcs.html and http://www.graphpad.com/quickcalcs/ttest1.cfm?Format=SD, accessed 10/23/2008

Table 7

Comparison of current PTSD symptoms reported in the two studies by trauma-exposed women

DSM-IV symptom	Description	STACY, *n*=1,480	NWS, *n*=1,397	χ^2 or t*	*p*
B Cluster		%	%		
B1	Unwanted memories	15.1	16.2	0.59	.442
B2	Nightmares	10.7	6.3	17.05	<.001
B3	Flashbacks	6.5	5.3	1.83	.999
B4	Psychological distress	7.6	5.5	4.62	.032
B5	Physical reactivity	4.3	4.5	0.02	.888
B total, *M (SD)*	--	0.5 (1.0)	0.4 (0.9)	t=2.81	.005
C Cluster		%	%		
C1	Avoid thought/feel	17.3	18.3	0.45	.502
C2	Avoid activity, etc.	6.1	6.8	0.50	.480
C3	Amnesia	14.5	18.0	6.01	.014
C4	Loss of interest	14.3	6.7	42.83	<.001
C5	Detachment	14.1	8.6	21.17	<.001
C6	Numbing	8.4	7.2	1.16	.282
C7	Foreshortened future	11.1	8.1	7.06	.008
C total, *M (SD)*	--	0.9 (1.4)	0.7 (1.2)	t=4.10	<.001
D Cluster		%	%		
D1	Trouble sleeping	22.0	15.1	22.24	<.001
D2	Anger and irritability	27.4	16.5	49.58	<.001
D3	Trouble concentrating	13.7	9.8	10.17	.001
D4	Hypervigilence	9.9	7.9	3.24	.072
D5	Exaggerated startle	10.1	7.7	4.85	.028
D total, *M (SD)*	--	0.8 (1.2)	0.6 (1.0)	t=4.84	<.001
Total, *M (SD)*	--	2.4 (3.2)	1.7 (2.6)	t=6.42	<.001

*Chi-square test is with Yates correction for continuity. Degrees of freedom for t-tests = 2,875.

†T-tests and chi-square tests conducted via http://faculty.vassar.edu/lowry/newcs.html and http://www.graphpad.com/quickcalcs/ttest1.cfm?Format=SD, accessed 10/23/08

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