

Postpartum Depressive Symptoms and Associated Risk Factors Among Women Undergoing Caesarean Delivery at a Tertiary Care Centre in New Delhi, India: A Prospective Observational Study

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Abstract

Background

Postpartum depression (PPD) is an important maternal mental health concern that can adversely affect maternal functioning, mother–infant bonding, and family relationships. Women undergoing caesarean delivery may experience additional physical and psychosocial stressors during the postpartum period. Early identification of depressive symptoms and associated risk factors is essential for timely assessment and intervention.

Objective

To determine the prevalence of postpartum depressive symptoms at 1 week, 4 weeks, and 6 months after caesarean delivery and to identify associated sociodemographic, psychosocial, and obstetric risk factors.

Methods

This prospective observational study was conducted in the Department of Obstetrics and Gynaecology at Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, from October 2019 to April 2021. A total of 350 women who underwent caesarean delivery were assessed using the Edinburgh Postnatal Depression Scale (EPDS) at approximately 1 week, 4 weeks, and 6 months postpartum. An EPDS score of ≥ 13 was used to identify women with probable postpartum depression.

Sociodemographic characteristics, intimate partner violence, family history of psychiatric illness, perceived social support, and obstetric and postoperative factors were evaluated. Associations were examined using appropriate statistical tests, with statistical significance set at $p < 0.05$.

Results

Among the 350 women assessed, 64 (18.3%) screened positive for postpartum depressive symptoms at least once during the 6-month follow-up period. The reported prevalence of EPDS scores ≥ 13 was 17.43% at 1 week, 15.43% at 4 weeks, and 12.29% at 6 months postpartum. Significant associations with postpartum depressive symptoms included a family history of psychiatric illness (odds ratio [OR], 13.06; 95% confidence interval [CI], 3.95–43.15), intimate partner violence (OR, 4.68; 95% CI, 2.43–9.02), lack of social support (OR, 4.12; 95% CI, 2.28–7.46), multiparity (OR, 2.23; 95% CI, 1.26–3.94), elective caesarean delivery (OR, 2.32; 95% CI, 1.24–4.34), and postoperative complications (OR, 4.30; 95% CI, 2.05–9.04). Conflict at home, a discrepancy between the expected and actual sex of the baby, and not exclusively breastfeeding were also reported to be associated with depressive symptoms. These

associations require cautious interpretation because of sparse data in some categories and the need to clarify the longitudinal outcome definitions.

Conclusion

Postpartum depressive symptoms were common among women undergoing caesarean delivery, with a substantial proportion identified during the early postpartum period. Screening should be integrated into postnatal care, alongside assessment of intimate partner violence, family psychiatric history, social support, and postoperative complications. Appropriate referral and continued follow-up may help identify women who require additional mental health support. The findings should be interpreted in light of the study's single-centre design and the need to reconcile follow-up-specific prevalence estimates and longitudinal outcome classifications.

Introduction

Postpartum depression (PPD) is a significant maternal mental health condition that can adversely affect a woman's emotional well-being, daily functioning, relationship with her infant, and family relationships. Pregnancy, childbirth, and the postpartum period involve substantial physiological, psychological, and social changes that may increase vulnerability to depressive symptoms. Regular contact with healthcare services during this period also provides opportunities for early identification and intervention [1]. The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), describes the peripartum-onset specifier for depressive episodes beginning during pregnancy or within four weeks after delivery. However, postpartum depressive symptoms may persist or emerge beyond this period, and studies commonly assess maternal mental health throughout the first six to twelve months after childbirth [2, 3].

The global prevalence of PPD has been estimated at approximately 10–15%, although reported estimates vary according to the population studied, timing of assessment, screening instrument, and diagnostic threshold [4, 5]. Untreated postpartum depression can impair maternal functioning and mother–infant interaction and may adversely affect infant development and family relationships [6, 7]. Early recognition is therefore important to facilitate appropriate clinical assessment, psychological support, and treatment when indicated.

Caesarean section (CS) is one of the most frequently performed obstetric surgical procedures worldwide, and its use has increased in many regions [8]. Although caesarean delivery is essential when clinically indicated, postoperative pain, restricted mobility, delayed recovery, breastfeeding difficulties, and concerns about the infant may contribute to maternal psychological distress. Emergency delivery, unexpected obstetric events, and limited emotional support may further compound these challenges. Evidence suggests a possible association between caesarean delivery and postpartum depression, although the relationship may vary according to the indication for surgery, maternal characteristics, and psychosocial circumstances [9, 10].

The development of postpartum depressive symptoms is multifactorial. Previously reported risk factors include a personal or family history of psychiatric illness, intimate partner violence (IPV), marital or family conflict, inadequate social support, socioeconomic disadvantage, unintended pregnancy, and stressful life events. Obstetric and neonatal factors, including preterm delivery, low birth weight, postoperative complications, and breastfeeding difficulties, may also be associated with maternal depressive symptoms [11–14]. However, the strength and consistency of these associations differ across populations, highlighting the importance of evaluating risk factors in specific sociocultural and healthcare settings.

In India, postpartum mental health requires particular attention because social expectations, family dynamics, gender preferences, access to mental healthcare, and the availability of practical and emotional support may influence maternal well-being [5, 14]. Women recovering from caesarean delivery may have additional healthcare needs during the early postpartum period. Screening with a validated instrument, such as the Edinburgh Postnatal Depression Scale (EPDS), can help identify women who require further clinical assessment. An EPDS score above a specified threshold indicates a positive screen for probable depression and should not, by itself, be considered a definitive psychiatric diagnosis [6, 15].

Despite increasing recognition of perinatal mental health, further evidence is needed regarding the timing of postpartum depressive symptoms and their associated psychosocial, sociodemographic, obstetric, and postoperative factors among women undergoing caesarean delivery in Indian tertiary-care settings. Understanding these factors may help identify women who require closer monitoring and appropriate referral during routine postnatal care.

Therefore, this study aimed to assess the prevalence of depressive symptoms at approximately one week, four weeks, and six months after caesarean delivery among women attending a tertiary-care centre in New Delhi, India, using the EPDS. A secondary objective was to examine the associations of sociodemographic characteristics, family psychiatric history, intimate partner violence, perceived social support, obstetric characteristics, and postoperative factors with postpartum depressive symptoms and their subsequent course during follow-up.

Materials and Methods

Study Design and Setting

This prospective observational study was conducted in the Department of Obstetrics and Gynaecology, Vardhman Mahavir Medical College (VMMC) and Safdarjung Hospital, New Delhi, India, from October 2019 to April 2021. The study aimed to assess the prevalence of postpartum depressive symptoms among women undergoing caesarean delivery and identify associated sociodemographic, obstetric, and psychosocial risk factors.

Study Population and Eligibility Criteria

A total of 415 women who underwent caesarean delivery were enrolled in the study. Of these, 350 women completed the initial assessment during the first postpartum week and were included in the analysis. Women were excluded if they declined participation, had language difficulties that prevented completion of the assessment, had a known psychiatric illness, had a twin pregnancy, experienced intrauterine fetal death, or had a newborn requiring admission to the neonatal intensive care unit (NICU).

Sample Size Calculation

The sample size was calculated using an anticipated postpartum depression prevalence of 21.7%, based on a previously published study by Xie et al. [16], with an absolute precision of 4.5% and a 5% level of significance. The estimated minimum sample size was approximately 313 participants. Allowing for potential non-response or incomplete follow-up, the study aimed to include at least 350 participants in the final analysis. The actual enrolment and follow-up numbers are reported separately.

Data Collection and Baseline Assessment

Sociodemographic, obstetric, and clinical information was collected using a structured data collection form. Variables included maternal age, residence, educational status, occupation, socioeconomic characteristics, type of family, parity, obstetric history, and mode of caesarean delivery. Relevant psychosocial factors, including family psychiatric history, conflict within the household, intimate partner violence, and perceived social support, were also assessed.

Assessment of Postpartum Depressive Symptoms

Postpartum depressive symptoms were assessed using the Edinburgh Postnatal Depression Scale (EPDS), a 10-item screening instrument developed to identify women who may require further assessment for postnatal depression [6]. The EPDS was administered during the first postpartum week, at four weeks postpartum, and at six months postpartum. The initial assessment was conducted face-to-face; subsequent assessments were conducted by telephone when an in-person assessment was not feasible.

An EPDS score of **13 or higher** was used to define a positive screen for postpartum depressive symptoms. A positive EPDS screen was considered indicative of possible postpartum depression and not a definitive psychiatric diagnosis. The repeated assessments were used to evaluate depressive symptoms over the six-month postpartum period.

Assessment of Psychosocial Risk Factors

Intimate partner violence was screened using the HITS instrument (Hurt, Insult, Threaten, and Scream), a brief screening tool for identifying potential intimate partner violence [17]. A score greater than 10 was considered a positive screen, as specified in the study protocol.

Perceived social support was assessed using the Multidimensional Scale of Perceived Social Support (MSPSS), which evaluates perceived support from family, friends, and significant others [18]. Social support was categorized according to the study's predefined scoring criteria. Family psychiatric history and conflict within the household were recorded as additional psychosocial variables.

Obstetric and Postpartum Variables

Obstetric and postpartum variables included parity, elective or emergency caesarean delivery, whether the newborn's sex matched the mother's expectation, breastfeeding status, and postoperative complications. These variables were assessed for their potential association with postpartum depressive symptoms during the follow-up period.

Study Outcomes

The primary outcome was the proportion of women with an EPDS score of 13 or higher at each assessment point: the first postpartum week, four weeks postpartum, and six months postpartum.

The secondary outcome was the proportion of women who screened positive for postpartum depressive symptoms at least once during the six-month follow-up period. Associations between postpartum depressive symptoms and selected sociodemographic, obstetric, and psychosocial factors were also examined.

Statistical Analysis

Data were analysed using IBM SPSS Statistics, version 21. Categorical variables were summarized as frequencies and percentages, while continuous variables were summarized using means and standard deviations or medians and interquartile ranges, as appropriate to their distributions.

Associations between categorical variables were assessed using the chi-square test or Fisher's exact test, as appropriate. Continuous variables were compared using the independent-samples *t*-test or the Wilcoxon rank-sum test, depending on the distribution of the data and the assumptions of the statistical tests. Odds ratios (ORs) and corresponding 95% confidence intervals (CIs) were used to describe associations between selected risk factors and postpartum depressive symptoms. A two-sided *p*-value of less than 0.05 was considered statistically significant.

Ethical Considerations

The study was approved by the Institutional Ethics Committee of VMMC and Safdarjung Hospital, New Delhi (approval number: IEC/VMMC/SJH/Thesis/2019-10/193). Written informed consent was obtained from participants before enrolment. Participant confidentiality was maintained throughout data collection and analysis.

Results

Sociodemographic and Obstetric Characteristics

A total of 350 women who underwent caesarean delivery were included in the study. The sociodemographic and obstetric characteristics of the participants are presented in Table 1. Most participants were aged 21–30 years (88.29%). Regarding socioeconomic status, 41.55% belonged to the lower socioeconomic category, followed by 35.82% in the upper-lower category. Secondary education was the most common educational level (30.29%), while 27.14% of participants were illiterate.

An unplanned pregnancy was reported by 68.86% of women, and 51.43% were multiparous. Intimate partner violence was reported in 13.71% of participants, while 4.00% had a family history of psychiatric illness. Social support was available to 80.00% of women. Emergency caesarean delivery accounted for 82.00% of procedures. Preterm delivery before 37 weeks occurred in 20.86% of participants, and 27.43% of newborns had a birth weight below 2.5 kg. The newborn's sex matched maternal expectations in 82.29% of cases. Breastfeeding was reported in 95.71% of participants, postoperative complications occurred in 9.71%, and 33.43% of women required pain relief (Table 1).

Table 1
Distribution of Sociodemographic and Obstetric Characteristics Among the Study
Population (N = 350)

Characteristics	Number (n)	Percentage (%)
Maternal age (years)		
≤ 20	32	9.14
21–30	309	88.29
> 30	9	2.57
Socioeconomic status		
Upper	4	1.15
Upper middle	19	5.44
Lower middle	56	16.05
Upper lower	125	35.82
Lower	145	41.55
Educational status		
Illiterate	95	27.14
Primary	77	22.00
Secondary	106	30.29
Senior secondary	40	11.43
Graduate and above	32	9.14
Intimate partner violence	48	13.71
Family history of psychiatric illness	14	4.00
Social support available	280	80.00
Unplanned pregnancy	241	68.86
Parity		
Primiparous	170	48.57
Multiparous	180	51.43
Gestational age < 37 weeks	73	20.86
Type of caesarean delivery		
Elective	63	18.00

Characteristics	Number (n)	Percentage (%)
Maternal age (years)		
≤ 20	32	9.14
Emergency	287	82.00
Birth weight (kg)		
< 2.5	96	27.43
≥ 2.5	254	72.57
Sex of newborn		
Male	166	47.43
Female	184	52.57
Newborn's sex matched maternal expectations	288	82.29
Breastfeeding	335	95.71
Post-caesarean contraception used	219	62.57
Antenatal complications	61	17.4
Postoperative complications	34	9.7
Pain relief required	117	33.4

Prevalence of Postpartum Depressive Symptoms

Postpartum depressive symptoms were assessed using the Edinburgh Postnatal Depression Scale (EPDS), with a score of 13 or higher considered a positive screen. The prevalence of depressive symptoms was 17.43% during the first postpartum week, 15.43% at four weeks postpartum, and 12.29% at six months postpartum. Overall, 64 women (18.3%) screened positive at least once during the six-month follow-up period (Table 2).

Table 2
Prevalence of Postpartum Depressive Symptoms at Different Assessment Points

Assessment point	Number assessed	EPDS-positive, n (%)
First postpartum week	350	61 (17.43)
Four weeks postpartum	350	54 (15.43)
Six months postpartum	350	43 (12.29)
Positive at least once during six-month follow-up	350	64 (18.3)

Factors Associated with Postpartum Depressive Symptoms Within Six Months

Among the 350 participants, 64 (18.3%) screened positive for postpartum depressive symptoms at least once during the six-month follow-up period, while 286 did not. The reported significant associations included nuclear family structure, family history of psychiatric illness, multiparity, conflict at home, intimate partner violence, lack of social support, elective caesarean delivery, the newborn's sex not matching maternal expectations, not breastfeeding, and postoperative complications (Table 3).

A family history of psychiatric illness was associated with an odds ratio (OR) of 13.06 (95% confidence interval [CI] 3.95–43.15). Conflict at home had a reported OR of 32.61 (95% CI 1.66–639.43). Intimate partner violence (OR 4.68; 95% CI 2.43–9.02), lack of social support (OR 4.12; 95% CI 2.28–7.46), and postoperative complications (OR 4.30; 95% CI 2.05–9.04) were also reported to be associated with postpartum depressive symptoms (Table 3).

Table 3

Risk Factors Associated with Postpartum Depressive Symptoms Within Six Months Postpartum

Parameter	Depression, n (%) (n = 64)	No depression, n (%) (n = 286)	p-value	OR (95% CI)
Maternal age (18–30 years)	63 (98.4)	278 (97.2)	1.000	—
Patient's education (uneducated)	19 (29.7)	76 (26.6)	0.574	—
Socioeconomic status (lower)	27 (42.2)	119 (41.6)	0.899	—
Type of family (nuclear)	29 (45.3)	91 (54.7)	0.040	1.78 (1.02–3.08)
Family history of psychiatric illness	10 (15.6)	4 (1.4)	< 0.001	13.06 (3.95–43.15)
Contraception used	45 (70.3)	174 (60.8)	0.157	1.52 (0.85–2.74)
Multiparity	43 (67.2)	137 (47.9)	0.005	2.23 (1.26–3.94)
Conflict at home	3 (4.7)	0 (0.0)	0.006	32.61 (1.66–639.43)
Intimate partner violence	21 (32.8)	27 (9.4)	< 0.001	4.68 (2.43–9.02)
No social support	37 (57.8)	243 (85.0)	< 0.001	4.12 (2.28–7.46)
Unplanned pregnancy	43 (67.2)	198 (69.2)	0.750	—
Elective caesarean delivery	19 (29.7)	44 (15.4)	0.007	2.32 (1.24–4.34)
Gestational age (weeks), mean $\pm$ SD	37.78 $\pm$ 1.99	38.24 $\pm$ 1.62	0.087	—
Female newborn	38 (59.4)	146 (51.0)	0.228	—
Newborn's sex did not match maternal expectations	40 (62.5)	248 (86.7)	< 0.001	3.92 (2.13–7.21)
Birth weight (kg), mean $\pm$ SD	2.70 $\pm$ 0.58	2.80 $\pm$ 0.46	0.063	—
Not breastfeeding	57 (89.1)	278 (97.2)	0.009	4.27 (1.49–12.24)
No pain relief required	18 (28.1)	99 (34.6)	0.320	1.35 (0.74–2.46)
Antenatal complications	14 (21.9)	47 (16.4)	0.300	1.35 (0.74–2.46)

Parameter	Depression, n (%) (n = 64)	No depression, n (%) (n = 286)	p-value	OR (95% CI)
Maternal age (18–30 years)	63 (98.4)	278 (97.2)	1.000	—
Patient's education (uneducated)	19 (29.7)	76 (26.6)	0.574	—
Postoperative complications	15 (23.4)	19 (6.6)	< 0.001	4.30 (2.05–9.04)

OR: odds ratio; CI: confidence interval; SD: standard deviation. Dashes indicate that an OR was not reported.

Factors Associated with Improvement in EPDS Scores

The analysis of improving EPDS scores included 37 women in the improvement group and 288 women in the comparison group. The reported factors associated with improving EPDS scores included family structure, family history of psychiatric illness, parity, conflict at home, intimate partner violence, social support, type of caesarean delivery, whether the newborn's sex matched maternal expectations, breastfeeding status, and postoperative complications (Table 4).

A family history of psychiatric illness was associated with a reported OR of 16.57 (95% CI 4.58–59.87). Other reported associations included intimate partner violence (OR 4.64; 95% CI 2.10–10.27) and postoperative complications (OR 4.96; 95% CI 2.11–11.68) (Table 4).

Table 4
Risk Factors Associated with Improving EPDS Scores

Risk factor	Improving EPDS, n (%) (n = 37)	No depression, n (%) (n = 288)	p-value	OR (95% CI)
Type of family				
Nuclear	18 (48.6)	92 (31.9)	0.043	2.02 (1.01–4.03)
Joint	19 (51.4)	196 (68.1)	—	0.50 (0.25–0.99)
Family history of psychiatric illness	7 (18.9)	4 (1.4)	< 0.001	16.57 (4.58–59.87)
Parity				
Primiparous	12 (32.4)	150 (52.1)	0.024	0.44 (0.21–0.91)
Multiparous	25 (67.6)	138 (47.9)	—	2.26 (1.10–4.68)
Conflict at home	2 (5.4)	0 (0.0)	0.013	40.63 (1.91–863.43)
Intimate partner violence	12 (32.4)	27 (9.4)	< 0.001	4.64 (2.10–10.27)
No social support	23 (62.2)	245 (85.1)	< 0.001	3.47 (1.66–7.26)
Type of caesarean delivery				
Elective	11 (29.7)	44 (15.3)	0.027	2.35 (1.08–5.09)
Emergency	26 (70.3)	244 (84.7)	—	0.43 (0.20–0.92)
Newborn's sex did not match maternal expectations	24 (64.9)	250 (86.8)	< 0.001	3.56 (1.67–7.59)
Not breastfeeding	32 (86.5)	280 (97.2)	0.010	5.47 (1.69–17.72)
Postoperative complications	10 (27.0)	20 (6.9)	< 0.001	4.96 (2.11–11.68)

OR: odds ratio; CI: confidence interval. Dashes indicate that a separate p-value was not reported for that category.

Factors Associated with Deterioration in EPDS Scores

The analysis of deteriorating EPDS scores included five women in the deterioration group and 288 women in the comparison group. Conflict at home, intimate partner violence, lack of social support, and birth weight of 2.5 kg or less were reported as associated factors (Table 5).

The reported ORs were 192.33 (95% CI 6.86–5391.22) for conflict at home, 14.50 (95% CI 2.32–90.62) for intimate partner violence, 22.79 (95% CI 2.49–208.82) for lack of social support, and 10.22 (95% CI 1.13–92.84) for birth weight of 2.5 kg or less (Table 5).

Table 5
Risk Factors Associated with Deteriorating EPDS Scores

Parameter	Deteriorating EPDS, n (%) (n = 5)	No depression, n (%) (n = 288)	p-value	OR (95% CI)
Conflict at home	1 (20.0)	0 (0.0)	0.017	192.33 (6.86–5391.22)
Intimate partner violence	3 (60.0)	27 (9.4)	0.008	14.50 (2.32–90.62)
No social support	1 (20.0)	245 (85.1)	0.003	22.79 (2.49–208.82)
Birth weight ≤ 2.5 kg	4 (80.0)	81 (28.1)	—	10.22 (1.13–92.84)

OR: odds ratio; CI: confidence interval.

Discussion

In this study, postpartum depressive symptoms were identified in 17.43% of women during the first postpartum week, 15.43% at four weeks, and 12.29% at six months following caesarean delivery. Overall, 64 of 350 women (18.3%) screened positive for postpartum depression at least once during the six-month follow-up period. These findings highlight the importance of repeated screening throughout the postpartum period rather than relying on a single assessment. The Edinburgh Postnatal Depression Scale (EPDS) is a validated screening instrument for identifying women who may require further assessment for perinatal depression; however, a positive screening result does not independently establish a clinical diagnosis [19, 20].

The declining proportion of women screening positive over time may reflect improvement in symptoms, adjustment to motherhood, recovery following childbirth, and changes in family support. Nevertheless, the persistence of positive screens at six months highlights the need for continued follow-up. Postpartum depression is associated with maternal distress, impaired functioning, difficulties in mother–infant interaction, and adverse consequences for family well-being [21, 22]. Screening during the early postpartum period provides an opportunity for timely identification, while subsequent assessments may help detect persistent or newly emerging symptoms.

Prevalence of postpartum depressive symptoms

The overall prevalence of 18.3% observed in this cohort is consistent with the substantial burden of postpartum depressive symptoms reported across populations, although prevalence estimates vary according to the screening instrument, cutoff value, timing of assessment, study design, and characteristics of the study population [21, 23]. The use of an EPDS cutoff of 13 or more in the present study identifies women with potentially clinically significant symptoms and supports referral for diagnostic evaluation. Differences between studies should be interpreted in light of these methodological variations.

The repeated assessments in this study provide information beyond a single prevalence estimate. The proportion screening positive decreased from 17.43% in the first postpartum week to 12.29% at six months. This pattern suggests that the early postpartum period is an important opportunity for identification and support. However, improvement in prevalence over time should not be interpreted as evidence that symptoms will resolve without intervention. Women with persistent symptoms, functional impairment, or safety concerns require appropriate clinical assessment and follow-up [19, 21].

Psychosocial factors associated with postpartum depression

A family history of psychiatric illness was one of the strongest factors associated with postpartum depression in our study (OR 13.06, 95% CI 3.95–43.15). A family history of psychiatric disorders may indicate an increased underlying vulnerability to depression and other mental health conditions. The magnitude of the association in our study should be interpreted cautiously because relatively few participants reported a family history of psychiatric illness. Nevertheless, this information may be useful in identifying women who could benefit from closer psychological assessment during pregnancy and after delivery [21, 23].

Intimate partner violence (IPV) was significantly associated with postpartum depression (OR 4.68, 95% CI 2.43–9.02). Exposure to violence may contribute to psychological distress, fear, reduced autonomy, and inadequate emotional or practical support. The association observed in this study highlights the importance of assessing women's safety and psychosocial circumstances as part of maternal care. Enquiry about IPV should be conducted sensitively and confidentially, with appropriate referral and support pathways available [22, 24].

The absence of social support was associated with increased odds of postpartum depression (OR 4.12, 95% CI 2.28–7.46). Support from partners, family members, and other trusted individuals may help women manage infant care, physical recovery, sleep disruption, and the emotional demands of the postpartum period. Conversely, inadequate support may increase feelings of isolation and overwhelm. These findings support incorporating an assessment of social support into routine postnatal care and facilitating access to family counselling, community resources, and mental health services when required [21, 23].

Obstetric and postnatal factors

Multiparity was associated with postpartum depression in the present study (OR 2.23, 95% CI 1.26–3.94). Caring for a newborn while meeting the needs of other children may increase caregiving responsibilities and emotional strain, particularly when practical support is limited. However, parity-related findings vary across populations and study designs. The association should therefore be interpreted in the context of family circumstances, available support, and other maternal risk factors rather than as an independent predictor in every population [23, 25].

Elective caesarean delivery was associated with higher odds of postpartum depression than the comparison group (OR 2.32, 95% CI 1.24–4.34). This finding does not establish that elective caesarean delivery causes depression. The relationship between delivery circumstances and maternal mental health may be influenced by antenatal psychological status, expectations about childbirth, previous obstetric experiences, indications for surgery, and postoperative recovery. Assessment of maternal mental health before delivery and during postnatal follow-up may help identify women requiring additional support [25].

Postoperative complications were associated with increased odds of postpartum depression (OR 4.30, 95% CI 2.05–9.04). Complications may prolong recovery, increase discomfort, interfere with infant care, and contribute to concerns about maternal health. These factors may make the transition to motherhood more difficult, particularly when practical support is limited. The association underscores the value of integrating emotional well-being assessment into postoperative and postnatal care, especially for women experiencing complications.

Not breastfeeding was associated with postpartum depression (OR 4.27, 95% CI 1.49–12.24). Breastfeeding difficulties may contribute to distress when women experience pain, fatigue, concerns about milk supply, or difficulty establishing feeding. The relationship may also operate in the opposite direction, as depressive symptoms can interfere with breastfeeding initiation or continuation. Therefore, the observed association should not be interpreted as evidence of causation. Women should receive practical, non-judgmental feeding support tailored to their circumstances [22, 25].

The absence of a match between the baby's sex and the sex expected by the family was also associated with postpartum depression (OR 3.92, 95% CI 2.13–7.21). This finding may reflect family expectations, gender-related social pressures, and the emotional environment surrounding childbirth. It highlights the importance of understanding the mother's social circumstances and ensuring respectful, non-discriminatory maternity care. The study does not establish the reasons for these expectations or whether they preceded the onset of depressive symptoms.

Patterns of improvement and deterioration in EPDS scores

The analyses of changes in EPDS scores suggest that postpartum depressive symptoms may follow different trajectories. Among women classified as having improving EPDS scores, significant

associations were observed with family history of psychiatric illness, IPV, absence of social support, conflict at home, parity, caesarean type, breastfeeding status, and postoperative complications. These findings suggest that improvement in symptoms does not necessarily mean that the psychosocial or obstetric circumstances associated with depression have resolved.

Among women classified as having deteriorating EPDS scores, IPV, conflict at home, and absence of social support were associated with worsening symptoms. Low birth weight was also associated with deterioration. These factors may indicate overlapping maternal and infant vulnerabilities that warrant closer follow-up. However, the small number of women in the deteriorating-symptom group limits the precision of these estimates. These subgroup findings should be considered exploratory and require confirmation in larger longitudinal studies.

Taken together, the trajectory findings support repeated assessment of maternal mental health rather than assuming that symptoms identified early after delivery will improve uniformly. Follow-up should consider psychological symptoms alongside family relationships, safety, social support, infant health, and recovery from surgery.

Clinical and public health implications

The findings have practical implications for postnatal care in tertiary hospitals. A structured approach could include EPDS screening at appropriate postnatal contacts, followed by clinical assessment for women with elevated scores. Screening should be linked to a clear referral pathway because the EPDS identifies women who may need further evaluation rather than establishing a diagnosis by itself [19, 20]. Women with a family history of psychiatric illness, exposure to IPV, inadequate social support, or postoperative complications may particularly benefit from careful psychosocial assessment.

Maternal mental health services should also be responsive to women's social circumstances. Confidential enquiry about violence, assessment of available support, counselling when required, and coordination between obstetric, paediatric, and mental health services may help identify women whose needs extend beyond routine postoperative care. Integrating screening and referral into existing maternal and child health services may provide a practical approach to earlier identification and support.

Strengths and limitations

A strength of this study is the repeated assessment of women after caesarean delivery, allowing the prevalence of positive EPDS screens to be described at several postpartum time points. The study also examined a range of sociodemographic, psychosocial, obstetric, and postnatal factors within a tertiary-care setting.

Several limitations should be considered when interpreting the findings. The study was conducted at a single tertiary-care centre, which may limit generalisability to other healthcare settings and community populations. EPDS scores were used to identify depressive symptoms, and positive screens should not be interpreted as confirmed clinical diagnoses. The observed associations do not establish causality,

and unmeasured or residual confounding may have influenced the findings. In addition, the small numbers in some symptom-trajectory groups may have produced imprecise estimates. The results should therefore be interpreted as associations within this cohort rather than definitive evidence of causal effects.

Conclusion

Postpartum depressive symptoms were common among women undergoing caesarean delivery in this tertiary-care cohort, with 18.3% screening positive at least once during six months of follow-up. Family history of psychiatric illness, IPV, absence of social support, multiparity, elective caesarean delivery, postoperative complications, lack of breastfeeding, and discordance between the baby's sex and family expectations were among the factors associated with postpartum depression. The findings support repeated postpartum screening combined with psychosocial assessment and appropriate referral. Integrating maternal mental health into routine obstetric and postnatal care may help identify women who require additional support and facilitate timely clinical evaluation.

Declarations

Ethics Approval and Consent to Participate

The study was approved by the Institutional Ethics Committee of Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi (IEC/VMMC/SJH/Thesis/2019-10/193). Written informed consent was obtained from all participants before enrolment.

Consent for Publication

Not applicable.

Competing Interests

The authors declare that they have no competing interests.

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Authors' Contributions

SV, PM, RB, BS, GS, PV, and AL contributed to the study conception and design, data collection, and interpretation of the findings. SV and AL prepared the manuscript. PM, RB, BS, GS, and PV critically reviewed the manuscript. All authors reviewed and approved the final manuscript.

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Availability of Data and Materials

The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to institutional policies and applicable ethical requirements.

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