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# The mode of delivery and some selected obstetric factors as predictors of post-partum depression

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## Abstract

**Background:** The most prevalent mental or emotional problem associated with childbirth is post-partum depression (PPD). This study was designed to determine the psychological responses of Iranian women to difficult childbirth.

**Methods:** In this prospective cohort design, incidence rate and associated obstetric predictors of PPD over twelve week's post-partum were investigated among 1801 non depressed pregnant women attending primary health centers (PHCs) of Mazandaran province from January to June 2009 using the Iranian version of the Edinburgh Postnatal Depression Scale (EPDS > 12). Using logistic regression analyses, odds ratios (ORs) for the significant obstetric risk factors that were significantly associated with PPD from chi-square tests were calculated. The associations were controlled for possible socio-demographic confounding factors.

**Results:** The incidence proportions of depression occurring over a 12 weeks period of post-partum were 12.30%. The regression model showed that the risk of PPD was increased by experienced recurrent urinary infection [OR=2.25, (95% CI: 1.15-4.38), unwanted pregnancy [OR=1.97, (95% CI: 1.15-3.35)] and gestational diabetes [OR=3.41, (95% CI=1.46-5.88)] during pregnancy.

**Conclusions:** Although the mode of delivery was not predictive of PPD, other difficulties during pregnancy were associated with higher levels of depressive symptoms over 12 week's post-partum that needs on-time interventions.

**Keywords:** Depression, Obstetrics; Post-partum, Risk factors



## Introduction

Post-partum depression (PPD) is the most common psychiatric disorder following childbirth and a key concept for women-infant mental health (1, 2); a moderate to severe depression symptoms that lasts longer than post-partum blues and with adverse effect on whole family (3). The women at risk are seldom identified during pregnancy or at the delivery time (4). This condition particularly occurs in many developing countries where psychological issues are almost ignored (5). It is estimated that up to 80% of cases do not report it and thus, are not diagnosed by respective specialists (6). A literature review have shown a range of 74.0% to 82.1% of PPD in some countries (3).

Coupled with the existing diagnostic vagueness, there is also considerable lack of information about the risk factors linked with the incidence of this psychiatric disorder (7). The epidemiological studies reported

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psychosocial and socio-demographic risk factors such as experienced depression during pregnancy (8), poor marital relationship (9) and younger maternal age (10). The association between obstetric factors and PPD has been investigated in a number of studies and several studies reported an association (11, 12), but others did not (13, 14). Still, the existing evidence is incompatible and effect size is small (15, 16). The purpose of this project was to investigate whether complications during pregnancy or delivery could predict PPD over 12-week post-partum among Iranian women. To our knowledge some of these complications studied for the first time. Determination of PPD risk factors could assist health care providers comprehend why a woman becomes depressed, in addition to assisting in planning and implementing a preventive program and adequate treatment.

## Materials and Methods

This follow-up cohort study was conducted among rural and urban pregnant women attending Primary Health Care center (PHCs) of Mazandaran province to investigate whether perinatal complications put women at greater risk for depression at 2, 8 and 12 week's post-partum. All, literate, singleton, 16-45 years old pregnant women with gestational age 32-42 weeks pregnancy, who attended PHCs for prenatal care were invited to take part in this study. Women on pharmacological treatment for psychiatric problems and whose Edinburgh Postnatal Depression Scale (EPDS)(17) scores were more than the cut-off point (>12) during 32-42 weeks of pregnancy were excluded from the study. During the study time frame from January to June of 2009, 9187 women (4,684 in urban and 4,503 in rural) who were in their 3rd trimester of pregnancy were registered at the 308 clinics. Among them, 2,626 women were eligible and approached in the study and of those, 2,359 (89.8%) volunteered. Finally, 2,279 (96.6%) completed the EPDS and other questionnaires. Of those, 1,801 women were free of depression and followed to 12 weeks postpartum.

Data were collected using a reliable questionnaire (Cronbach's alpha=86) contains socio-demographic and obstetrics factors. These variables were selected based on literature review. Participants provided information on complications during pregnancy, delivery and after birth to estimate risk of PPD. For accuracy, obtained data rechecked by women's documents in PHCs. Concerning obstetric and gynecological variables, questions were placed in chronological order. Women were first asked about their history of medical problems with focus on obstetric and gynecologic history in multiparous women from earlier pregnancy, and also pregnancy related factors. They were then asked about their labor and delivery experiences and factors pertaining to prenatal and postnatal problems after delivery. Information was also gathered on the neonatal characteristics.

Obstetric and gynecological data of interest included history of medical problems, infertility, history of abortion, any complications during previous and this pregnancy, gestational age at the first antenatal care visit, gestational age at the time of delivery, number of antenatal care visits, unwanted pregnancies, participation in health education programs, weight gain, mode of delivery, place of delivery, intrapartum excessive bleeding, puerperal complications, birth weight, gender of the baby and neonatal morbidity.

Gestational age was determined by a fetal ultrasound examination conducted during pregnancy. Birth was classified as preterm if it occurred before 37 weeks of gestation. Type of delivery was divided into three categories: (1) vaginal delivery; (2) elective caesarean section; (3) emergency caesarean section. Location of the delivery was either at a private hospital or in governmental hospital. Unwanted pregnancy was defined if the women had not desire this pregnancy at the time of confinement or planned it.

### Covariates

Based on the literature, the following non-obstetrical factors were considered as possible confounders in the association between perinatal complications and PPD: women age, age at marriage, women and husbands' education, women and husband' employment status, family structure, housing's holds, total household income, gravidity and location of the health center. Income was categorized into three groups based on monthly income according to the Iranian Ministry of Finance report based on family income for five people during the data collection period.

During pregnancy and after birth the women were asked to fill the Iranian version of the EPDS. It includes 10 Likert items that takes 10 minutes or less to answer. Each sample selects one of four possible responses ("no", "not at all", "yes", and "quite often") according to their feelings within the past seven days. The score of all questions was computed (18). A score of greater than 12 was a valid cut-off value for the provisional diagnosis of PPD in the Iranian sample (19).

Verification of some items in socio-demographic and obstetric and gynecological questionnaires was also done. Most of the questions (e.g. parity, age, number of visits, weight gain, gender of the baby, mode of delivery) after being completed by subjects were checked again with their documents in the health centers. All women and babies in the study were weighed with the same scales which were made from the same company in all health centers. To reduce errors and to obtain better accuracy, all scales were checked prior to being used.

### Analysis

All analyses were performed using the IBM-SPSS software version 20. Chi-square tests were used to describe the association between sample socio-demographic characteristics and perinatal risk factors (categorical variables) with PPD. Using logistic regression analyses, we calculated odds ratios (ORs) for the risk factors that were significantly associated with PPD, as indicated by the chi-square tests. The associations were controlled for possible confounding factors. All tests with p-values of less than 0.05 were taken statistically significant.

Ethical approval was obtained from the Medical Ethics Committee, University Putra Malaysia (UPM) and Ethic Committee of Mazandaran University of Medical Sciences in Iran.

## Results

Attrition over the 12 weeks data collection was 14.15% and this reflected a total of 255 mothers who completed phase 1 of the study (i.e. during 32-42 weeks of pregnancy) but did not respond to post-partum 2nd, 8th and 12th week's data collection request. No significant difference was found in terms of the average age, women' and their husbands'

**Table 1.** Socio-demographic characteristics by post-partum depression status.

| Variables | No-PPD | PPD | p-value |
|---|---|---|---|
| **Age (Years)** | | | 0.002 |
| < 25 | 544 (80.2) | 134 (19.8) | |
| 25-35 | 673 (85.5) | 114 (14.5) | |
| 36 or older | 75 (92.6) | 6 (7.4) | |
| **Age at marriage (Years)** | | | 0.090 |
| < 25 | 1114 (82.9) | 229 (7.1) | |
| ≥ 25 | 178 (87.7) | 25 (33.4) | |
| **Education (Years)** | | | 0.020 |
| Lower secondary (≤ 9) | 465 (81.4) | 106 (18.6) | |
| Upper secondary (10-12) | 644 (83.5) | 127 (16.5) | |
| Completed High School (>12) | 183 (89.7) | 21 (10.3) | |
| **Husband education (Years)** | | | 0.240 |
| Lower secondary (≤ 9) | 527 (82.3) | 113 (17.7) | |
| Upper secondary (10-12) | 562 (83.5) | 111 (16.5) | |
| Completed high school (>12) | 203 (87.1) | 30 (12.9) | |
| **Total household income in tomans (monthly)** | | | 0.002 |
| Low (< 350,000) | 806 (81.3) | 185 (18.7) | |
| Medium (350,000-450,000) | 305 (85.9) | 50 (14.1) | |
| High (> 450,000) | 181 (90.5) | 19 (9.5) | |
| **Gravida** | | | 0.009 |
| 1 | 673 (81.2) | 156 (18.8) | |
| 2 | 413 (85) | 73 (15.0) | |
| + 3 | 206 (89.2) | 25 (10.8) | |
| **Age of Last Child (months)** | | | |
| < 24 | 61 (77.2) | 18 (22.8) | 0.020 |
| 24-36 | 58 (87.9) | 8 (12.1) | |
| 37-72 | 192 (90.6) | 20 (9.4) | |
| > 72 | 229 (86.7) | 35 (13.3) | |
| **Gender of Children** | | | 0.860 |
| Female | 242 (87.4) | 35 (12.6) | |
| Male | 238 (86.2) | 38 (13.8) | |
| Both | 61 (88.4) | 8 (11.6) | |
| **Family Structure** | | | 0.040 |
| Extended | 341 (80.4) | 83 (19.6) | |
| Nuclear | 951 (84.8) | 171 (15.2) | |
| **Housing** | | | 0.330 |
| Renting | 492 (82.4) | 105 (17.6) | |
| Own house | 800 (84.3) | 149 (15.7) | |
| **Employed** | | | 0.001 |
| Housewife | 1208 (82.9) | 249 (17.1) | |
| Employ | 84 (93.4) | 5 (5.6) | |
| **Husband Employed** | | | 0.340 |
| Business | 140 (82.8) | 29 (17.2) | |
| Farmer | 82 (78.1) | 23 (21.9) | |
| Government servants | 874 (83.7) | 170 (16.3) | |
| Other | 196 (86.0) | 32 (14.0) | |
| **Location of health centre** | | | 0.730 |
| Rural | 636 (83.2) | 128 (16.8) | |
| Urban | 656 (83.9) | 126 (16.1) | |

**Table 2.** Frequencies of history of obstetrics gynecological complications by post-partum depression

| Variables | No-PPD | PPD | P-value |
|---|---|---|---|
| **Abortions** | 214 (84.3) | 39 (18.7) | 0.840 |
| Illegal | 38 (80.9) | 9 (19.1) | 0.440 |
| Legal | 174 (85.3) | 30 (14.7) | |
| **Infertility** | 106 (86.9) | 16 (13.1) | 0.300 |
| **Medical diseases** | 145 (81.0) | 34 (19.0) | 0.320 |
| **Anemia** | 113 (77.4) | 33 (22.6) | 0.030 |
| **Diabetes** | 3 (75.0) | 1 (25.0) | 0.380 |
| **Obstetric complications in previous pregnancy** | 192 (82.8) | 40 (17.2) | 0.280 |
| **Preterm birth** | 19 (82.6) | 4 (17.4) | 0.210 |
| **Elective cesarean section** | 67 (91.8) | 6 (8.2) | 0.050 |
| **Emergency cesarean section** | 112 (83.6) | 22 (16.4) | 0.990 |

education among women who were followed and those who dropped out.

The mean age and age at marriage of women was 25.9±5.2 years and 20.4±4 years respectively. About half of women and their husbands' had less than a high school education (50.5% and 41.3 %, respectively), and their mean household income was 319,985±1.5 Tomans (3500 Tomans = 1 US Dollar) per month. The majority of women were housewife (92.7%), had husbands who were employed in business (67.5%), owned their own home (62%), and lived in nuclear families (71.7%). About two third of women (61%) did not have any children. Half of women (50.6%) were recruited from rural PHCs, the remainder were recruited from urban PHCs.

The obstetric data that were gathered for the study included obstetric and gynecological history, pregnancy-related, delivery- related and perinatal characteristics. In this study 16.5% of women reported a history of abortion. The minority of women experienced infertility, 7.9% and medical conditions (12.2%) which the most predominant of those was anemia with 77.4% of cases. In multiparous women, 39.8 % of their previous pregnancy were complicated; emergency cesarean section constituted almost half (42.6%) of the complicated cases.

Most women (45%) entered the study with gestational age of more than 13 weeks. The majority of women (60.1%) had a prenatal visit less than 9 times; the mean number of visits being 9.3±3.6. Less than half of the women (42.3%) had weight gain of 12.5-18 Kg during this pregnancy. The most common complication (10.7%) in pregnancy was recurrent urinary infection, morning sickness and back pain was the second and third most common (6.7%, and 4.3% respectively). Pregnancy complications were the reason for 81 women to be admitted to the hospital. Out of 111 (6.2%) women who took sick leave, 40% were because of pregnancy difficulties. Most women (80.6%) had planned pregnancies and 85.6% of them participated in health education programs.

The babies of most women (83.1%) were born between 37-42 weeks of gestation with a mean of 38.6±1.69 weeks. Approximately, one third of women (34.5%) entered labor naturally and about half of the babies (53.9%) were born vaginally. Nearly all births (85%) took place in government hospitals. At time of delivery 10.8% of women experienced excessive

**Table 3.** Frequencies of pregnancy related variables by post-partum depression

| Variables | No-PPD | PPD | P-value |
|---|---|---|---|
| **Gestational age at first antenatal visit (weeks)** | | | 0.370 |
| < 6 | 209 (81.6) | 47 (18.4) | |
| 6 - 12 | 499 (85.2) | 87 (14.8) | |
| ≥ 13 | 584 (83) | 120 (17.0) | |
| **Number of prenatal visits** | | | 0.910 |
| < 9 | 768 (83.8) | 149 (16.2) | |
| 9-12 | 318 (83.7) | 62 (16.3) | |
| ≥ 12 | 205 (82.7) | 43 (17.3) | |
| **Weight gain(kg)** | | | 0.200 |
| < 9 | 214 (87.0) | 32 (13.0) | |
| 9-12 | 481 (83.8) | 93 (16.2) | |
| 12 - 18 | 531 (83.1) | 108 (16.9) | |
| ≥ 18 | 65 (77.4) | 19 (22.6) | |
| **Obstetric Complication:** | | | |
| Gestational diabetes | 46 (70.8) | 19 (29.2) | 0.004 |
| Gestational hypertension | 50 (83.3) | 10 (16.7) | 0.960 |
| Preeclampsia/ Eclampsia | 9 (81.8) | 2 (18.2) | 0.290 |
| Recurrent urinary Infection | 123 (73.2) | 45 (32.8) | 0.001 |
| Morning sickness | 88 (81.5) | 20 (18.5) | 0.540 |
| Back pain | 54 (78.3) | 15 (21.7) | 0.220 |
| Premature contractions | 12 (75.0) | 4 (25.0) | 0.150 |
| Vaginal bleeding | 21 (91.3) | 2 (8.7) | 0.150 |
| Miscellaneous | 44 (88.0) | 6 (12.0) | 0.390 |
| Admission to the hospital Because of pregnancy Complications | 57 (87.7) | 8 (12.3) | 0.360 |
| Sick leave in pregnancy | 78 (78.8) | 21 (21.2) | 0.180 |
| Unwanted pregnancy | 1048 (84.8) | 188 (15.2) | 0.010 |
| No participation in health Education program | 1108 (84.2) | 208 (15.8) | 0.080 |

**Table 4.** Frequencies of delivery related variables by post-partum depression

| Variables | No-PPD | PPD | P-value |
|---|---|---|---|
| **Gestational age at time of delivery (weeks)** | | | 0.750 |
| Premature (<37) | 225 (83.0) | 46 (17.0) | |
| Term (≥37) | 1066 (83.8) | 206 (16.2) | |
| **Mode of Delivery** | | | 0.690 |
| Emergency cesarean section | 372 (84.4) | 69 (15.6) | |
| Elective cesarean section | 252 (84.8) | 45 (15.2) | |
| Vaginal | 668 (83.0) | 139 (17.0) | |
| **Place of Delivery** | | | 0.080 |
| Private hospital | 193 (81.1) | 48 (18.9) | |
| Government hospital | 1099 (84.4) | 203 (15.6) | |
| Intra-partum excessive bleeding | 149 (82.8) | 31 (17.2) | 0.740 |
| Puerperal complications | 346 (81.0) | 81 (19.0) | 0.090 |
| Breast feeding complications | 208 (84.2) | 39 (15.8) | 0.770 |
| Infection | 37 (71.2) | 15 (28.8) | 0.010 |
| bleeding | 70 (78.7) | 19 (21.3) | 0.190 |
| laceration | 39 (86.7) | 6 (14.3) | 0.570 |

bleeding.

During puerperium, approximately one third (25.5%) of women experienced puerperal complications. The most dominant condition (54.17%) was breast feeding problems. At three months post-partum, 85.4% of babies were still breast fed exclusively by women. The majority of infant birth weight (96.1%) was more than 2,500 gm with a mean of 3,388± 429.3 gm. About half of the infant gender (50.8%) was male. A small numbers of infants (11%) experienced neonatal morbidity after birth, premature birth consisted the majority of those cases (46.25%).

Over the 12-week period of post-partum, there were a total of 254 new cases of PPD. The cumulative incidence rate of depression occurring at 2, 8 and 12 weeks post-partum was 6.9% (120), 4.6% (69) and 4.8% (65) respectively.

The frequency and percentages for PPD status are presented for each level of the categorical variables in the following manner: socio-demographic, obstetrics and gynecological history.

The incidence of PPD was more common in women whose age were younger than 25, gave up their education at lower secondary level, their family income were less than 350,000 tomans per month, experienced pregnancy for the first time (P=0.009), being a housewife and living in the extended family (Table 1).

The proportion of women with PPD increased in anemic women (22.6%) compared with non-anemic women (15.8%) (P=0.03) (P=0.001) (Table 2).

The proportion of PPD in women increased among those who reported having gestational diabetes (29.2%), recurrent urinary infection during pregnancy (32.8%) and unplanned pregnancy (21.2%) compared with women who did not experience gestational diabetes (15.9%) or recurrent urinary infection (15.2%) and had a plan for their pregnancy (15.2%) (Table 3).

Women in group of vaginal delivery (17%), and who gave birth a baby at a private hospital (18.9%) had a higher incidence of PPD compared with women who gave birth to a baby by other methods and who delivered their baby in governmental hospital, although the difference was not at a significant level. Also, higher EPDS scores were associated with experiencing infection during puerperal period (28.8%) compared with women who did not report infection (16%) (Table 4).

There was not any significant association between higher EPDS scores and neonatal complications (Table 5).

The logistic regression model showed that there was increased risk of PPD with experienced recurrent

**Table 5.** Frequencies of neonatal characteristic by post-partum depression

| Variables | No-PPD | PPD | P-value |
|---|---|---|---|
| **Birth Weight (gm*)** | | | 0.580 |
| LBW** (<2500) | 56 (86.2) | 9 (13.8) | |
| Not-LBW (≥2500) | 1236 (83.6) | 243 (14.6) | |
| **Sex of the Baby** | | | 0.640 |
| Male | 664 (83.2) | 134 (16.8) | |
| Female | 28 (84.1) | 119 (15.9) | |
| Neonatal morbidity | 151 (80.3) | 37 (19.7) | 0.190 |
| Prematurity | 89 (82.4) | 19 (17.6) | 0.720 |
| Infection | 3 (75.0) | 1 (25) | 0.640 |
| Jaundice | 64 (84.2) | 12(15.8) | 0.880 |
| Hospital stay of neonate | 126 (80.8) | 30 (19.2) | 0.310 |
| **Breast feeding status at three months** | | | 0.180 |
| Exclusive breast feeding | 1162 (83.6) | 228 (16.4) | |
| Bottle feeding | 21 (72.4) | 8 (27.6) | |
| Mix Feeding(breast feeding and bottle feeding | 97 (86.6) | 15 (13.4) | |

* gm=Gram
** LBW= Low birth weight

**Table 6.** Obstetrics gynecological factors as predictors of depressive symptoms over 12 weeks post-partum using logistic regression model (n = 1546).

| Risk Factors | B | SE | Odds ratio | 95% Confidence interval | P-Value |
|---|---|---|---|---|---|
| Mothers' age (years) | -.054 | .032 | .947 | .890-1.008 | .089 |
| Education (years) | -.03 | .043 | .96 | .88-1.04 | .37 |
| Mothers 'employ | .97 | 1.080 | 2.64 | .31-21.93 | .36 |
| Household income | .00 | .000 | 1.00 | 1.00-1.00 | .27 |
| Family structure | .31 | .294 | 1.36 | .76-2.42 | .29 |
| Gravida | -.01 | .285 | .98 | .56-1.72 | .96 |
| Age of last child | -.00 | .004 | .99 | .99-1.00 | .68 |
| Unwanted pregnancy | .67 | .272 | 1.97 | 1.15-3.35 | .013 |
| Recurrent urinary infection | .81 | .341 | 2.25 | 1.15-4.38 | .017 |
| Gestational diabetes | 1.22 | .441 | 3.41 | 1.47-8.09 | .005 |
| Anemia | .20 | .374 | 1.22 | .58-2.54 | .59 |
| Post-partum infection | .99 | .555 | 2.69 | .90-7.97 | .07 |
| Constant | 0.37 | | | | |

urinary infection [OR = 2.25, (95% CI: 1.15-4.38)], unwanted pregnancy [OR = 1.97, (95% CI: 1.15-3.35)] and gestational diabetes [OR = 3.41, (95% CI: 1.46-5.88)].

Table 6 shows B coefficient estimates and the corresponding adjusted odds ratios indicating the independent effect of each significant variable controlling for the effect of other variables in the model.

## Discussion

This study evaluated a wide range of perinatal complications as risk factors for PPD in a large sample size of a developing nation.

Although the incidence rate is a significant finding from both academic and clinical perspectives, few studies have actually investigated it (20). The incidence of depression in our sample was found to be comparable to other incidence studies using the same scale of measurement and the cut-off score in the longitudinal study (9, 21, 22).

The incidence of PPD in this study (6.9%, 4.5%, and 4.8% respectively) at 2, 8, and 12 weeks after birth are consistent with the incident rates reported in UK (5.31% and 2.61% at 8 and 32 weeks after birth, respectively) (23) and exceeded 3.5% and 2.3% incidences reported at the same time points in English women (22). However, the incidence rate reported in current study is less than that of 9.3% and 4.4% report at 12 weeks and one year after birth, respectively in Spain (9). The important issues which made a comparison of PPD incidence difficult are using different instruments, the variation in the timing of evaluation and accuracy of all cases that take place after birth (20).

In the current study, the three strongest obstetric predictors of PPD were unwanted pregnancy, gestational diabetes and recurrent urinary infection.

The results of this study are consistent with the majority of the studies that revealed PPD is more prevalent among women with unwanted pregnancy than those women who have a planned it (13, 24, 25). Unwanted pregnancy can cause adverse physical, psychological and social consequences in the short- and long-term for women (25,26). As for the relationship between unwanted pregnancy and PPD, it should also be mentioned that it is not just about the mothers' feeling toward the fetus, but it also reflects the feelings of others affected in this circumstance (16). Beck (2001) stated that even if the surprise pregnancy becomes a welcome one, a woman still has to contend with the consequence of this unplanned event which will subsequently affect the rest of their lives (27).

Few studies have looked specifically at the association between recurrent urinary infection in pregnancy and PPD, whereas the finding of the current study revealed the link between these difficulties with the increased risk of PPD. A published study, which identified positive association between symptoms of urgency and incontinence after birth and PPD, postulated that both might occur with the same causal factors (28). Similarly, Groer and Morgan (2007) reported more frequent symptoms of infection occurring in depressive women after birth. The authors are suggested that PPD may be associated with a dysregulated hypothalamic-pituitary-adrenocortical (HPA) axis and possible depressed cellular immunity (29).

In agreement with the findings of the current research, one study has acknowledged a statistically significant increase in depressive symptoms among women with gestational diabetes (30). This retrospective cohort study during the 6 months prior to one year following delivery found that women with gestational diabetes had experienced nearly double the odds of depression (15.2% vs. 8.5%) during the post-partum compared with those without diabetes(30). Approximately 20% to 25% of diabetic patients are influenced by depression, which is about twice as many in the general medical population (31). Moreover, nearly 2% to 9% of pregnant mothers have difficulties due to diabetes (32). The primary etiology in relation to the association between diabetes and depression is not evident; however, depression may occur due to stress, such as the effects of hyperglycemia and insulin on the thyroid and stress axis, the metabolic impact of diabetes on the brain and psychological burden of handling a chronic disease during pregnancy, as well as post-partum period (33).

Another important obstetrics risk factor of PPD that has been suggested is the type of delivery. In association with some of the studies this study did not find any association between type of delivery and PPD (13, 34, 35). The results are similar to those in developing countries such as Lebanon, Iran and Brazil (36, 37). In a meta-analysis and review of 24 studies, the evidence for a link between cesarean section (C/S) and PPD during one year after delivery was rather weak and the relationship had not been established (38).

There are differences in opinion concerning women's attitude and insights toward C/S and its role on PPD. Studies in diverse settings such as Lebanon in Asia and Nigeria in sub-Saharan of Africa, have demonstrated that some women consider C/S as a problem and they prefer normal delivery (39, 40). A study in Lebanon illustrated that women who delivered their baby by C/S were protected from PPD only in the urban areas, while it is a weak protective factor for those in the rural areas, in which natural birth is highly desired as part of the traditional culture (39). In Nigerian cultures, it is even perceived as a failure of womanhood to have a cesarean delivery (40). In contrast, in Latin America, the women considered C/S as a desirable and safe mode of delivery (41). Some of the other reasons may be fear of vaginal delivery, fear of baby's death during prolonged labor, feeling of no-assisted by hospital staff that make mothers' experiencing stress, insecurity, as well as having prolonged labor and extreme pain for a long time causing increased cortical level which is linked to stress (29, 37).

The contradictory findings concerning the relationship between mode of delivery and PPD may be indicated more deep. Therefore, qualitative studies are needed to conduct to establish the role of the mode of delivery on PPD. Due to the high rate of delivery by C/S in Iran, determining whether it is a risk factor for PPD is a worthwhile endeavor in aiding clinicians to identify a growing number of at risk mothers for PPD.

## Conclusion

This is one of the first study that longitudinally examined the incidence and obstetric gynecological risk factors of depression over 12 weeks after birth carried out in the community recruited from PHCs in the developing world using a reliable instrument. Results demonstrated a woman's mental health could be challenged by pregnancy, delivery and post-partum difficulties during post-partum period. The limitation of the study were exclusion of illiterate women from the study, other factors that may contribute to PPD were not evaluated and not all pregnant women and not all PHCs participated in this study.

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## Conflict of interest

The competing interests not declared.

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