

# Risk factors associated with postpartum depression in the Saudi population

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**Introduction:** Postpartum depression (PPD) is one of the major psychological disorders worldwide that affects both mother and child. The aim of this study was to correlate the risk of PPD with obstetric and demographic variables in Saudi females.

**Materials and methods:** Data were collected by interviewing females 8–12 weeks postpartum. PPD symptoms were defined as present when subjects had an Edinburgh Postnatal Depression Scale score of 10 or higher. Variables included in this study were age, education, occupation, parity, baby's sex, pregnancy period, delivery type, hemoglobin level, anemia, and iron pills taken during pregnancy.

**Results:** Of the 352 postpartum females, the prevalence of PPD symptom risk was 117 (33.2%). Among the PPD symptomatic females, 66 (39.8%) had low hemoglobin levels, and 45 (40.5%) females were anemic during pregnancy ( $P \leq 0.05$ ). These results suggest that early postpartum anemia, indicated by low hemoglobin level, is a significant risk factor for PPD (adjusted odds ratio 1.70, 95% confidence interval 1.05–2.74;  $P = 0.03$ ). Other variables, including age, parity, education, occupation, and delivery type, were not significantly correlated ( $P = 0.15–0.95$ ), but marginally indicative of the risk of depressive symptoms.

**Conclusion:** Low hemoglobin level and anemia during pregnancy were risk factors for PPD in Saudi females. Many other factors may be considered risk factors, such as age, occupation, and parity. Anemic women need more attention and to be checked regarding their PPD, and treated if necessary.

**Keywords:** postpartum depression, hemoglobin level, anemia, EPDS

## Introduction

Postpartum depression (PPD) is the most common psychological health problem among women, affecting 10%–15% worldwide.<sup>1</sup> It is characterized by tearfulness, despondency, emotional lability, feelings of guilt, loss of appetite, suicidal ideation, sleep disturbances, poor concentration and memory, fatigue, and irritability, as well as feelings of inadequacy.<sup>2,3</sup> PPD can develop at any time during the first postpartum year.<sup>4</sup> Usually, 50%–80% females experience mood disturbance during the first week, which peaks at day 5, and may be fully resolved within 10–14 days postpartum.<sup>5</sup> Mood disturbance can prevail after the third week of child delivery and/or up to 1 year and can evolve into PPD, which may affect both the mother's and the child's health.<sup>6,7</sup> Full-blown PPD affects the entire family and creates an economic burden on the family as well as on the public health system.<sup>8,9</sup> In most cases, high depressive risk was reported during the first 3–4 months postpartum.<sup>10,11</sup> Hence the screening of PPD is extremely important and could be performed regularly after 4–6 weeks postpartum.<sup>11,12</sup>

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The prevention of PPD may not be completely possible, although health professionals can help in recognizing and reducing key risk factors.

The most consistently reported risk factors are an early history of depression, history of psychiatric illness, depression during pregnancy, lack of social support, and recent life stresses.<sup>2,13-15</sup> In addition, some risk factors are only seen in Eastern communities, such as the delivery of a female infant and grand multiparity.<sup>16,17</sup>

Nutritional deficiency has also been associated with depression in the postpartum population, including that in omega-3 fatty acids, zinc, and iron.<sup>18,19</sup> Iron deficiency is the most prevalent nutrient deficiency in almost all childbearing women in the world.<sup>20</sup> Postpartum iron deficiency results in common postpartum anemia caused by excessive blood loss during child delivery.<sup>21</sup> Several studies have reported that anemia due to iron deficiency was associated with increased symptoms of PPD.<sup>22,23</sup> However, controversial associations have also reported between maternal iron status, low hemoglobin (Hb) level, maternal anemia, and PPD.<sup>24</sup> In our literature search, we did not find any studies that reported the risk factors of PPD in the Saudi population. Hence we decided to determine the prevalence of PPD and its associated risk factor(s) in demographic and obstetric variables, including anemia among patients using obstetric and “well-baby” clinic services of two Saudi hospitals.

## Materials and methods

### Place and duration of study

The study was conducted at the King Khalid University Hospital (KKUH) and Riyadh Military Hospital (RMH) (Al-Wazarat Primary Health Care Centers), Riyadh, Kingdom of Saudi Arabia, from April 2013 to May 2013 (6 weeks).

### Study design and data-collection tool

The design of the study was observational case-control and retrospective. Depressive symptoms were assessed in Saudi women who had had their babies delivered in KKUH or RMH at 8–12 weeks postpartum and among those attending primary health care centers for their baby’s vaccination. Exclusion criteria included those who had a history of postpartum blood transfusion, early puerperium in postpartum hemorrhage and/or were known to have any previous psychiatric illness.

The Arabic-language version of the Edinburgh Postnatal Depression Scale (EPDS) was used to study depressive symptomatology. The EPDS is a ten-item self-report scale validated and widely used to screen for PPD.<sup>25</sup> The researchers gave instructions to the mother and made sure the mother

understood the questions before filling out the form. The researcher also helped, if the mother requested, to read the questions and/or explain them to her. Similar to previous studies, participants who scored 10 or higher on the EPDS were considered as possible PPD cases, and those who scored less than 10 were considered normal and therefore controls.<sup>23,26</sup>

All of the requirements for this study were formally explained to the women in their native language. If they agreed to participate, they were asked to sign the consent form.

## Data-collection methods

The research questionnaire contains 22 closed-ended questions in the Arabic language. The questionnaire is divided into three parts: the first part deals with sociodemographic variables, which include age, education level, and occupation; the second part contains obstetric history variables and past psychiatric history of the participants.

The third part of the questionnaire contains the pre-designed self-administered EPDS. The EPDS is a reliable and valid instrument that has been used in research as well as primary clinical care to screen people with depressive symptomatology.<sup>27,28</sup> Hb level, anemic condition, and iron-supplement recommendations were recorded from the study participants’ postnatal medical records, and anemia was defined as Hb level <11 g/dL.<sup>29</sup>

## Sample size

We assumed an unequal sample size of PPD cases (EPDS score  $\geq 10$ ) and controls (EPDS score <10), (total 352, PPD cases 117 and controls 235), with an odds ratio (OR) of 2.0, at the 5% level of significance, with 80% study power and 5% expected dropout.<sup>30,31</sup>

## Statistical analysis

Descriptive statistics were used for summarizing the study and outcome variables. The  $\chi^2$  test and ORs with 95% confidence intervals (CIs) were used for observation and quantifying the association between different variables. Multivariate binary logistic regression was used to identify the independent associated factors of PPD.  $P \leq 0.05$  was considered significant.

## Ethical considerations

The study protocol was approved by the Local Committee of the Post-graduate Saudi Board of the central province. Approval for conducting the study was obtained from the Institutional Review Board of KKUH. The objectives of the study were explained to the participants, and their consent

was considered a prerequisite for enrollment in the study. Confidentiality was assured through the anonymity of the questionnaire. All collected data were kept confidential and used only for study purposes.

## Results

A total of 352 postpartum females who completed the demographic and obstetric variables section and the EPDS questionnaire were included in this study. Out of the 352 postpartum females, 204 (58%) females attended KKUH and 148 (42%) females attended RMH for baby care. Distribution of the Hb levels and PPD symptoms of the participants is presented in Table 1. Participants' age ranged from 19 to 47 years; mean age was 29.92 years (standard deviation  $\pm 5.7$ ). Of the total participants, 207 (58.8%) females belonged to the age-group 25–34 years, whereas 81 (23%) females were aged more than 35 years. The females who participated in the study included housewives (239, 67.9%), those employed outside the home (82, 23.3%), those with a university education (196, 52.3%), and those with a secondary education (104, 29.5%). Most of the females had full-term pregnancy ( $>37$  weeks; 338, 96%) and had normal vaginal deliveries (269, 76.4%). Those who delivered male babies in their last delivery numbered 185 (52.6%), primipara 115 (32.7%), parity of two to three 121 (34.4%), and more than four babies 116 (33.0%).

The EPDS was divided into two (dichotomous) categories. Of the 352 mothers, 117 (33.2%) had depressive symptoms (EPDS score  $\geq 10$ ), and 235 (66.8%) did not have depressive symptoms (EPDS scores  $< 10$ ). Of the 117 postpartum females with depressive symptoms, 45 (30.5%) attended RMH, whereas 72 (61.5%) attended KKUH during pregnancy as well as for baby care. In univariate modeling, age,

education, working status, and parity were not found to be statistically significant predictors of discordant scores ( $P=0.22-0.77$ ) (Table 2). However, comparatively, the risk of PPD symptoms was slightly more in the low-age group (37.5%  $< 25$  years, OR 1.37, CI 0.76–2.46) and in the high-age group (37.0%  $\geq 35$  year; OR 1.02, CI 0.52–2.00). In addition, the risk of PPD symptoms was also slightly more in females who were employed outside the home (36.6%, OR 1.29, CI 0.76–2.18), and engaged in continuing education (41.9%, OR 1.61, CI 0.75–3.46). Result also showed an insignificant risk of PPD symptoms among those who delivered their child by cesarean (34.9%, OR 1.10, CI 0.66–1.85) and had more than four children (35.3%, OR 1.20, CI 0.69–2.07).

Out of the 352 postpartum females, normal Hb levels ( $\geq 11$  g/dL) were found in 186 (52.8%), whereas low Hb levels ( $< 11$  g/dL) were detected in 166 (47.2%). The mean Hb level was 10.98 g/dL (standard deviation  $\pm 1.49$ ). Out of the 166 low-Hb females, 56 (33.7%) attended RMH and 110 (66.3%) attended KKUH for their delivery. A total of 111 (31.53%) females noticed the presence of anemia during pregnancy, with 51 (45.9%) of them attending RMH and 60 (54.1%) attending KKUH during pregnancy. Postpartum Hb levels were significantly correlated with females who had anemia during pregnancy ( $P < 0.005$ ). However, no significant

**Table 2** Distribution of sociodemographic characteristic and its association with postpartum depression (PPD) in Saudi postpartum females (n=352)

| Variables             | Participants (%) | PPD symptoms (%) EPDS $\geq 10$ | OR (95% CI)      | P    |
|-----------------------|------------------|---------------------------------|------------------|------|
| <b>Age, years</b>     |                  |                                 |                  |      |
| 25–34                 | 207 (58.8)       | 63/207 (30.4)                   | 1.00             |      |
| 35+                   | 81 (23.0)        | 30/81 (37.0)                    | 1.34 (0.78–2.30) | 0.28 |
| $< 25$                | 64 (18.2)        | 24/64 (37.5)                    | 1.37 (0.76–2.46) | 0.29 |
| <b>Education</b>      |                  |                                 |                  |      |
| Primary               | 18 (5.1)         | 4/18 (22.2)                     | 1.00             |      |
| Secondary             | 104 (29.5)       | 37/104 (35.6)                   | 1.93 (0.59–6.30) | 0.27 |
| Intermediate          | 34 (9.7)         | 12/34 (35.3)                    | 1.91 (0.51–7.11) | 0.33 |
| University and above  | 196 (55.7)       | 64/196 (32.7)                   | 1.70 (0.54–5.36) | 0.36 |
| <b>Working status</b> |                  |                                 |                  |      |
| Housewife             | 239 (67.9)       | 74/239 (31.0)                   | 1.00             |      |
| Working outside       | 82 (23.3)        | 30/82 (36.6)                    | 1.29 (0.76–2.18) | 0.34 |
| Student               | 31 (8.8)         | 13/31 (41.9)                    | 1.61 (0.75–3.46) | 0.22 |
| <b>Parity</b>         |                  |                                 |                  |      |
| Primipara             | 115 (32.7)       | 36/115 (31.3)                   | 1.00             |      |
| 2–3                   | 121 (34.4)       | 40/121 (33.1)                   | 1.08 (0.63–1.87) | 0.77 |
| 4+                    | 116 (32.9)       | 41/116 (35.3)                   | 1.20 (0.69–2.07) | 0.51 |

**Abbreviations:** EPDS, Edinburgh Postnatal Depression Scale; OR, odds ratio; CI, confidence interval.

**Table 1** Distribution of hemoglobin (Hb) levels and postpartum depression (PPD) symptoms of Saudi females in two hospitals

| Baseline characteristic | n (%)       |
|-------------------------|-------------|
| Low Hb level            | 166 (47.2)  |
| Anemia                  | 111 (31.53) |
| PPD symptoms            | 117 (33.2)  |
| Attending KKUH          | 204 (58)    |
| Anemia                  | 60 (29.4)   |
| Low Hb level            | 110 (53.9)  |
| PPD symptoms            | 72 (35.3)   |
| Attending RML           | 148 (42)    |
| Anemia                  | 51 (34.5)   |
| Low Hb level            | 56 (37.8)   |
| PPD symptoms            | 45 (30.4)   |

**Abbreviations:** KKUH, King Khalid University Hospital; RML, Riyadh Military Hospital.

correlation was found between postpartum Hb level and iron pills taken either regularly, irregularly, or never during the pregnancy period ( $P=0.338$ ). One of the important findings was a significant correlation between low postpartum Hb levels and having a high-risk score of PPD ( $P=0.015$ ) (Table 3). Of the 117 females who scored  $\geq 10$  on the EPDS, 66 (56.4%) had low postpartum Hb levels, and 51 (43.6%) had normal postpartum Hb levels (OR 1.75, CI 1.12–2.73). In addition, a proportion of females who had anemia during pregnancy had a significant risk of PPD symptoms ( $P<0.049$ ). We also found that very few females ( $n=8$ ) who had not taken iron pills during their pregnancy had a high risk of PPD symptoms (50%) compared to those who had taken iron pills regularly (OR 2.04, CI 0.74–5.69). By using multivariate logistic regression analysis, it was observed that Hb levels  $< 11.0$  were independently associated with PPD symptoms by adjusting other variables in the model (Table 3).

## Discussion

A number of studies have focused on PPD in women, especially on how the mother's depressive disorder can affect the infant's emotional, social, and cognitive development.<sup>32</sup> In developed countries, health care professionals regularly screen for PPD in order to take appropriate care of mother-and-child health.<sup>33,34</sup> Our study was conducted to determine the risk of PPD and its associated factors in Saudi females. The average prevalence of PPD symptoms in the present

study was higher than worldwide PPD values. The increased rate of PPD symptoms in this study is not surprising, as a review study reported a very wide range of prevalence. This is due to cross-cultural factors and a diversity of different social factors.<sup>35</sup> Some studies have reported poor mental health, depression, anxiety, and psychiatric disorders in wives of polygamous husbands.<sup>36,37</sup> An important finding in this study were the significant correlations between anemia during pregnancy and postpartum Hb levels and between low Hb levels and risk of PPD symptoms. In addition, a proportion of females who were anemic during pregnancy also showed significant correlation with risk of PPD. Earlier international studies also suggested that early postpartum anemia, as indicated by low Hb concentration, is a significant risk factor for PPD.<sup>22,38,39</sup> Low Hb levels cause weakness, faintness, painful perineal sutures, and tingling of the extremities.<sup>20</sup> Several studies have also demonstrated the negative effect of anemia on self-reported quality of life, contributing to depression in the mother.<sup>40,41</sup> The link between low Hb levels and high EPDS scores is an important finding in the present study. The cause of relatively low Hb levels in the Saudi population is unclear, although the most common cause of reduced Hb in healthy adults is iron deficiency.<sup>42</sup> Iron deficiency was reported in about 50% of women of reproductive age.<sup>30</sup> Stewart<sup>42</sup> reported that iron deficiency contributes to PPD. In the current study, females who had not taken iron pills during pregnancy had high EPDS scores. Iron supplementation to

**Table 3** Obstetric variables, EPDS score, and postpartum depression (PPD) in Saudi postpartum females ( $n=352$ )

| Variables                                | Participants (%) | PPD symptoms (%) EPDS $\geq 10$ | Crude OR (95% CI) | Adjusted OR (95% CI) |
|--|------------------|---------------------------------|-------------------|----------------------|
| <b>Hemoglobin</b>                        |                  |                                 |                   |                      |
| 11+                                      | 186 (52.8)       | 51/186 (24.7)                   | 1.00              | 1.00                 |
| <11                                      | 166 (47.2)       | 66/166 (39.8)                   | 1.75 (1.12–2.73)* | 1.70 (1.05–2.74)**   |
| <b>Pregnancy period</b>                  |                  |                                 |                   |                      |
| Full term (>37 weeks)                    | 338 (96.0)       | 111/338 (32.8)                  | 1.00              | 1.00                 |
| Preterm                                  | 14 (4.0)         | 6/14 (42.9)                     | 1.53 (0.51–4.53)  | 1.57 (0.52–4.76)     |
| <b>Delivery type</b>                     |                  |                                 |                   |                      |
| Normal                                   | 269 (76.4)       | 88/269 (32.7)                   | 1.00              | 1.00                 |
| Cesarean                                 | 83 (23.6)        | 29/83 (34.9)                    | 1.10 (0.66–1.85)  | 0.96 (0.56–1.64)     |
| <b>Sex of child</b>                      |                  |                                 |                   |                      |
| Male                                     | 185 (52.6)       | 61/185 (33.0)                   | 1.00              | 1.00                 |
| Female                                   | 167 (47.4)       | 56/167 (33.5)                   | 1.03 (0.66–1.60)  | 1.04 (0.66–1.64)     |
| <b>Anemia during pregnancy</b>           |                  |                                 |                   |                      |
| No                                       | 241 (68.5)       | 72/241 (29.8)                   | 1.00              | 1.00                 |
| Yes                                      | 111 (31.5)       | 45/111 (40.5)                   | 1.60 (1.00–2.56)* | 1.44 (0.89–2.34)**   |
| <b>Iron pills given during pregnancy</b> |                  |                                 |                   |                      |
| Regular                                  | 201 (57.1)       | 66/201 (32.8)                   | 1.00              | 1.00                 |
| Irregular                                | 135 (38.4)       | 43/135 (31.8)                   | 0.96 (0.60–1.52)  | 0.95 (0.59–1.53)     |
| No                                       | 16 (4.5)         | 8/16 (50)                       | 2.14 (0.74–5.69)  | 1.88 (0.66–5.34)     |

**Notes:** \*Statistically significant ( $P=0.01$ ;  $P=0.04$ ); \*\*statistically significant ( $P=0.03$ ;  $P=0.05$ ).

**Abbreviations:** EPDS, Edinburgh Postnatal Depression Scale; OR, odds ratio; CI, confidence interval.

prevent PPD could be possible in women who are anemic during pregnancy or soon after giving birth.<sup>22</sup>

Postpartum females who were most likely to have low Hb levels and have an abnormal delivery (cesarean) were significantly correlated ( $P=0.005$ ). In addition, a proportion of females (34.7%) who were identified as anemic during pregnancy had complications relatively more often during delivery (including cesarean) compared to a nonanemic mothers. Therefore, this result may be consistent with an earlier study that showed that caesarean delivery leads to increased risk of PPD.<sup>43</sup>

The demographic variables included in this study revealed that relatively younger and older female groups were associated with higher risk of PPD, which is similar to previous studies, which stated that advanced and young age are the risk factors for PPD.<sup>44,45</sup> This case-control study has also revealed that there was low risk of PPD among housewives compared to those who were working away from their homes. However, in contrast to our finding, other studies have reported an excess risk of PPD among housewives.<sup>46,47</sup> Our study did not find maternal level of education as a risk factor for PPD, which is consistent with the finding of another study,<sup>48</sup> but differs from some other reports.<sup>47,48</sup> No differences were observed regarding risk of PPD with regard to the sex of the child, which is in line with some other studies.<sup>49,50</sup>

## Limitations

The current study is case-control based on observational data which may prove an association between low Hb level and PPD, but do not demonstrate causation. We used only the EPDS screening test, whereas multiple test confirmation by structured or semistructured interview is needed. In the present study, Hb levels were the only predictor of anemia, so we cannot be sure whether low hemoglobin levels were due to iron deficiency or any other disorder.

## Conclusion

This study showed a relatively high prevalence of PPD symptoms. Early detection of risk factors for PPD may help clinicians in early intervention and management. In the present study, we concluded that low Hb levels and anemia during pregnancy were risk factors for PPD in our study subjects. Many other factors that may be considered risk factors are age, occupation, and parity. Therefore, efforts should be made to provide intervention for depression by providing support at home. We further advise that a psychiatrist and a social worker should attend a postnatal care unit to advise mothers who may be at risk of developing not only PPD but also other

psychiatric disorders. We would also like to recommend that further studies are needed in the Saudi community to investigate further some of the risk factors that were found to be associated with PPD.

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## Disclosure

The authors report no conflicts of interest in this work.

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