Relationship Between Prenatal Anxiety and Perinatal Outcome in Nulliparous Women: A Prospective Study

Sundri G. Bhagwanani, MD, PhD, Kathleen Seagraves, PhD, Leroy J. Dierker, MD, and Marianne Lax, MSSA

Cleveland, Ohio

Nulliparous women with singleton gestation were assessed prospectively for anxiety levels with the State-Trait Anxiety Inventory, which measured state (situational and transitional) and trait (dispositional and stable) anxiety, with high scores indicating high anxiety. Bivariate and multivariate methods were used for data analysis.

Anxiety assessments (n=239) were obtained in 88 women at different stages of gestation. Mean anxiety scores were lowest at 22 to 26 weeks. A woman's successive scores were highly correlated. The trait anxiety (A-T) scores were higher for married women. A positive correlation was present between anxiety scores and gestational age at delivery. Low A-T scores correlated with low birthweight, preterm delivery, and chorioamnionitis. High state anxiety (A-S) levels correlated with the presence of meconium in the amniotic fluid and neonatal congenital abnormalities. Postdate delivery also was associated with higher although statistically insignificant anxiety scores. Women who presented to the labor and delivery room for various complaints had higher A-S and A-T levels. Maternal anxiety level was associated with adverse perinatal outcome; specifically, prematurity and low birthweight correlated with low A-T levels. (*J Natl Med Assoc.* 1997;89:93-98.)

Key words: pregnancy ◆ anxiety ◆ perinatal outcome

High maternal anxiety and emotional distress have been related to longer duration of labor,[1] obstetric complications,[2] and lower Apgar scores.[1,3] Several studies, however, have failed to confirm these associations[4-9]; some have even reported higher birthweight[10] and higher maternal weight gain.[5] Retrospective design as well as conceptual and methodological weaknesses of the earlier studies have been emphasized in the past.[3,11-13] Specifically, diverse occurrences such as abnormal gestation (prematurity and postmaturity), abnormal duration of labor (prolonged as well as precipitate labor), cervical dysplasia, nuchal cord, bruised fetal nose, malpresentation, marginal placenta, episiotomy, and breast abscess were grouped together as complications. Moreover, the majority of these studies failed to adequately control for pertinent demographic and preexisting medical risk factors. Among the recent studies, Lobel et al[14] reported a correlation between a complex latent stress model and low birthweight as well as preterm delivery. Wadhwa et al,[13] using a large number of parameters, observed a relationship between preterm delivery and pregnancy-specific anxiety. No association between anxiety and obstetric complications including preterm delivery was observed in other large studies.[15,16] Thus, the evidence linking high anxiety to adverse perinatal out-

From the Departments of Obstetrics and Gynecology and Psychiatry, MetroHealth Medical Center, Affiliate of Case Western Reserve University, Cleveland, Ohio. Requests for reprints should be addressed to Dr Sundri G. Bhagwanani, 1401 Blair Mill Rd, Silver Spring, MD 20910.

Table 1. Demographic Characteristics (N=88)

Characteristic	%
Mean age (years)	20.9*
Race	
White	64.6
African American	27.4
Hispanic	8.0
Education	
<12 years	54.5
≥12 years	45.5
Marital status	
Married	23.9
Single	76.1
Insurance	
Medicaid	46.8
None	48.9
Other	4.3
Smoking	44.3
Elective abortions (≤2)	20.5

*Range:18 to 33 years.

come is conflicting and tenuous.

The objective of this study was to prospectively determine anxiety levels in normal pregnant women and to examine its relationship with perinatal outcome as well as assess its potential value in prenatal care.

MATERIALS AND METHODS

Nulliparous, English-speaking women, 18 to 34 years of age and between 8 and 28 weeks of gestation were approached for participation in the study. Exclusion criteria included history of one spontaneous or ≥three elective abortions, current substance abuse, medical or psychiatric disorders, genital tract anomaly, or multiple pregnancy. All subjects attended the prenatal clinic at MetroHealth Medical center, a county hospital affiliated with Case Western Reserve University, Cleveland, Ohio, and signed an informed consent form.

Demographic information regarding age, ethnic background, marital status, education, employment, type of health insurance, and smoking history was collected for all study subjects. Spielberger's State-Trait Anxiety Inventory[17] was used to assess anxiety levels. This is a simple and rapid self-rate questionnaire containing 40 items rated on a 4-point scale designed to measure the A-S (situational and transient) and the A-T (dispositional and stable) levels. To increase the validity of the data,[14] we attempted to assess the anxiety levels three to four times during pregnancy. The assessment was made at recruitment in the study (8 to 28 weeks) and then repeated after minimum intervals of 6 weeks. Anxiety scores for each participant during pregnancy were averaged for correlation with perinatal outcome. Mean values of the scores of women with various complications were compared with those of the remainder.

In-person psychiatric evaluation was carried out once during pregnancy to rule out psychopathology according to the criteria set forth in the *Diagnostic and Statistical Manual* (*DSM-111R*) published by the American Psychiatric Association. The interview was conducted by two of the authors (S.K. and L.M.) who were unaware of the anxiety scores and consisted of both structured format and open-ended questions followed by the rater-assessed Brief Psychiatric Rating Scale.[18]

Perinatal outcome variables included anemia (hematocrit ≤30), urinary tract infection, hypertension inclusive of pregnancy-induced hypertension, gestational diabetes, premature rupture of membranes, chorioamnionitis, presence of moderate to thick meconium in the amniotic fluid, fetal distress necessitating cesarean delivery, gestational age at delivery, preterm delivery, postdate delivery (≥42 weeks), postpartum fever (excluding cases with antecedent chorioamnionitis), birthweight, sex, Apgar scores, and congenital abnormalities. Standard diagnostic criteria were followed.[19] Visit to the labor and delivery room for various complaints that did not result in hospitalization also was considered an outcome variable. The information regarding perinatal outcome was obtained from the medical records without knowledge of anxiety scores. Gestational age was calculated by the best clinical estimate based on last menstrual period, early uterine size, ultrasound examination, and Dubowitz assessment of the newborn.

Birthweight and gestational age were analyzed as continuous as well as dichotomous variables (presence or absence of low birthweight, and of preterm or postdate delivery). The rest of the outcome variables were computed as dichotomous (yes/no). In bivariate analysis, Pearson and Spearman correlations were computed for all continuous and categorical variables, and analysis of variance (ANOVA) or one-way, two-level factorial ANOVA were performed for all categorical variables versus continuous variables. Chi-squared analysis was used for comparing categorical variables. The Mann-Whitney U and Kruskal-Wallis parametric tests were

performed as confirmatory tests. All tests of statistical significance were two-tailed. In multivariate analysis, linear and logistic regressions were performed respectively for the continuous and dichotomous dependent variables. A P value $\leq .05$ was considered significant.

RESULTS

Of 129 women approached, 95 (73.6%) agreed to participate. Two were later excluded–one woman had a positive drug screen and the other suffered from paranoid and suicidal ideation. Of the remaining 93 women, two moved out of town and three transferred their care elsewhere and were lost to follow-up. Thus, perinatal outcome information was available for 88 participants. Thirty-two percent of the subjects were recruited in the first trimester, 61% by 20 weeks, and 39% between 21 and 28 weeks gestation.

Demographic characteristics of the study population are shown in Table 1. Essentially, the majority were single women with low incomes who had not completed high school. A total of 239 anxiety assessments were obtained from 88 women, with ≥ 3 assessments made in 68%. The mean values and standard error of the mean (M±SEM) for the A-S and A-T scores for the group throughout pregnancy were 38.2±0.87 and 40.7±0.89, respectively. Mean A-S and A-T scores were strongly correlated (r=.75; P=.001). The anxiety levels declined during midpregnancy, with the lowest values of 35.6 for A-S and 37.7 for A-T ($P<.05$) being at 22 to 26 weeks (Figure). Because the assessments at these gestation periods were not always obtained from the same women, the data were treated as being cross sectional. Had the data been analyzed with repeated measures ANOVA, a stronger statistical significance would have been achieved.

Anxiety levels did not correlate with age, ethnicity, level of education, type of health insurance, smoking history, and being underweight or overweight ($\leq$105 or $\geq$200 lb). Married women showed higher A-T levels (P=.043). The relationship of anxiety levels with perinatal outcome is shown in Table 2. The anxiety levels and gestational age at delivery as a continuous variable were positively correlated ($P<.05$ for A-T). The mean values for all of the anxiety scores were lower in seven women who had preterm delivery (P=.05 for A-T). These women were not demographically different from the rest of the study participants. The frequency of urinary tract infection was

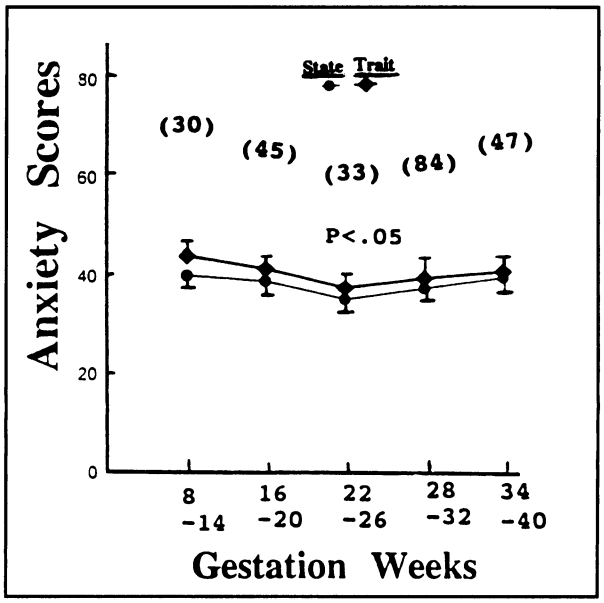

Figure.
Anxiety scores (M±SEM) at different stages of gestation. Numbers in parentheses = number of anxiety assessments. P value indicates significance compared with the group at 8 to 14 weeks in A-T levels.

similar although the incidence of premature rupture of membranes was higher (43% versus 11%). An A-T score of <33 (mean−SD) was obtained in 17 women, and the incidence of preterm delivery in these was 23.5% compared with 4.2% in the remainder of the study group (a 5.6-fold increase) while with an A-S score of <31 (mean−SD), the increase in preterm delivery was threefold. Anxiety scores were higher in eight (9.1%) women who had postdate delivery (41.7 versus 37.9 for A-S and 43.1 versus 40.5 for A-T), but the difference did not reach statistical significance. The A-S score was $\geq$46 (mean+SD) in 17 women, and the incidence of postdate delivery in these was 17.6% compared with 7% in the remainder (a 2.5-fold increase) while with an A-T score of >49 (mean+SD), the increase in postdate delivery was twofold.

Anxiety levels were also positively related to birthweight as a continuous variable ($P<.05$ for both scores). This relationship, however, became insignificant when controlled for gestational age. Five (5.7%) women had low birthweight delivery at 32 to 39 weeks of gestation, and their anxiety levels were lower (P=.057 for A-S and $P<.001$ for A-T). Four of the five women were African American. There were no other demographic or smoking habit differences.

Anxiety levels were lower in seven (7.9%) women

who had chorioamnionitis ($P<.01$ for A-T) and higher in women who had meconium ($P=.05$ for A-S). Six (6.8%) women delivered infants who were diagnosed as having congenital abnormalities. Two had heart defects, one each had a multicystic kidney, cleft palate, club foot, and bilateral hydrocele. All of their anxiety scores were higher ($P=.046$ for A-S). Only the woman whose infant had a renal anomaly was aware of the diagnosis prenatally. A-S scores were also higher, although not significantly so, in women who had hypertension inclusive of pregnancy-induced hypertension (40.3 versus 38.1) or fetal distress requiring cesarean delivery (42 versus 38). No association was observed between the anxiety levels and any other adverse perinatal outcome. Fifty-seven (64.8%) women presented to the labor and delivery room on one or more occasions during pregnancy for various complaints. When analyzed as a dichotomous variable (yes/no), the labor and delivery room visit was positively correlated with both anxiety scores ($P=.001$ for A-S and $P=.01$ for A-T). This group was not demographically different from 31 women with low anxiety scores (34.4 versus 40.3 for A-S and 37.8 versus 42.4 for A-T) who never presented to the labor and delivery room.

The relationship of anxiety level in each trimester with the perinatal outcome was examined. Anxiety was assessed in 28 women in the first trimester. Four of the six women with neonatal congenital abnormalities were in this group, and their mean A-S scores were higher ($P=.04$). The numbers were too small for any other correlations. Significant associations observed in the second trimester ($n = 68$) were between low A-T levels and preterm delivery ($P=.013$) as well as low birthweight ($P=.014$). Eighty-two women had anxiety assessments in the third trimester. The relationship of low A-T levels with preterm delivery ($P=.019$) and low birthweight ($P=.052$) still persisted. Additionally, low A-S levels correlated with preterm delivery ($P=.017$) and low birthweight ($P=.004$). As with the average anxiety scores, high A-S levels in the third trimester were associated with the presence of meconium ($P=.018$), fetal distress requiring cesarean delivery (43.2 versus 37.9), and postdate delivery (42.2 versus 37.9).

DISCUSSION

Average A-S and A-T scores throughout pregnancy in our study population were similar to those observed by us (Bhagwanani SG and Jones SA, unpublished data) in nonpregnant, demographically similar African-American women (37.3 for A-S and 39.1 for A-T). The values were somewhat lower than those reported for Hungarian women during pregnancy (38 and 41 versus 40 and 44 for A-S and A-T, respectively).[20] Our observation of a decline in the anxiety level during mid-pregnancy is consistent with that of others.[21] High correlation between the A-S and A-T and between a woman's successive scores through pregnancy seen in our study also has been reported previously.[14] More than one anxiety assessment for the majority of subjects has likely improved the psychometric validity of our data.[14] Married women in our study scored higher in A-T ($P=.043$). Although speculatively logical, this finding is contrary to the general impression that single status is associated with higher anxiety levels.

A positive correlation with gestational age at delivery observed in our study appears, at first, to be inconsistent with the results of previous studies[13,14]; however, a positive correlation of anxiety with birthweight and maternal weight gain has been reported.[5,10] The data, though, were not controlled for gestational age. We also observed positive correlation with birthweight ($P<.05$ for A-S and A-T) and maternal weight gain ($P=.042$ for A-T), which became insignificant when controlled for gestational age. Recent studies have reported prolongation of pregnancy with chronic maternal stress in rats.[22,23] A retrospective study did not reveal higher anxiety levels in women who had postterm delivery,[24] although others have noted an association of higher maternal anxiety with an increased number of dysmature babies.[25] It is unlikely that our results were affected by the variable number of anxiety assessments for the subjects in our study since the correlation between a woman's individual and average scores was high ($r=.77$-$.87$ for A-S and $.87$-$.95$ for A-T), and similar relationships were observed between the outcomes and anxiety levels in the second as well as third trimesters.

Gestational age at delivery was negatively correlated with anxiety and stress in two studies.[13,14] The relationship of preterm delivery with the score on a simple five-item (yes/no) pregnancy-specific anxiety scale but not with several more elaborate and widely used measures[13] is an important observation that requires further investigation. Points of concern are that the incidence of preterm delivery in the study (13.2%) was much higher than is usually reported for the educated, white, upper middle class population and the incidence of diabetes was also high (12.5%).

Table 2. Relationship of Anxiety Scores (Mean±SEM) With Perinatal Outcome (N=88)*

Outcome	No. Cases (%)	A-State	A-Trait
Gestational age at delivery (weeks)			
<37	7 (7.9)	35.1±3.3	34.8±2.2†
37 to <41	61 (69.3)	37.8±1.1	41.1±1.1
41 to <42	12 (13.6)	40.1±2.0	40.5±2.6
≥42	8 (9.1)	41.7±1.9	43.1±3.1
Low birthweight	5 (5.7)	31.5±3.1	32.8±0.9‡
Chorioamnionitis	7 (7.9)	38.2±1.7	35.9±1.4§
Meconium	16 (18.2)	41.7±1.9†	43.1±3.1
Congenital abnormalities	6 (6.8)	44.0±1.4†	43.8±2.0
Labor and delivery room visit	57 (64.8)	40.3±1.1‡	42.4±1.1§
Study group	88 (100)	38.2±0.8	40.6±0.9

*P value indicates the significance of the group compared with the remainder.
†$P \leq .05$.
‡$P \leq .001$.
§$P \leq .01$.

No mention was made of other preexisting medical conditions, although the results were controlled for antepartum complications.

Lobel et al[14] used a complex latent stress model incorporating life events stress, perception of stress, and the scores of A-S to assess prenatal stress. The majority of subjects in the study were Hispanic (64%); only 12% were white. Preterm delivery (16.9%) correlated with the medical risk but not with the A-T scores. Notably, they observed that despite a higher than usual number of life events, perceptual and emotional stress was lower, indicating a stimulus-response disparity in their population. The low emotional response could prove to be a critical factor.

Women who presented to the labor and delivery room for various complaints had significantly higher anxiety scores than those who did not (Table 2). Such a visit is not necessarily an adverse outcome since it could lead to the prevention of a complication. Within limits, anxiety serves the function of alerting as well as mobilizing, and its abolition (or inappropriately low levels) could result in the individual lacking the necessary physiological and psychological adaptation to deal effectively with stressful situations such as a loss, task learning, or pregnancy.[26] Low anxiety scores also could be due to low emotional response or arousal (low motivation) or to the denial and repressive coping style. The differentiation may be difficult even with in-person interview although encouraging results recently were reported with the use of the Stress-Arousal Adjective List.[26] Repressive coping style has been associated with an increased number of obstetric complications.[27] Thus, the differentiation may not be necessary for the clinical application.

Evidence points to the emotional specificity with bodily malfunction,[28] and one would not anticipate outcomes representing the opposite ends of a spectrum such as preterm and postdate delivery or prolonged and precipitate labor to be associated with similar emotional response. Low anxiety levels and arousal adversely affect task performance and psychological functioning.[29] The effects on the pathophysiology and health in humans are practically unknown since attention has been focused exclusively on high stress and anxiety. Generalized low autonomic activity and endocrine response could be a significant factor for low resistance to infection, low birthweight, and preterm delivery. Our observation of an association of adverse perinatal outcomes with lower or higher anxiety levels may seem unique but is in accordance with the universality of bodily malfunction associated with the physiochemical and psychological measurements above and below the normal range. Further investigation is needed to confirm these initial observations of emotional specificity with adverse perinatal outcome and of the potential value of assessing anxiety levels during pregnancy.

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