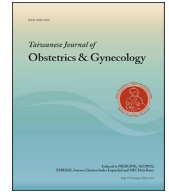




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## Original Article

# The impact of prenatal psychologic and obstetric parameters on *postpartum* depression in late-term pregnancies: A preliminary study



Derya Akdag Cirik <sup>a,\*</sup>, Neslihan Yerebasmaz <sup>a</sup>, Vahap Ozan Kotan <sup>b</sup>,  
Kerime Nazli Salihoglu <sup>a</sup>, Funda Akpınar <sup>a</sup>, Serdar Yalvac <sup>a</sup>, Omer Kandemir <sup>a</sup>

<sup>a</sup> Department of Obstetrics and Gynecology, Etlik Zubeyde Hanım Women's Health Training and Research Hospital, Ankara, Turkey

<sup>b</sup> Department of Psychiatry, Numune Training and Research Hospital, Ankara, Turkey

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## ABSTRACT

**Objective:** To determine the prenatal psychologic (anxiety and depression) and perinatal obstetric (pregnancy and labor complications) predictors of *postpartum* depression (PPD) in late-term pregnancies. **Materials and methods:** A total of 149 women with late-term gestation who were hospitalized for antenatal fetal surveillance were included. All participants were asked to complete Hospital Anxiety and Depression Scale immediately after hospitalization and Edinburgh Postnatal Depression Scale in the *postpartum* period. Demographic, psychologic, and obstetric variables were tested as predictors of PPD by regression analysis.

**Results:** High scores for prenatal anxiety, depression, and PPD were detected in 17.4%, 12.8%, and 23.5% of the participants, respectively. The mode of delivery was not associated with PPD for late-term pregnancies. Women having urgent cesarean, planned cesarean, and vaginal delivery had similar rates of PPD (28.1%, 23.8%, and 21.9%, respectively). In the multivariate analysis, prenatal depression [odds ratio (OR), 9.85; 95% confidence interval (CI), 2.72–35.65], prenatal anxiety (OR, 4.95; 95% CI, 1.59–15.39) and suspicion of fetal distress (OR, 4.44; 95% CI, 1.13–13.64) were found to be independent predictors of PPD. **Conclusion:** For late-term pregnancies, women with prenatal anxiety or depression and had cesarean delivery due to the suspicion of fetal distress were at risk for PPD.

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## Introduction

Although new mothers may have emotional changes such as dysphoria, insomnia, and anxiety, these symptoms are usually resolved within 2 weeks after birth [1]. However, in 10–15% of new mothers, the symptoms resume or even worsen; these women are diagnosed as having *postpartum* depression (PPD). The major reported risk factors for PPD are predominantly sociocultural and psychological. History of depression, marital problems, lack of social support, stressful life events, and low socioeconomic status are the most frequently reported predictors [2–4]. By contrast, little is

known about the impact of antenatal obstetric problems, prenatal mood, and the route of delivery on PPD.

While post-term pregnancies account for nearly 5–10% of all pregnancies and are defined as a pregnancy that has extended beyond 42 0/7 weeks, a new terminology, late-term has started to be used for pregnancy that has reached between 41 0/7 weeks and 41 6/7 weeks of gestation [5,6]. Both late- and post-term pregnancies are associated with increased risk for perinatal morbidity and mortality. Because the risk of stillbirth increases beyond 41 weeks, *antepartum* fetal surveillance and labor induction are usually considered in perinatology clinics when the pregnancy exceed 41 weeks.

In this study, we aimed to investigate the probable psychiatric and obstetric risk factors, such as prenatal anxiety, depression, route of delivery, and perinatal outcome variables for the development PPD in late-term pregnancies.

\* Corresponding author. Department of Obstetrics and Gynecology, Etlik Zubeyde Hanım Women's Health Training and Research Hospital, Yeni Etlik Caddesi Number 55, 06010 Keçioren, Ankara, Turkey.

E-mail address: [deryaakdag@yahoo.com](mailto:deryaakdag@yahoo.com) (D.A. Cirik).

## Materials and methods

This study was conducted in the perinatology clinic of a maternity hospital, serving as a tertiary care center in Ankara, Turkey. Ethical approval was granted by the Local Ethical Committee of the hospital and written informed consent was obtained from every participant. Procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000 and 2008.

According to our clinical protocols, women at 41 weeks of gestation were accepted as “late-term” and hospitalized for fetal surveillance. Women who were hospitalized for late-term pregnancy between June 2013 and January 2014 and gave birth in this hospital were eligible for the study inclusion. Exclusion criteria were: prior cesarean pregnancy; presence of any chronic systemic disease; diagnosed fetal anomaly; history of diagnosed psychiatric disease; and patients who had lactation within the past 2 years.

### Outcome measures

Women hospitalized for late-term pregnancy were given oral information for the trial and invited to participate. For women who accepted to participate, a sociodemographic characteristics form that included questions about sociodemographic data such as age, prepregnancy body mass index, parity, smoking habits, education, employment, and household population. Later, the Hospital Anxiety and Depression Scale (HADS) questionnaire was given. The presence and the severity of anxiety and depression in the participants were assessed using the HADS, which was originally formulated as a 14-item scale for the medically ill population in 1983 [7]. The Turkish language version was validated by Aydemir [8]. The clinical cut-off value was 10 for anxiety and 7 for depression subscale.

We also collected the perinatal outcome variables from the medical records of the patients. The presence of oligohydramnios or polyhydramnios, the use of labor induction, the mode of delivery (normal delivery, planned or urgent cesarean delivery), the birthweight of the baby, and the indications of urgent cesarean delivery.

Following delivery, women were called in for a control visit and were asked to complete the Edinburgh Postnatal Depression Scale (EPDS) for evaluating PPD [9]. Women who did not come to follow-up visits were interviewed to complete the questions of EPDS by telephone call. EPDS is a widely used scale to evaluate PPD in different cultures and the Turkish version was validated by Aydin et al [10], in *postpartum* women. The clinical cut-off value was 13 for PPD.

### Management of late-term pregnancy

According to protocols, women who were hospitalized for late-term pregnancy were assessed with fetal biometry, Doppler measurements of fetal and uteroplacental circulations, and vaginal examination in the perinatology clinic. Women who were determined to have any contraindication for normal labor, such as cephalopelvic disproportion and an estimated birth weight > 4000 g, were referred for planned cesarean delivery. The women who were detected to have an unripened cervix were transferred to the antenatal care unit for labor induction. Women underwent regular vaginal examinations and electronic fetal monitoring during the induction period. An urgent cesarean (unscheduled) was performed in suspicion of fetal distress. Additionally, women with > 6 cm of dilation with ruptured membranes who failed to progress despite 4 hours of adequate uterine activity, or at least 6 hours of oxytocin administration with inadequate uterine activity and no cervical change were also referred for urgent unscheduled cesarean delivery.

## Data analysis

All statistical analysis was performed by using SPSS version 21.0 (SPSS Inc., Armonk, NY, USA). Normally distributed and categorical variables were compared by the Student *t* test and Chi-square test, respectively. The Kruskal–Wallis test was used to compare the parameters and the Mann–Whitney *U* test was performed in order to test the significance using Bonferroni correction to adjust multiple comparisons. While the association between ordinal and/or non-normally distributed variables were investigated, the correlation coefficients and their significance were calculated using the Spearman test. For the multivariate analysis, possible risk factors identified were further entered into the logistic regression analysis to determine the independent predictors of PPD. A 5% type I error was used for the statistical significance.

## Results

Of the 171 women enrolled in the study, 22 were excluded and the remaining 149 women were eligible for final statistical analysis (Fig. 1). The median age of the participants was 25 years, ranging from 18 years to 42 years. Mean prepregnancy body mass index was  $29.6 \pm 4.11$  kg/m<sup>2</sup>, ranging from 19 kg/m<sup>2</sup> to 45 kg/m<sup>2</sup>; 88 women were nulliparous.

Within 2–6 months after delivery, 35 (23.5%) women were found to have PPD as determined by a score of  $\geq 13$  on EPDS. Univariate analysis revealed that seven of 17 variables tested for post-term pregnancies had significant association with PPD. Among sociodemographic variables; low educational status, having three or more children, living in a crowded family (household population  $\geq 5$ ) and smoking were found as the significant predictors of PPD in women with late-term pregnancy (Table 1). When the association between prenatal mood disorders and PPD was analyzed, women who had either prenatal anxiety or depression, detected by using HADS scale, were found to develop higher rates of PPD ( $p < 0.001$ ) in the postnatal period. In the entire cohort, 32 women (21.5%) underwent a planned cesarean delivery. Of the other 117 women, 57 (38.2%) went into spontaneous labor and 60 (51.2%) had labor induction. Of these 117 women, 96 had vaginal delivery but 21 required an urgent unscheduled cesarean delivery. We detected no significant association between the route of delivery (cesarean delivery vs. normal delivery) and PPD in women with post-term pregnancies ( $p = 0.77$ ; Table 2).

In the univariate analysis of perinatal outcome variables, only the women having macrosomic baby (birthweight > 4000 g) were found to develop higher rates of PPD in the postnatal period. The rate of cesarean delivery was also significantly higher in women with a birthweight > 4000 g compared to those with a normal weight baby (65.0% vs. 31.0%, respectively,  $p = 0.003$ ).

However, in the multivariate analysis of variables; three predictor variables were detected to be significantly associated with PPD in late-term pregnancies (Table 3). Those variables were prenatal depression, prenatal anxiety, and suspicion of fetal distress. For late-term pregnancies, pregnant women having prenatal depression had nearly 10 times (odds ratio, 9.85) more risk for developing PPD. By contrast, women who had underwent urgent cesarean delivery due to the suspicion of fetal distress were detected to have 4.44 times more risk for having PPD.

## Discussion

To our knowledge, this is the first study to investigate the mental health and perinatal outcome variables as possible risk factors for PPD in late-term pregnancies. In this study, for late-term pregnancies, we did not find an association between PPD and route

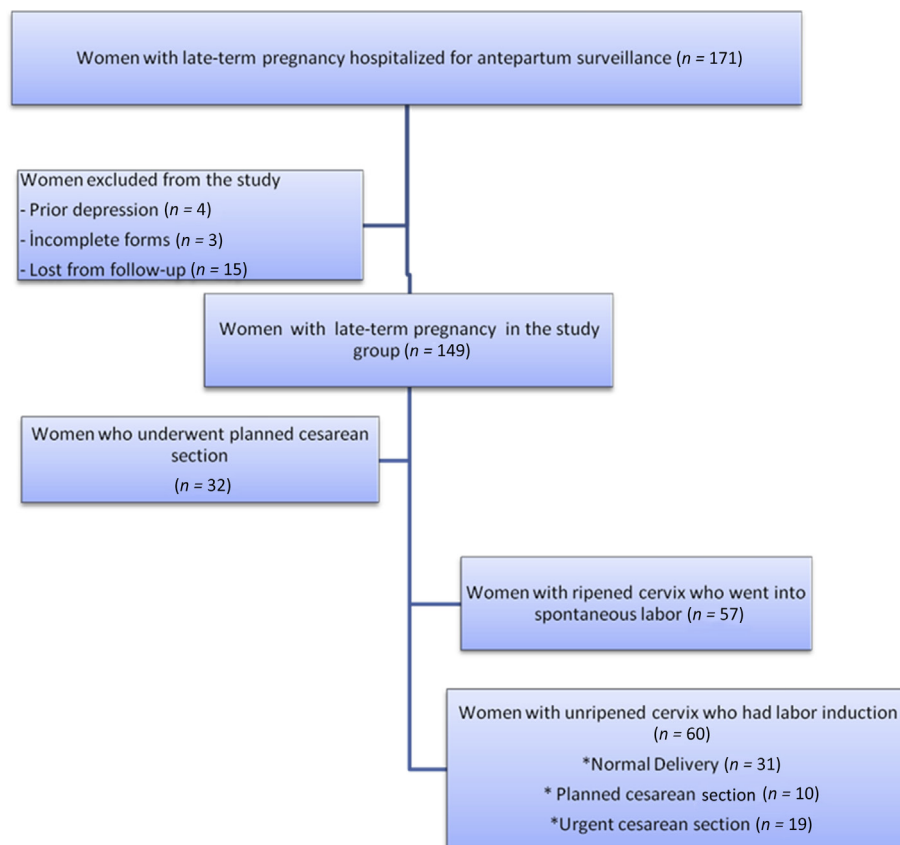


Fig. 1. Flow diagram of perinatal management for the study group.

Table 1

The relationship between sociodemographic variables and *postpartum* depression.

| Sociodemographic parameters |                           | Depressed <i>n</i> = 35 | Not depressed <sup>a</sup> <i>n</i> = 114 | <i>p</i>  |
|-----------------------------|---------------------------|-------------------------|---|-----------|
| Maternal age (y)            | Adolescent ( $\leq 19$ y) | 9 (64.3)                | 5 (35.7)                                  | 0.32      |
|                             | Adult ( $>19$ y)          | 105 (77.8)              | 30 (22.2)                                 |           |
| BMI (kg/m <sup>2</sup> )    | Normal                    | 74 (77.9)               | 21 (22.1)                                 | 0.60      |
|                             | Obese ( $> 30$ )          | 40 (74.1)               | 14 (25.9)                                 |           |
| Smoking habits              | None                      | 108 (78.8)              | 29 (21.2)                                 | 0.035     |
|                             | Present                   | 6 (50.0)                | 6 (50.0)                                  |           |
| Parity                      | Nulliparity               | 67 (76.1)               | 21 (23.9)                                 | 0.90      |
|                             | Multiparity               | 47 (77.0)               | 14 (23.0)                                 |           |
| No. of children             | $< 3$                     | 113 (77.9)              | 32 (22.1)                                 | 0.04      |
|                             | $\geq 3$                  | 1 (25.0)                | 3 (75.0)                                  |           |
| Education                   | Less than HS              | 59 (70.2)               | 25 (29.8)                                 | 0.04      |
|                             | HS or university          | 55 (84.6)               | 10 (15.4)                                 |           |
| Employment                  | None                      | 93 (74.4)               | 32 (25.6)                                 | 0.17      |
|                             | Employed                  | 21 (87.5)               | 3 (12.5)                                  |           |
| Household population        | $< 5$                     | 108 (81.2)              | 25 (18.8)                                 | $< 0.001$ |
|                             | $\geq 5$                  | 6 (37.5)                | 10 (62.5)                                 |           |

Data are presented as *n* (%).

BMI = body mass index; HS = High School.

<sup>a</sup> Edinburg Postnatal Depression Scale score  $< 13$ .

of delivery. However, as novel data, having an urgent cesarean due to the suspicion of fetal distress significantly predicted the development of PPD in late-term pregnancies. Additionally, both having prenatal depression and prenatal anxiety were found to be the independent predictive factors of PPD in late-term pregnancy.

Consistent with studies conducted on term pregnancies, no association between the route of delivery and PPD was found in late-term pregnancies [11–17]. This might be explained by the wide use of regional anesthesia and adequate pain control in cesarean

deliveries as it is true for normal delivery. In addition, women who give birth a baby with cesarean delivery also breastfeed early and have adequate mother-child attachment similar to those who have normal delivery.

As novel data, this study identified the suspicion of fetal distress as a risk factor for PPD in late-term pregnancies. This significant increase of PPD with the suspicion of fetal distress may be explained with the following two theories. The first theory is that a pregnant woman might have severe anxiety if she was told that an

**Table 2**Prenatal psychologic and obstetric risk assessment for *postpartum* depression (PPD) in late-term pregnancies.

| Parameters                              |                        | Women with PPD, n = 35 | Women without PPD, n = 114 | p       |
|---|------------------------|------------------------|----------------------------|---------|
| Antenatal obstetric risk assessment     |                        |                        |                            |         |
| Prenatal anxiety scores <sup>a</sup>    | Normal                 | 101 (82.1)             | 22 (17.9)                  | < 0.001 |
|   | High                   | 13 (50.0)              | 13 (50.0)                  |         |
| Prenatal depression scores <sup>b</sup> | Normal                 | 108 (83.1)             | 22 (16.9)                  | < 0.001 |
|   | High                   | 6 (31.6)               | 13 (68.4)                  |         |
| Psychological status                    |                        |                        |                            |         |
| Oligohydramnios (yes %)                 |                        | 6 (17.1)               | 25 (21.9)                  | 0.54    |
| Polyhydramnios (yes %)                  |                        | 3 (8.6)                | 2 (1.8)                    | 0.09    |
| Having labor induction (yes %)          |                        | 13 (37.1)              | 47 (41.2)                  | 0.67    |
| Mode of delivery                        | Normal delivery        | 75 (78.)               | 21 (21.9)                  | 0.77    |
|   | Planned CD             | 16 (76.2)              | 5 (23.8)                   |         |
|   | Urgent CD <sup>1</sup> | 23 (71.9)              | 9 (28.1)                   |         |
| Indications of CS (n = 60)              |                        |                        |                            |         |
| Macrosomic baby <sup>c</sup> (yes %)    |                        | 4 (21.1)               | 10 (29.4)                  | 0.75    |
| Suspicion of fetal distress (yes %)     |                        | 6 (17.1)               | 9 (7.9)                    | 0.12    |
| Dysfunctional labor (yes %)             |                        | 13 (23.1)              | 11 (27.5)                  | 1.0     |

Data are presented as n (%).

CD = cesarean delivery.

<sup>a</sup> Hospital Anxiety and Depression Scale, score of anxiety  $\geq 10$ .<sup>b</sup> Hospital Anxiety and Depression Scale, score of depression  $\geq 7$ .<sup>c</sup> Delivery of a baby weighing > 4000 g.**Table 3**Multivariate analysis for the risk factors for developing *postpartum* depression in late-term pregnancies.

| Risk factors                    | Odds ratio | 95% confidence interval | p      |
|---------------------------------|------------|-------------------------|--------|
| High prenatal anxiety scores    | 4.946      | 1.589–15.395            | 0.006  |
| High prenatal depression scores | 9.852      | 2.723–35.646            | <0.001 |
| Suspicion of fetal distress     | 4.440      | 1.130–13.637            | 0.043  |

urgent cesarean delivery had to be performed because her baby had acute fetal distress *in utero* and its life was dependent on such an operation. The second theory is that the presence of gradually increasing anxiety due to the prolongation of gestation, combined with the sudden fear of losing her baby due to the suspicion of fetal distress, might lead to the development of post-traumatic stress disorder some time after delivery [18,19]. By contrast, Söderquist et al [20] reported that compared to normal delivery, both an urgent cesarean delivery and instrumental delivery, increase the risk of post-traumatic stress disorder. Therefore, it may also be speculated that there may be a positive correlation between PPD and post-traumatic stress disorder.

In the literature, women hospitalized with high-risk pregnancies were also detected to have higher rates of prenatal anxiety and depression than low-risk pregnancies [21,22]. Having prenatal depression also increased the risk of developing PPD 6 weeks after childbirth in low-risk term pregnancies [23]. However, in this study, a higher percentage (68.4%) of women with prenatal depression developed PPD in the *postpartum* period. It might be explained with a speculation that women in our study group who had prenatal depression tend to be more stressful than those without depression. Therefore, this antenatal stress might trigger the PPD in women with prenatal depression.

In the literature, for term infants, various perinatal complications, such as preeclampsia, hospitalization during pregnancy for any reason and emergency cesarean delivery were proposed as the risk factors for PPD [24]. The increased PPD with preeclampsia were thought to be associated with the physical morbidity of women and the psychological mechanisms. They stated that sudden events like a complex delivery might lead to feelings of disappointment and failure. For preterm births, in a recent study, Mehler et al [25] showed that parents with preterm infants (32–37 weeks) had higher depression scores than those with term infants. Surprisingly, in that study, no association was found between the incidence of

PPD and the quality of motor skills of preterm infants. In addition, a recent multicenter study showed that women with very low birthweight baby were at higher risk for PPD than the controls [26]. As far as we know, there is no study that specifically analyzed PPD in post-term pregnancies.

The major strength of this study was the prospective design and the presence of detailed information about mood disorders, sociodemographic and perinatal risk factors. We selected a prospective design to limit the confounding factors by inclusion of only the late-term pregnancies with no additional perinatal complications, such as gestational diabetes, gestational hypertension, or pre-eclampsia as well as those without a history of depression.

The major limitations of our study was the small sample size and being a single center study. Another limitation might be the inclusion criteria. Pregnant women who were hospitalized for late-term pregnancy, and planned to induce labor were enrolled into the study. These women were aware of certain fetal risks and this might increase the stress of the mother. Therefore, results of this study might not represent the whole population of late-term pregnancies.

## Conclusions

In the current study, we aimed to evaluate the antenatal psychiatric and obstetric risk factors for the development of PPD in late-term pregnancies. After analysis of the data, there was no association between the route of delivery and PPD for late-term pregnancy. As is true for term pregnancy, both prenatal anxiety and depression predicted PPD in late-term pregnancies. Additionally, as novel data, we detected that urgent cesarean delivery with the suspicion of fetal distress significantly increased the risk of PPD in late-term pregnancies. Because the small number of patients is the major limitation of the study, multicenter studies with larger group of patients are required in order to determine the exact risk group for PPD during the perinatal period.

## Conflicts of interest

The authors have no conflicts of interest relevant to this article.

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