# Effects of Military Deployment on Pregnancy Outcomes

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**Citation**

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**Abstract**

OBJECTIVE:
To determine if deployment of a spouse to a combat zone during pregnancy increases the risk for preterm delivery, obstetrical complications, or postpartum depression.

STUDY DESIGN:
An anonymous survey was administered to patients presenting for routine appointments at the OB/GYN clinics at Womack Army Medical Center, located in Fort Bragg, North Carolina. The survey asked patients to answer questions regarding their first pregnancy. Pregnancy outcomes from women whose spouses were deployed during their first pregnancy (deployed group) were compared to women whose spouses were not deployed during their first pregnancy (non-deployed group).

RESULTS:
A total of 308 surveys were completed and used for analysis. More than a two-fold increased risk for preterm delivery was detected in the spouse deployed group compared to the non-deployed group (8.9% versus 21.4%). The risk of postpartum depression was more than doubled between the two groups (9.0% vs. 16.4%). No other statistically significant obstetrical outcomes were detected.

CONCLUSION:
Military deployment of a spouse may be associated with a higher incidence of preterm delivery and postpartum depression. Further research is needed to confirm these findings and to develop measures to mitigate these risk factors.

## INTRODUCTION

During the past 10 years more than 2 000 000 members of the United States military have been deployed to Iraq and Afghanistan (1). Many have served multiple tours with upwards of 15 months at a time in a combat zone.There has been a significant focus on the effects of combat deployments on the physical and mental health of American service members.Nevertheless, only limited data are available on their family members, frequently called the “overlooked causalities of war.” (2). During this stressful period, military families are frequently stationed at military installations removed from the social support of friends and family. A weekly phone call or email may be the only correspondence soldiers have with their family during a combat deployment.

Pregnancy rates among women married to Active Duty members dramatically increases before military deployment (3). Pregnant women with a deployed spouse have reported higher stress levels than their peers whose spouses were present during their pregnancy (4). Elevated levels of stress and anxiety during pregnancy have both been shown to independently increase the risk for spontaneous preterm birth (5, 6). Increased stress may also increase the risk for low birth weight and preeclampsia (6, 7). Current theories postulate that increased levels of catecholamines during the stressed state results in vasoconstriction of the uteroplacental unit that can deprive the fetus of oxygen and caloric input (6). Pregnant women whose spouses are deployed have increased levels of stress which may place them at risk for certain obstetrical complications.Nevertheless, there are few published reports regarding pregnancy outcomes and military deployment.

Fort Bragg is home to over 55 000 Active Duty soldiers consisting of members of the 82$^{nd}$ Airborne Division, 18$^{th}$ Airborne Corps, and the Special Operations Command. Womack Army Medical Center is located on Fort Bragg

with the Department of Obstetrics/Gynecology providing care exclusively to Active Duty soldiers and their dependents.There are on average 3000 live births per year at our facility.These factors make Fort Bragg an ideal location to investigate the effects of military deployment on pregnancy outcomes.

The purpose of this study was to determine if spouse deployment during pregnancy has any effects on pregnancy outcomes.More importantly, we undertook this project to determine if there were any differences in the rate of preterm delivery between the deployed group versus non-deployed group as previous studies have identified that stress during pregnancy is associated with higher risk for preterm delivery.

## MATERIAL AND METHODS

Data for this study are based on a 15 question survey administered in the fall of 2012.The questionnaire included an introduction explaining the purpose of the survey and informing respondents that participation was voluntary and anonymous.Variables included patient demographics, spouse deployment status, gestational age at delivery, pregnancy outcomes, stress/anxiety levels during pregnancy, and history of antenatal or postpartum depression.Patients were also asked to comment if they had a previous history of cold knife cone or loop electrosurgical excision procedure, and whether there was a history of multifetal gestation during their first pregnancy to identify risk factors for preterm delivery (8). Nursing staff screened all patients who presented for a routine appointment.Patients meeting the inclusion criteria were provided the questionnaire and asked to complete the survey within the waiting room prior to their scheduled appointment.

Inclusion criteria included women who had been pregnant at least once in the past 10 years and had a spouse that had been either present during the patient's entire first pregnancy or was deployed to Iraq or Afghanistan.Women were excluded if they had participated in CenteringPregnancy during their first pregnancy versus traditional obstetric care as there is evidence that CenteringPregnancy may reduce preterm delivery (9, 10). Patients younger than 18 or older than 35 years of age during their first pregnancy were also excluded (8).

Chi-squared test was used to determine differences in baseline characteristics. Paired *t* tests were used to compare characteristics with deployment status. Statistical analyses were conducted using IBM SPSS Statistics version 18 (IBM Corporation, Armonk, NY). All values were analyzed using frequency distributions with calculations of means and standard deviations and range.Statistical significance was established at a *P* value less than or equal to 0.05.This study was approved by the Womack Army Medical Center Institutional Review Board.

## RESULTS

Three-hundred and seventy-eight surveys were given to patients to complete with 346 surveys being returned (91.5%).Of the 346 surveys, 308 (89.2%) were completely filled out by the patient.There were a total of 168 (54.5%) patients who spouses were not deployed to either Iraq of Afghanistan during their first pregnancy (non-deployed group) and a total of 140 (45.5%) patients who had a spouse deployed during their first pregnancy (deployed group).Among the deployed group, 43 patients had a spouse deployed less than half of their pregnancy, 50 patients had a spouse deployed for more than half of their pregnancy, and 47 patients had a spouse deployed during the entire pregnancy.

Demographic results are summarized in Table 1.There were no statistically significant differences in the demographics between the two groups.Recognized risk factors for preterm delivery between the two groups were similar: multiple gestations (non-deployed 4, 2.4%; deployed 5, 3.6%), loop electrosurgical excision procedure and cold knife cone (non-deployed 16, 9.5%; deployed 18, 12.9%), and history of alcohol, tobacco, or substance abuse (non-deployed 23, 13.7%; deployed 11, 7.8%).

**Table 1**

Demographics of Deployed and Non-Deployed Groups

| Characteristic | Non-Deployed Group (n = 168) | Deployed Group (n = 140) | *P* |
|---|---|---|---|
| Age, Mean y (Range) | 22.7 (18-34) | 24.6 (18-35) | 0.008 |
| Ethnicity | | | 0.195 |
| American Indian | 0 (0.0%) | 5 (3.6%) | |
| Asian | 4 (2.4%) | 3 (2.1%) | |
| Black/African American | 30 (17.9%) | 19 (13.6%) | |
| Hispanic/Latina | 13 (7.7%) | 14 (10.0%) | |
| White | 111 (66.1%) | 91 (65.0%) | |
| Other | 10 (6.0%) | 8 (5.7%) | |
| Prior Medical History | | | 0.308 |
| Hypertension | 0 (0.0%) | 2 (1.4%) | |
| Asthma | 4 (2.4%) | 3 (2.1%) | |
| Diabetes Mellitus | 1 (0.6%) | 3 (2.1%) | |
| Autoimmune Disease | 1 (0.6%) | 1 (0.7%) | |
| Hypothyroid | 2 (1.2%) | 0 (0.0%) | |
| Depression | 1 (0.6%) | 0 (0.0%) | |
| Multiple Gestation | 4 (2.4%) | 5 (3.6%) | 0.537 |
| LEEP/CKC | 16 (9.5%) | 18 (12.9%) | 0.353 |
| Substance Abuse | | | 0.256 |
| Alcohol | 4 (2.4%) | 2 (1.4%) | |
| Alcohol/Tobacco | 3 (1.8%) | 0 (0.0%) | |
| Drugs | 0 (0.0%) | 0 (0.0%) | |
| Tobacco | 16 (9.5%) | 9 (6.4%) | |

The rate of preterm delivery between the non-deployed cohort and the deployed group was found to be 8.9% (15) and 21.4% (30) respectively.Although preterm delivery was more than double between the two groups, 100.0% of women in the non-deployed group indicated that they had a live baby versus 99.2% in the deployed group; there was one patient in the deployed group who identified an intrauterine fetal demise at 35 0/7 weeks.The rates of postterm delivery (non-deployed 30, 17.9%; deployed 24, 17.1%) were comparable between the two groups. The majority of women had full-term pregnancies (non-deployed 100, 59.5%; deployed 74, 52.9%). Nineteen (11.3%) women had miscarriages in the non-deployed and 12 (8.6%) in the deployed cohort; Four (2.4%) women in the non-deployed cohort had an elective abortion.

Only 27 (16.0%) women in the non-deployed and 29 (20.7%) in the deployed reported that they had pregnancy complications during their first pregnancy; gestational diabetes and pre-eclampsia accounted for 90% of complications.No statistically significant differences in obstetrical complications were found between the two groups ($P = 0.301$).

Women were also asked to comment on their anxiety and stress levels during their first pregnancy. Fifty-four (38.5%) women in the deployed group indicated that their stress level during pregnancy was moderate to severe compared to 34 (20.3%) in the non-deployed group.Moreover, 20.3% of women in the non-deployed group indicated that their anxiety level was moderate to severe versus the 35.7% of women in the deployed group (Table 2).

**Table 2**

Patient's Anxiety and Stress Levels during their First Pregnancy

| | Anxiety Level* | | | Stress Level† | | |
|---|---|---|---|---|---|---|
| | None | Mild | Moderate to Severe | None | Mild | Moderate to Severe |
| Non-Deployed Group (n = 168) | 73 (43.5%) | 61 (36.3%) | 34 (20.3%) | 54 (32.1%) | 67 (39.9%) | 47 (28.0%) |
| Deployed Group (n = 140) | 44(31.4%) | 42 (30.0%) | 54 (38.5%) | 31 (22.1%) | 54(38.6%) | 55 (39.3%) |

*$P = 0.005$
†$P = 0.117$

The deployment of a spouse during pregnancy appears to have a significant effect on depression both antenatal and postpartum.The rate of antenatal depression was nearly doubled between the two groups 3 (2.1%) in the non-deployed group versus 6 (4.7%) in the deployed group ($P = 0.227$). More importantly, the rates of postpartum depression were 13 (9.0%) in the non-deployed group versus 21 (16.4%) in the deployed group ($P = 0.047$).

Patients who had a spouse deployed during their first pregnancy were asked to comment on whether they believed that their obstetric provider felt concerned about the patient's social situation during her prenatal care. Only 46 (32.9%) women indicated on the survey that they believed as though their obstetric provider spent time during their prenatal care addressing the patient's social situation.

## DISCUSSION

This study suggests that military deployment of a spouse may be associated with an almost three-fold increased risk for preterm delivery.Preterm delivery is the second leading cause of neonatal mortality in the United States. Despite the advances in obstetrics over the past twenty years, the incidence of preterm delivery in the United States increased from 9.4% in 1981 to 11.8% in 1999 (8). Infants born preterm are at higher risk for central nervous system disorders, chronic respiratory problems, infections, developmental impairments, cardiovascular disorders, and cognitive dysfunction (11). There are multiple risk factors for preterm birth including socioeconomic status, race, age, previous preterm birth, and multiple gestations; we tried to control for these confounders by only examining patients' first pregnancy and by demonstrating that there were no statistically significant differences between the two groups with regards to preterm delivery risk factors.Psychosocial issues such as depression and stress can also contribute to preterm birth.Regarding the former, our study suggests that the risk of postpartum depression is nearly doubled if a

patient's spouse is deployed during pregnancy (9.0% versus 16.4%), which is consistent with previously report studies (12).

Hobel et al. reported that maternal stress may be the central mechanism responsible for initiating events that contribute to preterm labor (13, 14). Increased prenatal stress or depression can disrupt the hypothalamic-pituitary-axis that leads to the release of stress hormones such as cortisol and catecholamines (15). These hormones are believed to directly affect uterine activity and uterine blood flow that can lead to placental hypoperfusion and subsequent restriction of oxygen to the fetus that leads to fetal growth restriction and could also precipitate preterm birth (13, 14, 15, 16). Higher levels of stress may also lead to altered maternal nutrition, which has the potential to affect birth weight and gestational age at delivery (17). Our study suggests stress levels are nearly doubled between the two groups which is consistent with data that has been previously published looking at stress in spouses of deployed servicemen (18). Furthermore, depression during pregnancy increases the risk for preterm delivery, low birth weight, and intrauterine growth restriction (6, 15, 19, 20, 21). One hypothesis is depression causes a compromised immune system function leading to reproductive tract infections that may trigger preterm birth (22, 23).

Our study is the first to identify military deployment of a spouse during pregnancy as a possible risk for preterm delivery.Moreover, no statically significant differences were found between either the demographics of the two groups or risk factors for preterm delivery.The identification of risk factors is essential when interventions are possible and when implemented may improve outcomes.Multiple studies have identified that psychosocial stressors have tangible negative effects upon pregnancy.Health care providers serving military populations need to be aware of the social aspect of their patients and the effects they may have on pregnancy outcomes.This study demonstrated 51.4% of patients whose spouses were deployed reported their obstetric provider did not address their social situation during their prenatal care whereas only 32.9% of patients indicated they thought their obstetric provider felt concerned regarding their social situation.

Once providers recognize at risk patients, one possible intervention for our military population as well as underserved populations is CenteringPregnancy.Data suggests CenteringPregnancy may reduce preterm delivery with a risk reduction of 33% in comparison to traditional obstetric care (10). Group care provides more time between patient and provider, and may especially benefit patients who have poor social support as this model allows women to be a part of a group that offers help with stress and coping.Another recommendation would be to educate providers regarding resources within the community to refer patients who may have limited social support.

The conclusion drawn from this study is limited due to the inherent limitations of a survey as a data collection instrument including recall bias.We are currently enrolling patients into a retrospective cohort study to confirm the findings in this study; nevertheless, we believe these findings are important to raise awareness that spouse deployment may be associated with preterm delivery and may serve as an impetus for further research.The American Congress of Obstetricians and Gynecologists acknowledges more research is needed on the effects of military deployment on pregnancy outcomes (24). In view of the continuing military operations in Afghanistan as well as other areas of conflict, it is imperative to address the effects of deployment on pregnancy.Providers taking care of this special population should be aware of the specific physiologic and social factors affecting pregnancy including military deployment of spouses that they can provide the appropriate resources for their patients.Moreover, providers taking care of any obstetric population need to be cognizant of the effects of social stressors and take appropriate means to address them so we can take action against a treatable risk factor of preterm delivery.

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### References

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