

# Gestational and Postnatal Cortisol Profiles of Women With Posttraumatic Stress Disorder and the Dissociative Subtype

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## ABSTRACT

**Objective:** To test the hypothesis that women with posttraumatic stress disorder (PTSD) have greater salivary cortisol levels across the diurnal curve and throughout gestation, birth, and the postpartum period than women who do not have PTSD.

**Design:** Prospective, longitudinal, biobehavioral cohort study.

**Setting:** Prenatal clinics at academic health centers in the Midwest region of the United States.

**Participants:** Women expecting their first infants who fit with one of four cohorts: a nonexposed control group, a trauma-exposed control group, a group with PTSD, and a group with the dissociative subtype of PTSD.

**Methods:** In the first half of pregnancy, 395 women provided three salivary cortisol specimens on a single day for diurnal data. A subsample of 111 women provided three salivary cortisol specimens per day, 12 times, from early pregnancy to 6 weeks postpartum for longitudinal data. Trauma history, PTSD, and dissociative symptoms were measured via standardized telephone diagnostic interviews with the use of validated epidemiologic measures. Generalized estimating equations were used to determine group differences.

**Results:** Generalized estimating equations were used to show that women with the dissociative subtype of PTSD had the highest and flattest gestational cortisol level curves. The difference was greatest in early pregnancy, when participants in the dissociative subtype group had cortisol levels 8 times greater in the afternoon and 10 times greater at bedtime than those in the nonexposed control group.

**Conclusion:** Women with the dissociative subtype of PTSD, a complex form associated with a history of childhood maltreatment, may have toxic levels of cortisol that contribute to intergenerational patterns of adverse health outcomes.

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Perinatal outcomes are indicative of the health of a society's population (Allen, 2008; Risnes et al., 2011). Maternal psychosocial stress has been implicated as one of five pathways to the adverse perinatal outcome of premature birth (Green et al., 2005). It is also associated with lower birth weight (Shannon, King, & Kennedy, 2007) and is a risk factor in the fetus for early lifespan morbidity and mortality (Reynolds, Labad, Buss, Ghaemmaghami, & Raikonen, 2013). Biological mediators of social determinants of health, including psychosocial stressors, are a priority focus for research to redress preterm birth (Lackritz et al., 2013).

Posttraumatic stress disorder (PTSD) is a severe form of psychological stress that affects 8% of pregnant women (Seng et al., 2010). However, PTSD has only recently been studied in relation to perinatal outcomes. Recent studies in large prenatal clinic samples showed significant associations of PTSD with preterm birth or shorter gestation, especially in current as opposed to lifetime remitted PTSD, PTSD with depression (Seng, Low, Sperlich, Ronis, & Liberzon, 2011; Shaw et al., 2014; Yonkers et al., 2014), and PTSD that is subsequent to childhood maltreatment (Seng et al., 2011) or military sexual trauma (Shaw et al., 2014).

**Posttraumatic stress disorder is associated with adverse perinatal outcomes. Elevated cortisol is a plausible mechanism for adverse outcomes and may affect maternal prenatal physiology.**

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With the release of the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013)*, a diagnosis of PTSD may include a dissociative subtype characterized by altered perception of the environment in the form of derealization or depersonalization. In an epidemiologic analysis of 25,000 adults across 26 nations, 14.4% of those with PTSD fit the dissociative subtype classification (Stein et al., 2013). Dissociation has been associated with more severe PTSD that is diagnosed earlier in the lifespan and is associated with a greater number of lifetime trauma exposures, including history of childhood maltreatment or cumulative adverse childhood experiences (Liotti, 2004; Shonkoff et al., 2012; Stein et al., 2013). Thus, dissociation is an important indicator of severity and chronicity. It also may be a more proximal predictor of shorter gestation than the previously identified risk factor of childhood maltreatment (Seng et al., 2011).

Researchers of the specific physiology of the dissociative subtype of PTSD showed a phenotype that appears to have different patterns of emotion dysregulation (Lanius et al., 2010). Although this is not an analysis of the DSM-5 dissociative subtype per se, researchers in one recent study distinguished a phenotype in women with PTSD and early-life trauma that was characterized by dissociative symptomatology and blunted cortisol reactivity (Zaba et al., 2015). Another group of researchers studied cortisol in women with PTSD and childhood sexual abuse and found blunted cortisol reactivity and greater basal levels (Schalinski, Elbert, Steudte-Schmiedgen, & Kirschbaum, 2015). An earlier study team distinguished a dissociative disorder phenotype from PTSD that was based on elevated basal cortisol levels and blunted reactivity (Simeon et al., 2007). Together, evidence from these studies indicates that exposure to the early relational trauma that predisposes a person to dissociation and PTSD may affect that individual's short- and long-term cortisol patterns.

Because in utero elevations in hypothalamic-pituitary-adrenal (HPA) axis hormones are

associated with adverse perinatal outcomes (Green et al., 2005), slower infant mental development (Davis & Sandman, 2010), and adverse consequences to lifespan health (Reynolds, 2013), cortisol is an important biomarker for perinatal and developmental research. Data about the effects of PTSD on the HPA axis in pregnant women are very limited. In a recent study on cortisol levels in women at 21 and 34 weeks gestation that was focused on depression but entered trauma history and PTSD as covariates, researchers found no evidence to indicate an effect of PTSD after depression was taken into account (O'Connor et al., 2014). One recent study of gestational cortisol levels in women's hair showed effects of childhood abuse in one analysis (Schreier, Enlow, Ritz, Gennings, & Wright, 2015) and cumulative trauma in another (Schreier et al., 2016). Depression and PTSD were covariates used to adjust the model in the latter analysis, but the researchers did not report the relative effects. The dissociative subtype of PTSD, a new diagnosis in 2013 (American Psychiatric Association, 2013), requires investigation in perinatal research.

Our objective was to contribute to the literature on perinatal psychosocial stress by describing cortisol levels across the diurnal curve for 1 day in the first half of pregnancy and across the longitudinal gestational curve, including time points during pregnancy, birth, and the postnatal period, in women with PTSD, including a subset with the dissociative subtype. We examined four cohorts: a nonexposed control group, a resilient trauma-exposed control group, a group with PTSD (PTSD-only), and a group with the dissociative subtype of PTSD (PTSD-D). Our hypotheses were that (a) women with PTSD have greater diurnal levels of cortisol and (b) these greater levels of cortisol persist across gestation and the postnatal period. We further hypothesized that women with the dissociative subtype would have the greatest levels of diurnal and gestational cortisol.

## Methods

### Design and Setting

This prospective, ecological study of diurnal and gestational salivary cortisol profiles was a biobehavioral component of a larger clinical cohort study of the effect of PTSD on childbearing outcomes in a community sample of women in prenatal care. The parent study is the Stress, Trauma, Anxiety, and the Childbearing Year

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