Early detection of postpartum depression (PPD) for women suffering high-risk pregnancy: An explorative study on self-perceived burden and other prenatal risk factors of immediate PPD among women hospitalized with threatened preterm labour

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Abstract

**Background:** The mental health of pregnant women, particularly those with elevated risks, has been an issue of global concern. Thus far, few studies have addressed mental health of pregnant women with threatened preterm labour (TPL). In the present study, we investigated self-perceived burden (SPB) and postpartum depression (PPD) among hospitalized pregnant women with TPL, exploring the association of SPB with PPD, and identifying other potential risk factors of early PPD.

**Methods:** A self-reported survey conducted in the Obstetrics Department of Anhui Provincial Hospital, People's Republic of China. Women hospitalized with TPL were approached one week after delivery. One hundred fifty women were recruited from January 2017 to December 2017. Self-Perceived Burden Scale (SPBS), Edinburgh Postnatal Depression Scale (EPDS), and Multidimensional Scale of Perceived Social Support (MSPSS) were the main measures. Descriptive statistics, Spearman's correlation, and multiple logistic regression were employed for data analysis.

**Results:** SPB and PPD were commonly experienced by women hospitalized with TPL, and SPB was positively and significantly correlated with PPD. A multiple logistic regression analysis revealed that, for the women hospitalized with TPL during pregnancy, the emotional aspect of SPB (OR = 1.473, 95% CI = 1.141–1.903, p = 0.003), age (OR = 1.178, 95%CI = 1.056–1.314, p = 0.003), occupation (OR = 0.282, 95%CI = 0.095–0.023, p = 0.023), history of scarred uterus (OR = 0.163, 95%CI = 0.034–0.769, p = 0.022), delivery mode (OR = 5.974, 95%CI = 1.750–20.396, p = 0.004), and family support to women hospitalized with TPL during pregnancy (OR = 0.665, 95% CI = 0.498–0.887, p = 0.006) were the significant factors predicting early signs of PPD.

**Conclusion:** This study indicated that SPB and PPD were prevalent mental issues among hospitalized women with TPL, and SPB, especially perceived emotional burden, is a strong predictor of PPD. Our study suggests the necessity of paying attention to mental health issues—especially SPB and PPD—among hospitalized women with TPL, as well as providing appropriate interventions at the prenatal stage to prevent adverse consequences. Perceiving support from family during pregnancy with high risk can help women in reducing the risk of PPD.

**Background**

Spontaneous preterm birth (sPTB) before 37 weeks is the leading cause of neonatal mortality and morbidity, causing over 70% of foetal deaths [1–3]. Approximately 50% of the women with threatened preterm labour (TPL) will present sPTB [4–5]. TPL is not only a physical problem—it also affects a pregnant woman's psychological and emotional status [6]. However, as the research in this area focuses on the causes and biologic effects of TPL [7], few investigators have assessed the mental health of women with TPL before and after delivery. China announced a universal two-child policy in October 2015, which was predicted to increase advanced maternal age-associated TPL in China and bring new challenges to obstetric care[8]. In this study, we investigate the prevalence and correlation of two
psychological and emotional constructs—self-perceived burden (SPB) and postpartum depression (PPD)—among women hospitalized with TPL at a tertiary care hospital in China

PPD—which is characterized by the presence of non-psychotic depressive episodes—is a complex mix of physical, emotional, and behavioural changes that happen to puerpera in the weeks and months after delivery [9–10]. As one of the most frequent complications of childbirth, PPD affects 10–20% of mothers worldwide [11]. There is global consensus that PPD exerts negative short- and long-term effects on the establishment of motherhood, child development, and family wellbeing [12–14]. PPD has been found to be identified as a putative cause of disastrous behavioural tendencies, such as suicidal intent [15]. It has been estimated that unfortunately “only 20% of women with PPD are diagnosed and treated, leaving thousands of new mothers to suffer in silence” [16]. Although there is a consensus that the first symptoms of PPD usually appear between the fourth and sixth week postpartum [17], postpartum depression may start from the moment of birth resulting from psychological and emotional disorders that evolve continuously during pregnancy [18]. Thus, improving detection and diagnosis processes, especially providing early identification and intervention of PPD, has been an important task for all health professional working with women in the prenatal and postpartum periods [19]. Thus far, however, little attention has been paid to PPD among women who have experienced high-risk pregnancies; e.g. those who are hospitalized with TPL, and likely suffering great physiological, psychological, social, emotional, and economic pressures during pregnancy, and needing special care to recover from complications after delivery. The work by Dagklis et al. (2018) has indicated that thoughts of abortion increase the risk of depression [20].

Self-perceived burden (SPB) [21] is defined as “empathic concern engendered from the impact on others of one’s illness and care needs, resulting in guilt, distress, feelings of responsibility, and diminished sense of self”. SPB is understood as a multi-dimensional emotional construct arising from the care-recipients’ perceptions that they have become a burden to the caregiver [22–23]. Equity theory [24] is an underlying theory of SPB, which refers to that individuals try to maintain the equity between the contributions that they bring to a social relation and the benefits that they receive from it, and that if the balance is broken, emotional anxiety and depressive disorders may emerge. Self-perceived burden has been found to be significantly correlated with a decreased quality of life [25]. According to some recent studies, SPB will affect patients’ medical decisions and adherence [26]. Major research studies have shown that self-perceived burden (SPB) is experienced by certain groups of patients; e.g. chronic diseases patients [26], terminal cancer patients [27], and stroke victims [28] who experienced physical symptoms (e.g., pain and physical weakness) and psychological difficulties (e.g., depression, anxiety, and decreased quality of life) [29]. These groups of patients to various degrees rely on family members to assist and give informal care [28]. However, no attention has been paid to the SPB experienced by hospitalized pregnant women with TPL, who rely on others’ care and support, and could suffer great physiological, psychological, social, and economic pressure. The Confucian concept of ethics with family-oriented culture makes it exceptionally important to study the prevalence of SPB among Chinese women with TPL [30]. In China, young and middle-aged people are endowed with “pillar” roles in their families, and they are expected to shoulder the main family and social responsibilities, such as taking care of their parents and children and being
breadwinners. Traditionally, women in China take the majority of family duties, including reproducing, raising children, and taking care of parents and parents-in-law. Relying on and being burdensome to family members, especially parents and parents-in-law, may lead women to perceive shamefulness, significant guilt, and psychological burden. It has been demonstrated that in China, female patients generally tended to have a higher SPB than male patients [26]. Therefore, researchers and practitioners should pay a special attention to female patients in counties with a family-oriented culture, especially the hospitalized pregnant women with high-risk pregnancies in China, as their mental health will affect childbirth process and outcomes, child development, and family wellbeing.

This study aims to investigate SPB and PPD among hospitalized pregnant women with TPL in China, and explore the association of SPB with PPD and other prenatal risk factors of PPD. This research can provide new theoretical and practical insights related to women’s mental health during pregnancy and childbirth, especially contributing to the early detection of PPD for women with high-risk pregnancies. Results from this study will assist obstetric professionals in designing and developing patient-centered health care services and improve clinical practices to effectively support pregnant women with an elevated risk of pregnancy.

**Methods**

**Design**

This study was approved by the First Affiliated Hospital Ethics Committee of USTC (2019-P-013). All participants were informed regarding the aims, content, and procedures of the study. A self-reported survey questionnaire was disseminated between January 2017 and December 2017 in the Obstetric Department of Anhui Provincial Hospital, that is, the First Affiliated Hospital of the University of Science and Technology of China (USTC), a tertiary care hospital.

**Participants, recruitment process and data collection procedures**

Based on previous estimates of the prevalence of postpartum depression (30 pregnant women diagnosed with TPL and hospitalized), we assumed prevalence of PPD to be 75%. Using a formula and parameters [31] \( N = 400Q/P, Q = 1-P, P = \) the prevalence of PPD for calculating the sample size of our counting data, we needed a minimal sample size of 142.

Inclusion criteria for participants were as follows: (1) pregnant women diagnosed with TPL and hospitalized (according to the diagnostic criteria for the diagnosis of threatened premature birth by the obstetrician with abundant clinical experience; that is, before 37 weeks of pregnancy and appearing as irregular contractions, a small amount of vaginal bleeding, lower abdominal bulge, and other preterm clinical manifestations, and dilatation of the uterine mouth < 2 cm); (2) over 18 years of age; (3) without other severe neurologic diseases or severe psychiatric disorders; (4) having adequate cognitive ability to provide credible information; (5) having at least one caregiver who was one of the pregnant women’s family members and who provided informal care.
In total, 214 pregnant women were eligible. Among these eligible women, we had 9 cases of foetal death or spontaneous abortions, 10 women transferred to the Intensive Care Unit during the study, 31 women unwilling to participate in the study after delivery, and 14 women not providing valid answers (e.g., all the answers were the same, or missing data constituted over 20% of the total items); and these were excluded. As a result, a total of 150 pregnant women were included in the study. The flow chart of our study procedures is displayed in Fig. 1.

Women were approached one week after delivery by two trained senior nurses. Due to the physical discomfort during the pregnancy and labour and for other reasons, women were not very cooperative or interested in participating in the survey before giving birth. After delivery, the puerpera were encouraged to recall their experiences of being hospitalized with TPL; and they reported their social, psychologic and emotional status during the days in the hospital before and after delivery. Women were informed regarding the purpose of the study and asked whether they would be willing to participate and fill out the questionnaire. The potential participants were also advised that the survey was voluntary, that their responses would be kept confidential, and that they could withdraw from the study at any time. The questionnaires were anonymous but stamped with an ID number. The questionnaires took approximately 20–30 minutes to complete, and in order to facilitate their freedom to express their actual feelings, women were approached in the absence of their caregivers. For those cases when the women were unable to complete the questionnaire by themselves, the ward nurses read the questions to them, women responded to the questions, and the nurses then wrote the responses on paper. After each questionnaire was submitted, the nurses assessed whether all questions had been answered. If there were some unanswered questions, women were kindly asked whether they had any confusion or issues regarding the questions, and we encouraged them to complete the unanswered items.

**Main measures**

**Sociodemographic variables and clinical variables**

The pregnant women's sociodemographic characteristics and clinical information were obtained from electronic medical records. The information included women's parity (unipara/multipara), age, occupation (unemployed/employed), residence (rural/urban), education (their highest level achieved, whether senior high school or below/junior college, or Bachelor/Master's degree/Doctorate), number of terminations, having a scarred uterus before current delivery (no/yes), assisted reproductive technologies used (ART) (no/yes), length of hospital stay for TPL before delivery (days), premature delivery (no/yes), and delivery mode of present birth (natural labour/caesarean section). Information regarding insurance and expenses during TPL hospitalization were also obtained. However, since birth insurance can only be used once a year, in our study all pregnant women with TPL chose not to use birth insurance for their TPL hospitalization; and we did not include expenses in our analysis, since we believed that the economic aspect of SPB can more comprehensively and directly reflect the economic burden perceived by women.

**Edinburgh Postnatal Depression Scale (EPDS).**
The use of the EPDS during early postnatal days has been proven to be a simple and useful screening instrument for the onset of early postnatal depression that typically occurs within 1 week postpartum. In our study, a woman's early sign of postpartum depression was assessed using a self-administered, locally validated EPDS [32]. This scale consisted of 10 statements on common depressive symptoms, using 0~3 Likert-type responses to reflect the severity of symptoms. In our study, the recommended cut-off score of 9.5[33] (sensitivity, 82%; specificity, 86%) was used to evaluate the level of antepartum depression. The EPDS's Cronbach's α in this study was 0.918.

Self-Perceived Burden Scale (SPBS).

SPBS was used to measure women's Self-Perceived Burden during pregnancy when hospitalized with TPL Cousineau et al. [34] first proposed a conceptual framework of SPB and developed a 25-item scale SPBS18.0 Subsequently, an abbreviated version of the SPBS was developed that consisted of 10 items. In this study, SPB was measured with a validated, abbreviated Chinese version of the SPBS [35] that contains three dimensions (physical, emotional, and economic aspects) and 10 items. It uses a 5-point Likert scale and each score is summed to create a score ranging from 0 (no burden) to 50 (maximal burden), with higher scores indicating more severe SPB. Scoring above 20 points indicates a noteworthy level of SPB [35]. The Cronbach's alpha of the SPBS in our study was 0.799.

Multidimensional Scale of Perceived Social Support (MSPSS)

We also used MSPSS to measure women's perceived social support when they were hospitalized with TPL during pregnancy [36], which is a 12-item self-report scale that assesses perceived social support from three groups, namely family, friends, and significant others. For each group, it contains four specific statements and entails a 7-point Likert scale ranging from 1 (very strongly disagree) to 7 (very strongly agree). Item scores were aggregated, and a summed score ranging from 12 to 84 was obtained, with higher scores indicating greater perceived social support. Cronbach's α for the overall scale was 0.808.

Statistical analyses

Descriptive statistics were used to quantitatively describe or summarize basic features of the sample in our study (e.g., means, SDs, frequencies). We examined the associations of SPB with 1-week postpartum depression (PPD) using Spearman's correlation [37]. To explore the risk factors for PPD, we used a multiple logistic regression model [37] with a stepwise approach, including SPB, perceived social support, and all sociodemographic and clinical factors available in the study as potential factors. We conducted all statistical analyses using SPSS 22.0. A P value was set at 0.05 for significance in the analysis.

Results

Sample characteristics

Table 1 depicts sample characteristics of the 150 pregnant women; the mean age of respondents was 30.95 ± 5.90 years (mean ± SD), ranging from 19 to 48. Gestational weeks were between 19W and
36+4W. All participants were married.

**Prevalence and correlates of SPB and PPD**

In our study, participants’ EPDS scores ranged from 0 to 19 with a mean score of 9.67 (SD = 4.39), and a majority of pregnant women (54.7%) had EPDS scores above 9.5, which indicated that PPD indeed existed among the women who were hospitalized with TPL. Participants’ SPB scores ranged from 13 to 43, with a mean score of 22.533 (SD = 7.057), and over half of the pregnant women (64%) had an SPBS score above 20, which indicated that a majority of women hospitalized with TPL in our study suffered from SPB.

The EPDS score was positively and significantly correlated with the full score of SPBS (r = 0.500, p < 0.001), the score of SPBS-physical aspect (r = -0.472, p < 0.001), and the score of SPBS-emotional aspect (r = -0.506, p < 0.001); but there was no significant correlation with the score of SPBS-economic aspect (r = -0.050, p = 0.546).

**Multiple logistic regression analysis**

We conducted a multiple logistic regression to explore the potential factors (including SPB) that influence PPD. We divided participants into non-PPD (< 9.5) and those experiencing PPD (≥ 9.5) according to their EPDS scores. We set the 3 SPB subscales (physical aspect, emotional aspect, and emotional aspect) as the dependent variables; and included parity, age, occupation, education, residence, a history of scarred uterus, number of terminations, assisted reproductive technologies, length of hospital stay, delivery mode, premature delivery, and social support (family support/friend support/significant other support) as control variables (Table 2).

The results (Table 3) showed that the emotional aspect of SPB (OR = 1.473, 95% CI = 1.141-1.903, p = 0.003) was a significant risk factor for PPD, and women who perceived higher emotional burden during hospitalization with TPL were more likely to develop PPD. In addition, age (OR = 1.178, 95%CI = 1.056–1.314, p = 0.003), occupation (OR = 0.282, 95%CI = 0.095–0.023, p = 0.023), a history of scarred uterus (OR = 0.163, 95%CI = 0.034–0.769, p = 0.022), delivery mode of current partum (OR = 5.974, 95%CI = 1.750–20.396, p = 0.004), and family support to women hospitalized with TPL during pregnancy (OR = 0.665, 95%CI = 0.498–0.887, p = 0.006) also significantly influenced PPD. Women at a higher maternal age, being unemployed, no evidence of a scarred uterus, having a C-section as the delivery mode for the current partum, and/or without enough support from family during pregnancy were more likely to suffer PPD.

Our model explained between 40.0% (Cox and Snell R^2) and 53.5% (Nagelkerke R^2) of the likelihood of being screened positive for PPD. Since the results from variance inflation factor (VIF) analysis were between 1.195 and 3.594, we estimated that multicollinearity in the model was not strong.

**Discussion**
To our knowledge, this is the only study to find that PPD was prevalent among women hospitalized with TPL in the immediate postpartum period (54.7%), doubling the figure of 27.56% presented in one recent study depicting normal pregnant women's PPD after 1 week of delivery [38]. Our findings deliver a message similar to that of Verdoux et al. (2002) [39], who concluded that obstetrical complications such as threatened abortion/preterm birth (seen as a severe life event for a pregnant woman during pregnancy) increased the likelihood of presenting with severe depressive symptoms in the early postnatal period, and resulted in PPD. This underlines the necessity of not only exploring the possible consequences of pregnancy complications on both the baby's and mother's physical health, but also being concerned with the continuous impact on the mother's mental health [39].

Our findings indicate that women hospitalized for TPL in China commonly experience SPB. Chinese women hospitalized for TPL during the pregnancy may feel that they are unable to contribute equally to a caregiving relationship due to the unforeseen situation, and perceive themselves to be a burden to others (primarily the caregivers from the family). We noticed that it is common for TPL women who suffer with SPB to have early-onset PPD. It is noteworthy that perceived emotional burden during pregnancy is a strong sign of PPD in women hospitalized for TPL. This finding scientifically responds to the on-going call for prenatally identifying women at risk for PPD, and preventing PPD as early as possible [40–42].

Our study enriches the knowledge regarding antenatal risk factors of PPD. We suggest that assisting women hospitalized with high-risk pregnancies such as TPL, in relieving SPB during pregnancy, especially reducing perceived emotional burden, could be an effective way to prevent them from suffering PPD.

While the majority of studies of PPD have emphasized the importance of post-delivery family support in decreasing the risk of women experiencing PPD [43–44], our results suggest that for women with high-risk pregnancies, getting enough family support during pregnancy (i.e., during the TPL hospitalization period), is important in preventing them from PPD. Thus, health professionals and/or social workers should help in formulating positive family relationships, and encourage and advise family members—especially the partner and mother in law—to provide sufficient psychological and emotional care to women with high-risk pregnancies, in order to prevent women from showing early signs of PPD. In China, many studies on women's health have confirmed that conflicts with their mothers-in-law constitute a risk factor of women's depressive symptoms [45]. While based on the Confucian paradigm, a woman is expected to take care of and show respect and obedience to her mother-in-law; the mother-in-law, in turn, plays a key role in taking care of the pregnant and parturient woman. Previous studies [46] reported that 48.8% of mothers-in-law were caregivers after delivery among women in China. Undoubtedly, building a favorable relationship between women and their mothers-in-law is one of the keys to reducing the risk of women's PPD.

We found that pregnant women with a higher maternal age were more likely to be depressed after delivery, which is concordant with many other studies [47–48], including a study by Ming Gao et al. [49]. It reported that pregnant women older than 30 years of age had a higher risk of PPD. Similar to recent studies [50–53], our study showed that employment status was an influential factor of PPD. Women who are unemployed have an increased risk of PPD, probably due to perceived social exclusion and economic
reliance on partners. We also observed that mode of delivery was an important factor affecting the occurrence of PPD, as women having C-sections demonstrated a greater risk of PPD. This result is in agreement with a plethora of other studies [54–56]. The stress of a C-section and complications that occur during and after a C-section are likely to induce the occurrence of PPD [57]. Our finding that women without a scarred uterus manifested a higher risk of PPD was unexpected, and certainly warrants further research.

The previous findings [58–60] indicating that premature delivery is a strong risk factor for women developing PPD were not supported by the present study. This may be due to the fact that for pregnant women hospitalized with TPL, premature delivery was already expected, and that these women were somehow prepared for unpleasant results. This also alerts us to the possible psychological consequences of experiencing TPL—a stressful life event—which need to be recognized and addressed whenever the medical outcome of the pregnancy complication is favorable (i.e., when threatened abortion does not lead to premature birth) or not [39].

**Strength and limitations of the study**

To our knowledge, this is the first study to reveal the prevalence of SPB among women with high-risk pregnancy, and an association between SPB and PPD.

This study provides new knowledge on the prevention of PPD, and provides novel insights into managing women's mental health during pregnancy and childbirth, especially for high-risk pregnancies. We performed several recommended operations to increase the quality of the research study and the reliability and validity of the results; e.g., ensuring the credibility of the data by asking women to fill out the forms shortly after delivery and before discharge, and examining multicollinearity among variables before regression analysis.

However, the present study has some limitations. First, participants were recruited from a department of obstetrics at a single tertiary hospital, and do not represent all hospitalized pregnant women with TPL in China or globally. It may therefore be problematic to apply the results of this study to other institutes or geographic regions. We expect to further this study by expanding the research contexts. Second, as the regression model we applied in this study explained between 40.0% (Cox and Snell R²) and 53.5% (Nagelkerke R²) of the likelihood of being screened positive for SPB during pregnancy, there are evidently other important risk factors that have not been included. Thus, in future studies we will explore other factors that potentially underly SPB, including personality characteristics of the pregnant women, knowledge of TPL, relationships with caregivers, health condition of the caregiver, and the caregivers’ burden.

**Conclusions**
In our study we identified SPB and PPD as prevalent and noteworthy issues among women hospitalized with TPL, and we revealed that perceived emotional burden during TPL hospitalization was a predictive factor of women's PPD in the early postnatal period. By exploring the influences of demographic and clinical factors on PPD, our study showed that pregnant women at a higher maternal age, being unemployed, with no evidence of a scarred uterus, and having C-sections as the delivery mode for the current partum would have an increased risk of PPD. Our study suggests the necessity of paying attention to mental issues—especially SPB and PPD—commonly suffered by hospitalized women with TPL, and providing appropriate interventions at the prenatal stage to prevent adverse consequences.

Declarations

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Authors’ contributions
QQN, GZC, AC, and SH developed the study plan and design. QQN and AC prepared the data and conducted the statistical analyses. QQN, GZC, and AC interpreted the data. QQN and AC drafted the manuscript. SH provided insights into the study as a medical expert. QQN, GZC and AC contributed critical advice and participated in the revisions to the manuscript. QQN, GZC, AC, and SH were responsible for the entire contents of the manuscript. All authors approved the final version of the manuscript.

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Availability of data and materials
The dataset generated and analysed for this study is not publicly available due to the restrictions claimed in the document of the research permission and ethical approval. But the data are available from the ethics committee of the First Affiliated Hospital Ethics Committee of USTC for researchers who meet the criteria for access to confidential data. To request access to the data, please contact the ethics committee of the First Affiliated Hospital Ethics Committee of USTC or the main researcher Qianqian Ni.

Ethics approval and consent to participate
This study was approved by the ethics committee of the First Affiliated Hospital Ethics Committee of USTC (2019-P-013). We obtained written informed consent from all participants regarding the aims, content, and procedures of the study.

**Consent for publication**

Not applicable

**Competing interests**

The authors declare that they have no competing interests

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**Abbreviations**

SPB: Self-Perceived Burden; PPD: PostPartum Depression; SPBS: Self-Perceived Burden Scale; EPDS: Edinburgh Postnatal Depression Scale; MSPSS: Multidimensional Scale of Perceived Social Support; VIF: Variance Inflation Factor

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Tables

Table 1. Socio-demographic characteristics and clinical information of participants. (N = 150)
| Characteristic                                           | Number participants (n) | Percentage (%) |
|---------------------------------------------------------|-------------------------|----------------|
| Age (year)                                              | 30.95*                  | 5.901*         |
| Occupation                                              |                         |                |
| Unemployed                                              | 70                      | 46.7           |
| employed                                                | 80                      | 53.3           |
| Education                                               |                         |                |
| Senior high school or below                            | 80                      | 53.3           |
| Junior college or Bachelor degree                       | 64                      | 42.7           |
| Master or doctorate                                     | 6                       | 4.0            |
| Residence                                               |                         |                |
| Rural area                                              | 44                      | 29.3           |
| Urban                                                   | 106                     | 70.7           |
| Parity                                                  |                         |                |
| Nulliparous                                             | 62                      | 41.3           |
| Multiparous                                             | 88                      | 58.7           |
| history of Multiparous Scarred uterus                   |                         |                |
| No                                                      | 102                     | 68             |
| yes                                                     | 48                      | 32             |
| history of Number of termination                        |                         |                |
| No                                                      | 102                     | 68             |
| yes                                                     | 48                      | 32             |
| Assisted reproductive technologies                      |                         |                |
| no                                                      | 132                     | 88             |
| yes                                                     | 18                      | 12             |
| delivery mode                                           |                         |                |
| natural labour                                          | 48                      | 32             |
| caesarean section                                       | 102                     | 68             |
| Length of hospital stay(day)                            | 23.12*                  | 16.30*         |
| premature delivery                                      |                         |                |
| no                                                      | 26                      | 17.3           |
| yes                                                     | 124                     | 82.7           |
| Social support (MSPSS)                                  |                         |                |
| Family support                                          | 24.733*                 | 2.996*         |
| Friend support                                          | 21.987*                 | 4.028*         |
| Significant other support                               | 22.6*                   | 3.649*         |

1) = Max  2) = Min

**Table 2** Assignments of the variables in multiple regressions of PPD influencing factors in pregnant women (n=150)
variables | assignments
--- | ---
PPD($Y_1$) | 0=non PPD,1=PPD
parity($X_1$) | 0= nulliparous ,1= multiparous
age ($X_2$) | actual measured value
occupation ($X_3$) | 0= unemployed,1= employed
education ($X_4$) | 1= Senior high school or below,2= Junior college or Bachelor degree,3= Master or doctorate
residence ($X_5$) | 0= rural area ,1= urban
the history of scarred uterus ($X_6$) | 0= no,1= yes
number of termination ($X_7$) | actual measured value
assisted reproductive technologies ($X_8$) | 0= no,1= yes
length of hospital stay ($X_9$) | actual measured value
delivery mode | 0=natural labour,1= caesarean section
premature delivery ($X_{10}$) | 0= no,1= yes
social support (MSPSS) | Family support ($X_{11}$) | actual measured value
friend support ($X_{12}$) | actual measured value
significant other support ($X_{13}$) | actual measured value
SPB | physical aspects ($X_{14}$) | actual measured value
emotional aspects ($X_{15}$) | actual measured value
economic aspects ($X_{16}$) | actual measured value

$Y_n$= The dependent variable, $X_n$= The independent variables

**Table 3.** Exploration with multiple logistic regression of PPD predictors (N = 150)
## Predictors

| Predictor                          | B    | S.E. | Wald    | P     | OR   | 95%CI         | VIF   |
|-----------------------------------|------|------|---------|-------|------|---------------|-------|
| Parity                            | 0.078| 0.695| 0.013   | 0.911 | 1.081| 0.277    4.217| 2.446 |
| Age (year)                        | 0.164| 0.056| 8.609   | 0.003 | 1.178| 1.056    1.314| 1.814 |
| Occupation                        | -1.264| 0.556| 5.162   | 0.023 | 0.282| 0.095    0.841| 1.673 |
| Education                         | 0.189| 0.440| 0.184   | 0.668 | 1.207| 0.510    2.858| 1.457 |
| Residence                         | -0.105| 0.616| 0.429   | 0.865 | 0.900| 0.269    3.013| 1.479 |
| The history of scarred uterus     | -1.816| 0.792| 5.254   | 0.022 | 0.163| 0.034    0.769| 2.139 |
| Number of termination             | 0.372| 0.197| 3.563   | 0.059 | 1.450| 0.986    2.134| 1.195 |
| Assisted reproductive technologies| 0.822| 0.848| 0.939   | 0.333 | 2.275| 0.431    11.997| 1.630 |
| delivery mode                     | 1.787| 0.627| 8.139   | 0.004 | 5.974| 1.750    20.396| 1.469 |
| Length of hospital stay (day)     | 0.004| 0.018| 0.054   | 0.816 | 1.004| 0.969    1.041| 1.696 |
| premature delivery                | -0.676| 0.669| 1.021   | 0.312 | 0.509| 0.137    1.887| 1.314 |
| Physical aspects                  | -0.104| 0.176| 0.349   | 0.555 | 0.901| 0.639    1.272| 3.594 |
| emotional aspects                 | 0.387| 0.131| 8.811   | 0.003 | 1.473| 1.141    1.903| 3.309 |
| economic aspects                  | -0.365| 0.262| 1.943   | 0.163 | 0.694| 0.415    1.160| 1.288 |
| Social support                    | -0.409| 0.147| 7.686   | 0.006 | 0.665| 0.498    0.887| 2.351 |
| Family support                    | -0.075| 0.092| 0.671   | 0.413 | 0.927| 0.774    1.111| 2.288 |
| Friend support                    | 0.079| 0.113| 0.499   | 0.480 | 1.083| 0.868    1.350| 2.804 |
| Significant other support         |      |      |         |       |      |            |       |
| Constant                          | 4.365| 3.634| 1.443   | 0.230 | 78.663|          |       |

VIF = Variance Inflation Factor

## Figures

**Figure 1**

Flow diagram of our study on pregnant women included in the analysis