Assessment of magnitude and predictors of postpartum depression among mothers attending immunization clinics in Bihar, India

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ABSTRACT

Background: Postpartum depression (PPD) is characterized by a protracted phase of emotional turmoil which ensues at the time of major life change and increased responsibilities in the upkeep of a newborn child. In fact, it represents a considerable public health problem and has been found to have multiple etiologies including sociodemographic, economical, psychosocial, obstetrical, and medical risk factors. Hence, this study was conducted with the objective of estimating the proportion of PPD among mothers attending the immunization clinics and its association with various sociodemographic and other risk factors. Methods: All eligible mothers (up to 3 months after delivery) attending the immunization clinics at the health centers were interviewed using a pre-designed questionnaire and relevant information on sociodemographic, obstetrical, and other psychosocial factors was obtained. PPD was assessed using the Edinburgh Postnatal Depression Scale (EPDS) where the cutoff score of ≥13 was considered as being at risk for PPD. Results: A total of 400 mothers were included. The overall proportion of PPD came out to be 15.0% (95% CI 11.83-18.83%) while the median EPDS score was 6.5. Logistic regression analysis revealed that Muslim religion, preterm or low birth weight baby, current medical illness, family pressure to have male child, lack of support from family networks, and domestic violence remained independent predictors of PPD. Conclusion: This study identified certain important risk factors for PPD. Thus, the sensitization of the primary healthcare providers and early screening and counseling of the mothers and their families is essential for reduction of associated morbidities and unfavorable outcomes.

Keywords: EPDS, postpartum depression, proportion, predictors, risk factors

Introduction

Depression can inflict people from every background across their life cycle spanning from the early childhood to the later stages of life, with an increased toll at crucial life events. The postnatal period is well established as an increased time of risk for the development of serious mood disorders. Depression in postpartum period has been categorized into three types on the basis of ascending levels of severity—maternity blues, postpartum depression (PPD), and psychotic depression. Since the blues are self-limiting while the florid postpartum psychosis is more obvious, it is the serious but more often under documented middle group of PPD which becomes an imperative focus of query.[1]

PPD is a form of clinical depression characterized by a protracted phase of emotional turmoil which ensues at the time of major life change and increased responsibilities in the upkeep of a newborn child. In fact, PPD is the commonest complication of childbearing affecting roughly 10–15% of women and signifies an important public health problem distressing women as well as their families.[2] Between 40% and 70% of cases of PPD have their onset in the first 3 months postpartum.[3]

Globally, the prevalence of PPD has...
been approximated at 100–150 per 1,000 births.\(^4\) Prevalence of
PPD reported in India ranged between 15.3% and 23.0% with an
incidence of 11.0%.\(^5\)

PPD can have a tremendous impact not only on the mother
herself but also can jeopardize the family, her partner, mother–
infant relationship, and the long-term emotional and cognitive
development of the child.\(^6\) Children born to depressed mothers
are more likely to have decreased effective sharing and initial
sociality with strangers and also tend to suffer more from
behavioral problems, malnutrition as well as significantly
impaired cognitive and emotional development in their future
lives.\(^7\)

PPD comprises of non-psychotic depressive episodes where
loss of interest, sleeplessness and lack of energy is experienced
by new mothers within 4–6 weeks after delivery. Symptoms can
arise anytime from immediately after delivery to up to a year
post delivery.\(^8\) The symptoms of PPD include sadness, fatigue,
insomnia, decrease or increase in appetite, reduced libido, crying
episodes, anxiety, and irritability.\(^9\)

Numerous variables have been detected which act as predictors
of postnatal depression such as prenatal depression or anxiety,
marital status and relationships, self-esteem, child care related
stress, socioeconomic conditions, infant temperament, lack of
social support, unplanned or unwanted pregnancy, etc.\(^10\)

Thus, PPD appears to have multiple etiologies including
sociodemographic, economical, psychosocial, obstetrical, and
medical risk factors. Special factors such as birth of girl child,
protective influence of traditions, financial constraints, marital
barbarities, lack of social support systems have surfaced as
predisposing factors for Postnatal depression in low- and
medium-income countries like India, Pakistan, and Turkey.\(^11\)

Despite its serious consequences and amenability to treatment,
PPD often remains unrecognized.\(^12\) The foremost step to cope
with postnatal depression is to assess the symptoms accurately
and diagnose it early. Screening assists in prompt identification
of mothers at risk and thereby helps in prevention of PPD by
provision of psychosocial interventions for those who come out
to be positive, support, and supervision of depressed mothers
by pediatricians accompanied with rigorous care by nurses and
midwives for mothers with PPD, etc.\(^13\)

Although India’s National mental health programme was
launched way back in 1982, mental health of mothers remains an
inconspicuous element of this programme. There is scarcity of
dedicated maternal mental health services in healthcare facilities,
the healthcare providers generally lack training in mental health
aspects and the availability of mental health specialists is limited
or does not exist at all. Furthermore, presently a designated
screening tool is not available in the clinical settings nor any
routine data is collected on the proportion of perinatal women
suffering from PPD.\(^14\)

Although several studies related to PPD have been conducted in
India, there is paucity of data especially in context to the state
of Bihar. Thus, this study intended to add new knowledge about
the prevalence of PPD, to highlight the important risk factors
and to generate evidence-based data to prioritize maternal mental
healthcare services in Bihar. Hence, this study was conducted
with the objective of estimating the proportion of depression
in postpartum women visiting the immunisation clinics at rural
and urban health centres attached to AIIMS Patna, Bihar and to
determine the association of various factors associated with PPD,
including sociodemographic, obstetric and other risk factors.

Methods

Type of study
Hospital-based cross-sectional study.

Study setting
Immunization clinics at UHTC (Urban Health Training Centre,
Khagaul) and RHTC (Rural Health Training Centre, Naubatpur)
attached to Department of Community and Family Medicine,
AIIMS, Patna.

Study population
All postnatal mothers attending the Immunization clinic at these
health centers.

Inclusion criteria
All women in the Postpartum period (within 3 months following
delivery) and gave consent for the study.

Exclusion criteria
1. Women not willing to participate in the study. 2. Women who
had childbirth in the previous 2 weeks. 3. Previously diagnosed
depression cases. 4. Women currently treated for any psychiatric
illnesses.

Sample size
400 (200 each from RHTC, Naubatpur and UHTC, Khagaul)

Calculation of Sample size was done by taking the prevalence of
postpartum depression from a metanalysis study.\(^15\)

\[
N = \frac{4pq}{d^2}
\]

Where, \(P = 22\%\) (Prevalence of postnatal depression)
\(q = 100 - p = 100 - 22 = 78\%,\) Taking \(d\) (relative margin of
error) = 20%
\(N = 354.5 \text{ rounding off to 400}

Sampling technique
Every 5th subject coming to the respective health center was
randomly selected till the desired sample size was reached. The
duration of the study was 6 months (July to December, 2019).
Data collection tool
A pre-designed and pre-tested questionnaire was used for collecting information on sociodemographic details, obstetrical profile, and other relevant psychosocial history. PPD was evaluated using Edinburgh Postnatal Depression Scale (EPDS). EPDS is a validated tool and is widely used to detect the depressive symptoms in the postpartum period. It is a 10 item scale that measures depression depending on the recollection of feelings and moods during the past 7 days, each item is recorded on a severity scale of 0–3, yielding a total score ranging from 0 to 30. Seven of its items are reverse scored. Possible depression is suggested by a score of 10 or greater while values equal to 13 or more are invariably associated with depression. Therefore, cutoff score of 13 or more was used to calculate postnatal depression in this study.\[16\]

The EPDS scale was administered by the investigator in the language known to the patient (Hindi)\[17\] for ease of understanding. Care was taken to avoid the possibility of the mother discussing her answers with others and complete privacy was ensured for this purpose.

Statistical analysis
Data was entered in Microsoft Excel and analyzed using SPSS version 22. Results were stated in terms of frequencies and proportions for categorical variables while mean and standard deviations were calculated for the continuous variables. The proportion of PPD was computed as percentage of mothers who got a score ≥13 in EPDS. Chi-square test was applied to assess the differences in proportions of PPD across sociodemographic, obstetric, and psychosocial variables. Crude odds ratios (COR) with 95% confidence intervals were estimated for all the study determinants. Extended Mantel-Haenszel Chi-square test for linear trend was applied to test the trend of prevalence in more than two exposure levels. Binary logistic regression was conducted to calculate the adjusted odds ratios for those variables showing significant association (P < 0.05) in the univariate analysis. Model fit was evaluated using the Hosmer–Lemeshow test.

Ethical considerations
All eligible postnatal women provided written informed consent and the study was approved by the Institutional Ethics Committee of AIIMS, Patna. Date of approval- 4/10/2018.

Results
Sociodemographic profile
A total of 400 mothers were interviewed, out of which majority 274 (68.5%) were 20–25 years old with the mean age of 23.74 ± 3.69 years. Most, that is, 363 (90.75%) were Hindus, 281 (70.25%) women belonged to backward classes and 173 (43.25%) women were educated up to Intermediate level or beyond. Majority 95.25% mothers were unemployed and nearly half (49.25%) women belonged to lower socioeconomic class.

The overall proportion of PPD came out to be 15.0% (95% CI 11.83–18.83%) while the median EPDS score was 6.5 (Q1 = 4; Q3 = 10). Figure 1 represents the proportion of PPD among the postnatal mothers attending the health centers. The proportion of PPD was much higher at UHTC (16.5%) as compared to RHTC (13.5%). Similarly, the mean EPDS score of UHTC (8.05 ± 5.17) was slightly more than RHTC (7.2 ± 5.13) and this difference was not found to be statistically significant. (t = 1.66, P = 0.09).

Among the sociodemographical factors, variables like Muslim religion (P-value = 0.03) and general caste (P-value = 0.04) were found to be significantly associated with PPD. For SES variable, crude odds ratios for each SES group was estimated taking the high SES group as reference. The odds of development of depression among lower socioeconomic status (Grade V) was 2.68 times as compared to high SES (crude OR = 2.68, 95% CI = 0.89–9.89; P value = 0.098) indicating more toward causative association. However, the estimated odds for the development of PPD among low SES was 2.25 times compared to all others levels of SES (Crude OR = 2.25, 95% CI 1.14–4.29; P value = 0.0123). Also, a significant increasing linear trend of effect of SES was observed with decrease in SES from Grade I to V (Mantel-Haenszel Chi-square for linear trend = 8.3286; Pvalue = 0.0039).

It was observed that there were more chances of developing PPD in the postpartum women aged more than 25 years of age, among less educated women, those who were employed, those who belonged to urban area, living in joint families, in katcha/Semi-pucca house and rented houses but the difference was not significant in both the groups [Table 1].

Table 2 presents the association between various obstetric factors and PPD among the women. Birth of low birth weight or preterm baby led to higher odds of developing depression (COR = 3.21) which was statistically highly significant (P = 0.001). Similarly, those women suffering from any medical illness had a higher chance of developing PPD (COR = 2.28) which was also statistically significant (P = 0.02). Other variables including primipara, having more than one girl child, unwanted pregnancies,

![Figure 1: Proportion of Postpartum depression among study population (N = 400)](image-url)
Table 1: Univariate Analysis showing the association of Socio-demographic factors with Postpartum depression (n=400)

| Socio demographic Factors | EPDS Score ≥13 | EPDS Score <13 | COR* (95% CI) | P |
|---------------------------|----------------|----------------|---------------|---|
| Age (years)               |                |                |               |   |
| ≤25                       | 42             | 13.8           | 262           | 86.2 | 0.70 (0.38-1.28) | 0.25 |
| >25                       | 18             | 18.8           | 78            | 81.2 | 1.00             |      |
| Religion                  |                |                |               |   |
| Hindu                     | 50             | 13.8           | 313           | 86.2 | 0.43 (0.20-0.95) | 0.03*|
| Muslim                    | 10             | 27.0           | 27            | 73.0 | 1.00             |      |
| Caste                     |                |                |               |   |
| General                   | 24             | 20.2           | 95            | 79.8 | 1.72 (0.97-3.03) | 0.04*|
| Backward                  | 36             | 12.8           | 245           | 87.2 | 1.00             |      |
| Educational Status        |                |                |               |   |
| Upto High school          | 35             | 15.4           | 192           | 84.6 | 1.08 (0.62-1.88) | 0.89 |
| Intermediate and beyond   | 25             | 14.5           | 148           | 85.5 | 1.00             |      |
| Occupation                |                |                |               |   |
| Unemployed                | 55             | 14.4           | 326           | 85.6 | 0.47 (0.16-1.36) | 0.18 |
| Employed                  | 5              | 26.3           | 14            | 73.7 | 1.00             |      |
| Socio-economic status b   |                |                |               |   |
| Class I                   | 5              | 10.9           | 41            | 89.1 | 1.00             | 0.0039**|
| Class II                  | 6              | 10.5           | 51            | 89.5 | 0.96 (0.22-4.30) |      |
| Class III                 | 5              | 5.9            | 80            | 94.1 | 0.51 (0.11-2.37) |      |
| Class IV                  | 25             | 18.5           | 110           | 81.5 | 1.86 (0.64-6.63) |      |
| Class V                   | 19             | 24.7           | 58            | 75.3 | 2.68 (0.87-9.89) |      |
| Area of Residence         |                |                |               |   |
| Urban                     | 33             | 16.5           | 167           | 83.5 | 1.27 (0.73-2.20) | 0.48 |
| Rural                     | 27             | 13.3           | 173           | 86.5 | 1.00             |      |
| Type of Family            |                |                |               |   |
| Joint                     | 36             | 15.5           | 196           | 84.5 | 1.10 (0.63-1.93) | 0.42 |
| Nuclear                   | 24             | 14.3           | 144           | 85.7 | 1.00             |      |
| Type of house             |                |                |               |   |
| Katcha/Semi-pucca         | 21             | 17.4           | 100           | 82.6 | 1.30 (0.72-2.31) | 0.24 |
| Pucca                     | 39             | 14.0           | 240           | 86.0 | 1.00             |      |
| House Ownership           |                |                |               |   |
| Own                       | 49             | 14.8           | 283           | 85.2 | 0.90 (0.44-1.83) | 0.71 |
| Rented/living in others    | 11             | 16.2           | 57            | 83.8 | 1.00             |      |

*Crude Odd’s Ratio, b-Modified R. G. Prasad classification. *Significant at P<0.05; **Mantel-Haenszel Chi-square for linear trend
violence (adjOR: 2.99, 95% CI: 1.07–8.33) were found as independent predictors of PPD. The logistic regression model explained 21.7% (Nagelkerke $R^2$) of the variance in PPD and correctly classified 85.5% of cases. Hosmer and Lemeshow Test showed a good fit of the model ($\chi^2 = 0.413$, $P = 0.81$).

Table 6 describes the final model for the possible risk factors of postpartum depression taking the significant risk factors as observed in Model-1 and Model-2 above. The final model showed that the Muslim religion (adjOR: 2.61, 95% CI: 1.10–6.22), preterm or low birth weight baby (adjOR: 2.32, 95% CI: 1.14–4.74), family pressure to have male child (adjOR: 5.38, 95% CI: 2.80–10.34), lack of support from family networks (adjOR: 2.56, 95% CI: 1.13–5.84), and domestic violence (adjOR: 2.91, 95% CI: 1.03–8.21) were found as independent predictors of PPD after controlling for the possible confounding factors. The final logistic regression model explained 25.0% (Nagelkerke $R^2$) of the variance in PPD and correctly classified 86.5% of cases. Hosmer and Lemeshow Test showed a good fit of the model ($\chi^2 = 3.186$, $P$ value = 0.364). Hence the six independent variables among socio-economic factors, obstetrics and clinical factors and psychosocial factors were found to have significant effect on PPD among the women.

Drop in deviance test for Model-1 and Model-2 in comparison to Model-3 was performed. Drop in deviance statistics have a $\chi^2$ distribution with $d$ df, where $d$ is the difference in number of parameters. The drop in deviance test for Model-1 in comparison to Model-3 was found to be statistically significant indicating Model-1 was not adequate ($\chi^2 = 37.43$ at 1 df, $P = 0.0001$). Similarly, the Model-2 was also not adequate ($\chi^2 = 8.57$ at 1 df, $P = 0.001$). Hence the Model-3 was found to be better in comparison to Model-1 and Model-2.

**Discussion**

The present study revealed PPD in 60 (15.0%) of postnatal women. The reported prevalence of PPD in rural areas among different studies in India have been found to be in the range of 12% to 31.4%.[8,11,13,18] whereas the prevalence in urban areas was found to be in the range of 12.75–25.08%.[20–22] According to our study, the prevalence in rural and urban areas was 13.5% and 16.5%, respectively, indicating the estimated prevalence in the range of various studies conducted across the country. The reasons for differences in the PPD prevalence could be ascribed to varied study tool and technique, sociocultural norms and poverty levels. Owing to widespread illiteracy and ignorance

### Table 2: Univariate Analysis showing the association between various obstetric factors and postpartum depression among the women ($n=400$)

| Obstetric Factors          | EPDS Score ≥13 | EPDS Score <13 | COR (95% CI) | $P$    |
|----------------------------|----------------|----------------|--------------|--------|
|                            | No. | %      | No. | %      |        |       |
| Parity                     |     |        |     |        |        |       |
| Primipara                  | 29  | 16.0   | 152 | 84.0   | 1.16 (0.67–2.00) | 0.67  |
| Multipara                  | 31  | 14.2   | 188 | 85.8   | 1.00   |       |
| Total no. of girl child    |     |        |     |        |        |       |
| >1                         | 20  | 19.0   | 85  | 81.0   | 1.50 (0.83–2.71) | 0.20  |
| ≤1                         | 40  | 13.6   | 255 | 86.4   | 1.00   |       |
| Present pregnancy          |     |        |     |        |        |       |
| Wanted                     | 53  | 14.2   | 320 | 85.8   | 0.47 (0.19–1.17) | 0.09  |
| Unwanted                   | 7   | 25.9   | 20  | 74.1   | 1.00   |       |
| Sex of newborn             |     |        |     |        |        |       |
| Female                     | 38  | 17.0   | 186 | 83.0   | 1.43 (0.81–2.52) | 0.25  |
| Male                       | 22  | 12.5   | 154 | 87.5   | 1.00   |       |
| Time since last delivery   |     |        |     |        |        |       |
| 2–8 weeks                  | 33  | 14.3   | 197 | 85.7   | 0.88 (0.51–1.54) | 0.67  |
| 8–12 weeks                 | 27  | 15.9   | 143 | 84.1   | 1.00   |       |
| Mode of delivery           |     |        |     |        |        |       |
| LSCS                       | 23  | 17.0   | 112 | 83.0   | 1.27 (0.72–2.23) | 0.46  |
| Normal                     | 37  | 14.0   | 228 | 86.0   | 1.00   |       |
| Preterm/LBW                |     |        |     |        |        |       |
| Yes                        | 18  | 31.0   | 40  | 69.0   | 3.21 (1.69–6.12) | 0.001*|
| No                         | 42  | 12.3   | 300 | 87.7   | 1.00   |       |
| Any complication during pregnancy | 10  | 21.3   | 37  | 78.7   | 1.64 (0.77–3.50) | 0.20  |
| No                         | 50  | 14.2   | 303 | 85.8   | 1.00   |       |
| Any complication during delivery | 7   | 19.4   | 29  | 80.6   | 1.42 (0.59–3.40) | 0.46  |
| No                         | 53  | 14.6   | 311 | 85.4   | 1.00   |       |
| Current medical illness    |     |        |     |        |        |       |
| Yes                        | 14  | 25.9   | 40  | 74.1   | 2.28 (1.15–4.52) | 0.02* |
| No                         | 46  | 13.3   | 300 | 86.7   | 1.00   |       |

*Crude Odd’s Ratio. Significant at $P<0.05$.
among the mothers in the study region, there is a general lack of awareness toward such depression like entity.

The proportion of postnatal depression was significantly more in mothers who were Muslims (27%) by religion than Hindus (13.8%) which showed opposite to the study\textsuperscript{8} where PPD was more common in Hindus (15.6%) than Muslims (11.8%). The association of PPD with socioeconomic status was evident as the proportion was higher, that is, 24.5% and 18.5% among Class V and IV, respectively, which was statistically significant. This is consistent

Table 3: Univariate Analysis showing the association between various psychosocial factors and postpartum depression among the women (n=400)

| Psychosocial Factors                      | EPDS Score ≥13 | EPDS Score <13 | COR (95% CI) | P      |
|------------------------------------------|----------------|----------------|--------------|--------|
|                                          | No. %          | No. %          |              |        |
| Family pressure to have male child       |                |                |              |        |
| Yes                                      | 9              | 43             | 7.38 (4.06-13.44) | 0.000* |
| No                                       | 31             | 297            | 1.00         |        |
| Poor relations with in-laws              |                |                |              |        |
| Yes                                      | 21             | 48             | 3.28 (1.78-6.04) | 0.000* |
| No                                       | 39             | 292            | 1.00         |        |
| Marital disharmony                       |                |                |              |        |
| Yes                                      | 11             | 21             | 3.41 (1.55-7.51) | 0.004* |
| No                                       | 49             | 319            | 1.00         |        |
| Lack of Support from family               |                |                |              |        |
| Yes                                      | 13             | 24             | 3.64 (1.74-7.64) | 0.001* |
| No                                       | 47             | 316            | 1.00         |        |
| Substance abuse by husband               |                |                |              |        |
| Yes                                      | 25             | 87             | 2.08 (1.18-3.67) | 0.01*  |
| No                                       | 35             | 253            | 1.00         |        |
| Domestic violence                         |                |                |              |        |
| Yes                                      | 11             | 10             | 7.41 (2.99-18.36) | 0.000* |
| No                                       | 49             | 330            | 1.00         |        |
| Any financial difficulties               |                |                |              |        |
| Yes                                      | 20             | 59             | 2.38 (1.30-4.36) | 0.008* |
| No                                       | 40             | 281            | 1.00         |        |
| Any childcare related stress             |                |                |              |        |
| Yes                                      | 2              | 19             | 0.58 (0.13-2.57) | 0.75   |
| No                                       | 58             | 321            | 1.00         |        |
| Any other recent stress factor/adverse life event |          |                |              |        |
| Yes                                      | 5              | 11             | 2.72 (0.91-8.13) | 0.07   |
| No                                       | 55             | 329            | 1.00         |        |

Table 4: Logistic regression analysis for Socio-demographic and obstetrics factors

| Predictors                        | Adjusted Odd's Ratio [Exp (B)] | 95% C.I. for Exp (B) | df | P      |
|-----------------------------------|---------------------------------|----------------------|----|--------|
|                                   | Lower                           | Upper                |    |        |
| Muslim Religion                   | 2.74                            | 1.22                 | 6.14 | 1 | 0.01  |
| Low Socio-economic status         | 2.02                            | 1.07                 | 3.83 | 1 | 0.03  |
| Preterm/LBW                       | 10.10                           | 2.22                 | 45.45 | 1 | 0.003 |
| Constant                          | 1.71                            | -                    | -    | 0.24  |

OVERALL MODEL EVALUATION

-2 Log Likelihood 314.09
Cox & Snell $R^2$ 0.058
Nagelkerke $R^2$ 0.102

GOODNESS-OF-FIT TEST

Hosmer and Lemeshow Test
Chi-square 4.20
df 2
Sig. 0.24

CLASSIFICATION TABLE

| Observed | Predicted | DEPRESSION | DEPRESSION | PERCENTAGE CORRECT |
|----------|-----------|------------|------------|--------------------|
|          | 0         | 1          | 1          | 11.7               |
| 0        | 7         | 53         | 100.0      |                    |
| 1        | 0         | 340        | 86.8       |                    |
| Overall  |           |            |            |                    |
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with several other studies indicating higher prevalence of depression among the lower income group compared to other income group. We also observed a significant increasing trend of depression with decreasing socio-economic status. Poverty results in financial issues which becomes an add on stressor, especially when another family member is increased leading to depression.

Having a low birth weight or preterm baby was observed to be a predisposing factor for PPD which is similar to a study where 45% of depressed mothers as against 9.5% of nondepressed mothers reported their newborn babies to be low birth weight and unwell. Occurrence of medical illnesses like Thyroid disease, pain at CS site, etc., in women (25.9%) was also found to be significantly associated with depressive symptoms which is same as Shivalli study where 25% (8 out of 32) women with PPD had some known medical illness. However, no mother complained of any psychiatric problems during antenatal period or in the past life. This could be attributed towards the lack of knowledge or some cultural perceptions influencing the reporting of their symptoms.

Psychosocial factors have a direct bearing on the maternal mental health. We observed a significant association of having

| Predictors                                      | Adjusted Odd's Ratio [Exp (B)] | 95% C.I. for Exp (B)         | df | P     |
|------------------------------------------------|--------------------------------|-----------------------------|----|-------|
| Muslim Religion                                | 2.61                           | 1.10                        | 6.22 |     |
| LBW/Preterm                                    | 2.32                           | 1.14                        | 4.74 |     |
| Domestic violence                              | 5.38                           | 2.80                        | 10.34 |     |
| Lack of support from family                    | 2.56                           | 1.13                        | 5.84 |     |
| Domestic violence                              | 2.91                           | 1.03                        | 8.21 |     |
| Constant                                       | 1.71                           | -                           | -    |     |

OVERALL MODEL EVALUATION

-2 Log Likelihood

Cox & Snell $R^2$ 0.143

Nagelkerke $R^2$ 0.250

GOODNESS-OF-FIT TEST

Hosmer and Lemeshow Test

Chi-square 3.186

df 2

Sig. 0.364

CLASSIFICATION TABLE

| Observed | Predicted | DEPRESSION | DEPRESSION | PERCENTAGE CORRECT |
|----------|-----------|------------|------------|-------------------|
| 0        | 1         | 12         | 48         | 20.0              |
| 1        | 10        | 330        | 97.1       |                   |
| Overall percentage |          | 85.5       |             |                   |

Table 6: Logistic regression analysis for significant factors associated with PPD

| Predictors                                      | Adjusted Odd's Ratio [Exp (B)] | 95% C.I. for Exp (B) | df | P     |
|------------------------------------------------|--------------------------------|----------------------|----|-------|
| Muslim Religion                                | 2.61                           | 1.10                 | 6.22 |     |
| LBW/Preterm                                    | 2.32                           | 1.14                 | 4.74 |     |
| Family pressure to have male child             | 5.38                           | 2.80                 | 10.34 |     |
| Lack of support from family                    | 2.56                           | 1.13                 | 5.84 |     |
| Domestic violence                              | 2.91                           | 1.03                 | 8.21 |     |
| Constant                                       | 1.71                           | -                    | -    |     |

OVERALL MODEL EVALUATION

-2 Log Likelihood

Cox & Snell $R^2$ 0.143

Nagelkerke $R^2$ 0.250

GOODNESS-OF-FIT TEST

Hosmer and Lemeshow Test

Chi-square 3.186

df 2

Sig. 0.364

CLASSIFICATION TABLE

| Observed | Predicted | DEPRESSION | DEPRESSION | PERCENTAGE CORRECT |
|----------|-----------|------------|------------|-------------------|
| 0        | 1         | 12         | 48         | 20.0              |
| 1        | 6         | 334        | 98.2       |                   |
| Overall percentage |          | 86.5       |             |                   |
family pressure to have a male child with PPD. Desire or preference for a male baby, which is deep-rooted in the Indian culture causes stressful events during gestational period and the risk of depression becomes even greater if a girl child is born. This has been corroborated by another study. Further, a significant association ($P < 0.05$) was revealed between postnatal depression with poor relationship with in-laws, marital disharmony, lack of support from family, substance abuse like alcohol and tobacco usage by husband, domestic violence and financial difficulties. Similar findings were obtained by Saguna A's study where being “unhappy with in-laws” was linked with PPD (OR = 3.4, $P = 0.03$). Shriram V et al. study reported marital disharmony (17.5%) and lack of social support from family as associated factors.

Logistic regression analysis for significant factors showed that Muslim religion, preterm or low birth weight baby, current medical illness, family pressure to have male child, lack of support from family networks and domestic violence were possible predictors for PPD. Comparable results were obtained by the WHO study where similar risk factors for PPD comprising of low maternal literacy, financial problems, birth of a baby girl, marital disharmony, lack of support from the family, history of past psychiatric diseases, high parity and complications during antenatal period were reported. Previously published studies in low to middle income nations had also revealed comparable risk factors like low birth weight, preference for male child and domestic violence.

Recent studies conducted in Ethiopia (2020) noted that “domestic violence, lack of social support and dissatisfaction in marriage” were independent determinants of PPD. Another study from China also reiterated that parents-in-law's preference to baby boy while undervaluing girl child and dissatisfaction with husband's support were strongly associated with significant PPD symptoms. Thus, there is both agreement as well as disparities in the reporting of prevalence and predictors of PPD across India and the world.

PPD screening by simpler methods like EPDS is highly recommended and should be fundamental to postnatal care in order to avert distressing consequences on mother and child. The women in the postpartum period are likely to have multiple contacts with the health systems, so primary care physician is well placed to identify the warning signs and symptoms of PPD and could thus provide an adjunct for screening and managing PPD for the benefit of women, infants and families. Therefore, these providers should be equipped with the correct knowledge and necessary tools for finding optimal solutions to PPD.

Limitations of the study

This was a hospital-based study which may not be representative of the true population, hence prone to selection bias and hindering extrapolation into the general population. Larger community-based studies on PPD are thus warranted. The study has not taken into account antenatal depression. Using a single scale to gauge presence of probable depression is yet another limitation since EPDS is a screening tool for PPD and not a confirmatory one. However, abortion or stillbirth cases did not turn up for follow-up during the study period and consequently their association with PPD could not be assessed.

Nonetheless, the present study is first of its kind in Bihar which will not only give valuable inputs to the extent of this disease entity but shall also apprise the policy makers to assign resources for capacity building in maternal mental health care by evolving and executing new guidelines/protocols for effective screening, management and the ultimate reduction of the burden of PPD.

Conclusion

The proportion of PPD reported in the current study was 15%. An intermix of sociodemographic, biological and psychosocial factors play pivotal role in the causation of PPD. Family pressure to have male child, preterm or low birth weight baby, current medical illness, lack of support from family networks and domestic violence could predict the risk of PPD. Amelioration of these principally modifiable risk factors can prevent emergence of PPD. Most determinants identified by this study can be managed by a continuum of maternal and child health care. Emotional and psychosocial support should be provided at the community level as well as at health care settings to reduce the risk of depression.

This study also advocates a monitoring mechanism in which the primary care physicians should screen patients for depression at least once during pregnancy or during the first year post delivery. Additionally, a follow up with behavioral health resources for any patient with a positive screen should also be considered. This will definitely prove to be a cost-effective approach in improving quality of life for these affected individuals. Hence, the sensitization of the primary healthcare providers and early screening and counseling of the mothers and their families is essential for the reduction of associated morbidities and unfavorable outcomes.

Acknowledgement

We thank all the mothers for their cooperation and their active participation in this novel study.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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