

A Comparative Study of Peripartum Mental Health Disorders between COVID-19-infected and Non-infected during the Pandemic

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ABSTRACT

Introduction: This study was done to compare the prevalence of mental health disorders between COVID-19-infected and non-infected mothers during the COVID-19 pandemic. The secondary objective was to find out the risk factors and long-term outcome of peripartum depression (PPD).

Material and methods: This was an observational and comparative study using a questionnaire-based direct interview, conducted in a tertiary hospital. After judging the inclusion and exclusion criteria, 842 subjects were selected between September 2020 to December 2020. The Edinburgh postnatal depression scale (EPDS) and COVID-19 anxiety scale (CAS) was used for evaluation of the mental health. Subjects with PPD were followed up for a year.

Results: The mean age of the subjects was 24.8 ± 3.9 years, 142 (16.8%) were confirmed COVID-19 positive. Overall, 317 (37.6%) had possible PPD (EPDS ≥ 14) and 763 (90.6%) had peripartum anxiety (EPDS anxiety subscore ≥ 4). While there was no significant difference in the prevalence of PPD (32.6% vs 39%, $p = 0.12$), peripartum anxiety was higher among COVID non-infected subjects (91.6% vs 86.6%, $p = 0.04$). Furthermore, COVID-19-related anxiety was higher among COVID-19-infected compared to the non-infected [17 (10–28) vs 15 (8–25), $p = 0.00$]. In multivariate analysis, medical comorbidities ($p = 0.000$), history of psychiatric illness ($p = 0.002$), domestic violence ($p = 0.032$) and obstetric complications ($p = 0.000$) were significant risk factors for PPD. Among the subjects who had PPD, only 35% still had depression after a year.

Conclusion: This study provides an in-depth analysis of PPD and anxiety during the COVID-19 pandemic, the risk factors, and the long-term effects.

Clinical significance: It highlights the importance of routine screening for perinatal mental health disorders and early psychiatric consultation when required.

Keywords: COVID-19 anxiety scale, COVID-19 infection, Edinburgh postnatal depression scale, Peripartum anxiety, Peripartum depression, Peripartum mental health disorders.

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INTRODUCTION

Mental health disorders during pregnancy and the postpartum period may affect up to one in five mothers,¹ with even a higher prevalence seen in low-income nations.² It carries high morbidity and mortality among mothers and newborns.^{3–5} After the onset of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) or COVID-19 pandemic,^{6–9} the incidence of depression,^{10,11} anxiety, stress, insomnia, and suicidal tendencies¹² showed a significant rise. Children and adolescents,^{13,14} elderly,¹⁵ health care workers,^{16,17} and women during pregnancy and after childbirth¹⁸ are particularly vulnerable to these ailments. Multiple studies conducted in peripartum women during the pandemic showed an increased prevalence of depression, anxiety, and mental health disorders compared to the pre-COVID time.^{18–21}

However, whether the COVID-19 infection during the peripartum period leads to higher levels of depression and anxiety than the COVID-19 non-infected subjects and their long-term effects is largely unknown. In this study, our primary objective is to determine the prevalence of PPD and anxiety and any differences between COVID-19-infected and non-infected mothers. The secondary goal is to explore the risk factors of PPD among mothers. We also aimed to follow up on the subjects for one year to explore any long-term effects on mental health.

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MATERIAL AND METHODS

Study Design and Setting

This was a hospital-based observational and longitudinal study. The study was conducted in Medical College Hospital, Kolkata, India, a tertiary hospital, and its annex, Lady Dufferin Victoria Hospital. The former was dedicated to managing COVID-19-infected patients. Subjects were selected from 1 September 2020 to 31 December 2020 and the plan was to follow up longitudinally for 1 year.

Participants

Consecutive pregnant and postpartum women, who were more than 18 years, attending the outpatients and obstetric emergency were selected. Patients with respiratory symptoms and those with medical and obstetric indications were admitted to the isolation ward as per institutional protocol. Reverse transcription polymerase chain reaction (COVID-19 RT-PCR) test was done from the nasopharyngeal swab. Patients were segregated in the respective wards according to the COVID-19 report.

Patients with moderate COVID-19 infection having red flag signs, severe disease or those who were admitted in the High dependency unit or intensive care unit were first managed optimally, stabilized and then included in our study. Mothers presented with obstetric or medical complications or hemodynamic instability were managed optimally before inclusion.

Patients with altered mental status, hemodynamic instability not resolved within the end of the study period, expired during illness, incomplete data or not being willing to give consent, were excluded from the study.

Subjects who satisfied the inclusion and exclusion criteria were divided into two groups:

- Group I: COVID-19 infected
- Group II: COVID-19 non-infected

Assessment of eligibility for inclusion into the study was done by one of the primary investigators. Subjects who provided written valid informed consent underwent face-to-face interviews with one of the postgraduate trainees or primary investigators. All the standard protective measures were taken during the collection of data from the COVID-19-infected subjects. All the information was collected in a data collection form.

The institutional ethical committee approved the study.

Sample Size Estimation

The target sample size of the subjects was determined using the standard formula: $N = Z_{\alpha}^2 P(1 - P)/d^2$,²² where N is the estimated sample size. We set $\alpha = 0.05$ (significance level) as per recommendation to get the statistic of the significance $Z_{\alpha} = 1.96$. The pooled prevalence of perinatal depression, as estimated from previous systematic reviews and meta-analyses^{1,23,24} was around 20%. Thus, we set the prevalence value for this study at $P = 0.2$. The estimated maximum marginal error for proportion, d , was kept at 0.03. We further amplified the sample size by 20% to increase the statistical power and for conducting subgroup analysis. The final minimum estimated sample size for the study was determined at 819.

Outcome Variables

Baseline Information

Detailed data collection on sociodemographic factors, family-related factors, pregnancy-related factors, and clinical information was done using an agreed pre-designed pro forma.

Edinburgh Postnatal Depression Scale

Perinatal depression was assessed using the EPDS.²⁵ It consists of 10 questions related to the subjects' mental health. Each question has a score ranging from 0 to 3, making the maximum summative score of 30. It is an internationally recommended²⁶ and validated score used to screen for depression and anxiety in the perinatal period. A recommended score of 14 or more was used as a positive screen for possible depression²⁶ and used for statistical analysis.

Edinburgh Postnatal Depression Scale Anxiety Subscore

An overall assessment of anxiety was done using the EPDS anxiety subscore (EPDS-3A). The summative score of questions 3, 4, and 5 of the EPDS^{27,28} was used for screening anxiety as per the previous studies.¹⁸ A cut-off value of 4 or more was considered for screening anxiety.

The COVID-19-related Anxiety

Anxiety toward the COVID-19 infection was assessed by the CAS,²⁹ which was recently validated in a South Indian population. This is a 7-item scale, with four options in each. The maximum score is 28 and a minimum of 7. A higher score demonstrates a higher degree of anxiety due to COVID-19.

Knowledge, Attitude, and Practice toward COVID-19 Infection

A specific set of questions was approved by the Department of Psychiatry, Medical College, Kolkata, and was used to assess awareness of COVID-19 infection among pregnant and postpartum women. They included questions about (i) knowledge, (ii) attitude, and (iii) practices. The answer to each question was recorded in binary response (yes or no).

Risk Factors of PD

We analyzed several individual factors (age, education, monthly income, comorbidities, history of psychiatric illness, and family history of psychiatric disease), family-related factors (domestic violence, lack of family support, addiction in the husband, overcrowding, and financial difficulties) and pregnancy-related factors (gestations complications, history of child loss, and previous obstetric complications) predisposing to PPD.

Follow-up

The patients detected with PPD were referred to the Department of Psychiatry for further management and follow-up. The same scale was applied to detect any long-term effect of the pandemic on the mental health of these women after 1 year.

Statistical Analysis

The data were tabulated in Microsoft Excel and analyzed using a statistical package for the social sciences (SPSS) software, version 25.0. Categorical variables were presented in numbers and percentages, whereas continuous variables were presented in mean \pm standard deviation (SD) or median (range). The Chi-squared test was used to compare the categorical data between the two study groups. The Mann-Whitney U test was used to compare COVID-19 anxiety scores between them. To determine the risk factors for probable PPD, first, univariate analysis was done, and those variables found to be significant were subjected to multivariate analysis. To find out the correlation between the different scores, the spearman correlation coefficient was calculated; $p = 0.05$ was used as a cut-off for defining statistical significance.

RESULTS

A total of 842 subjects were included in the analysis of the study. Among the subjects, 142 patients were confirmed COVID-19 positive (group I) during the conduction of the study and 670 patients were without the infection (group II). The patient recruitment is presented in [Flowchart 1](#).

Flowchart 1: Flowchart of patient selection

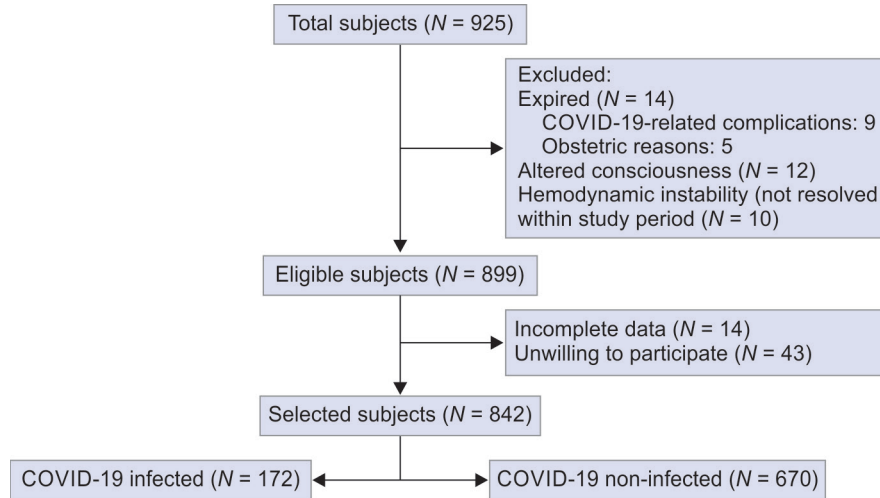


Table 1: Baseline parameters of the subjects

Parameters	N (%)
Clinical characteristics	
Pregnant	271 (32.2)
First trimester	2 (0.7)
Second trimester	16 (6.0)
Third trimester	253 (93.3)
Gravida	
1	415 (49.3)
2	326 (38.7)
3	87 (10.3)
4	10 (1.2)
≥5	4 (0.5)
Postpartum	571 (67.8)
First week	534 (93.5)
Second week	37 (6.5)
Parity	
Primiparous	521 (61.9)
Multiparous	321 (38.1)
Gestational complication	204 (24.2)
Past history of obstetric complications	137 (16.3)
Previous history of child loss	38 (4.5)
High risk-pregnancy	184 (21.9)
Medical comorbidities	197 (23.4)
Type of comorbidity	
Diabetes	25 (2.9)
Hypertension	63 (7.4)
Hypothyroid	104 (12.3)
Renal diseases	4 (0.5)
Cardiac diseases	1 (0.1)
Addiction	3 (0.3)
Outpatient	52 (6.2)
Inpatient	790 (93.8)

(Contd...)

Table 1: (Contd...)

Parameters	N (%)
Past history of psychiatric illness	28 (3.3)
SARI symptoms	47 (5.6)
Possible contact history	13 (1.5)
COVID-19 infected	172 (20.4)
Mild disease	103 (59.9)
Moderate/severe disease	69 (40.1)

SARI, severe acute respiratory infections

Sociodemographic Characteristics

The mean age of the population was 24.8 ± 3.9 years. Among the subjects, postpartum (571, 67.8%) and subjects in the third trimester of pregnancy (253, 30.0%) constitute the majority. Most of the study population belonged to urban areas (739, 87.8%). The baseline characteristics are summarized in Table 1.

The comparison between sociodemographic, pregnancy-related, and clinical parameters between the two groups showed similar characteristics, except a higher proportion of patients presenting with medical comorbidities (32% vs 21.2%, p = 0.003) were observed among the COVID-19-infected group (Table 2).

Mental Health of Pregnant and Postpartum

Among the subjects, 317 (37.6%) had probable depression (EPDS score ≥14). Peripartum anxiety (EPDS 3A ≥4) was observed among 763 (90.6%) subjects. Although there was no significant difference in the frequency of PPD, peripartum anxiety was higher (86.6% vs 91.6%, p = 0.04) among the COVID-19 non-infected subjects than those infected (Table 2).

However, anxiety related to COVID-19 was significantly higher among COVID-19-infected subjects [17 (10–28) vs 15 (8–25), p = 0.000] compared to those who were not infected (Table 2).

Knowledge, Attitude, and Practice toward COVID-19 Infection

There were several significant differences in the parameters between COVID-19-infected and non-infected subjects, as presented in Table 3.



Table 2: Comparison of sociodemographic and mental health parameters among COVID-19-infected (group I) and COVID-19 non-infected (group II) subjects

Parameters	Overall (N = 842) (%)	Group I (N = 172) (%)	Group II (N = 670) (%)	p-value
<i>Sociodemographic parameters</i>				
Age, mean \pm SD	24.8 \pm 3.9	25.8 \pm 4.1	24.8 \pm 3.7	0.97
Education, high school, or higher	432 (51.3)	89 (51.7)	330 (49.3)	0.56
Low income category	491 (58.3)	95 (55.2)	396 (59.1)	0.358
Unemployed at present	747 (88.7)	152 (88.4)	595 (88.8)	0.873
Unplanned pregnancy	247 (29.3)	46 (26.7)	220 (32.8)	0.125
Postpartum state	571 (67.8)	107 (62.2)	464 (69.3)	0.078
Primiparous	521 (61.9)	111 (64.5)	410 (61.2)	0.421
Previous child loss	38 (4.5)	7 (4.1)	31 (4.6)	0.754
Past obstetric complications	137 (16.3)	33 (19.2)	104 (15.5)	0.246
Gestational complication in present pregnancy	103 (12.2)	47 (27.3)	157 (23.4)	0.288
High-risk pregnancy	184 (21.9)	47 (27.3)	137 (20.4)	0.052
Medical comorbidities	154 (18.3)	55 (32.0)	142 (21.2)	0.003
Past history of psychiatric illness	28 (3.3)	7 (4.1)	21 (3.1)	0.542
<i>Mental health parameters</i>				
Possible PPD (EPDS \geq 14)	317 (37.6)	56 (32.6)	261 (39.0)	0.12
Peripartum anxiety (EPDS-3A \geq 4)	763 (90.6)	149 (86.6)	614 (91.6)	0.04
COVID-19-related anxiety, median (range)	15 (8–28)	17 (10–28)	15 (8–25)	0.00

N, number of subjects; %, percentage; PPD, peripartum depression; SD, standard deviation

Table 3: Comparison of knowledge, attitude and practice regarding COVID-19 disease among COVID-infected (group I) and non-infected (group II) subjects

Questions	Overall (N = 842) (%)	Group I (N = 172) (%)	Group II (N = 670) (%)	p-value
<i>Knowledge</i>				
How did you come to know about COVID-19?				
Social media	505 (60.0)	127 (73.8)	378 (56.4)	0.000
Television	565 (67.1)	132 (76.7)	433 (64.6)	0.003
Newspaper	170 (20.2)	37 (21.5)	133 (19.9)	0.628
By person	533 (63.3)	116 (67.4)	417 (62.2)	0.207
Do you have awareness regarding the symptoms and mode of transmission?	798 (94.8)	157 (91.3)	641 (95.7)	0.021
Awareness regarding the preventive measures	802 (95.2)	157 (91.3)	645 (96.3)	0.006
<i>Attitude</i>				
I feel that this could affect my pregnancy and baby	517 (61.4)	135 (78.5)	382 (57.0)	0.000
I feel nervous outside home	675 (80.2)	136 (79.1)	539 (80.4)	0.686
I feel that I should avoid hospital visit to prevent infection	647 (76.8)	137 (79.7)	510 (76.1)	0.327
I think breastfeeding can transmit the virus to my child	459 (54.5)	111 (64.5)	348 (51.9)	0.003
<i>Practice</i>				
I wash my hands with soap or use sanitizers	87 (10.3)	41 (23.8)	46 (6.9)	0.000
I wear face mask	153 (18.2)	30 (17.4)	123 (18.4)	0.781
I maintain social distancing	278 (33.0)	63 (36.6)	215 (32.1)	0.259

N, number of subjects; %, percentage; SD, standard deviation

Table 4: Factors predisposing to depression in pregnant and postpartum

Parameters	Univariate analysis			Multivariate analysis		
	No depression (EPDS < 14) N = 525 (62.4)	Possible depression (EPDS ≥ 14) N = 317 (37.6)	p-value	OR	95% CI	p-value
<i>Individual factors</i>						
High maternal age	9 (52.9)	8 (47.1)	0.418			
Low maternal age	254 (62.1)	155 (37.9)	0.885			
Low maternal education	265 (62.6)	158 (37.4)	0.859			
Monthly income						
Low	305 (62.1)	186 (37.9)				
Mid	192 (63)	113 (37.0)	0.951			
High	28 (60.9)	18 (39.1)				
Medical comorbidities	89 (45.2)	108 (54.8)	0.000	0.5	0.36–0.73	0.000
Past history of psychiatric illness	8 (28.6)	20 (71.4)	0.000	0.26	0.11–0.62	0.002
Family history of psychiatric illness	3 (33.3)	6 (66.7)	0.088			
<i>Family-related factors</i>						
Domestic violence	20 (38.5)	32 (61.5)	0.000	0.43	0.20–0.93	0.032
Addiction in husband	252 (60.7)	163 (39.3)	0.336			
Lack of family support	14 (41.2)	20 (58.8)	0.009	1.4	0.57–3.62	0.441
Nuclear family	214 (58.6)	151 (41.4)	0.051			
Overcrowding	324 (64.5)	178 (35.5)	0.111			
Financial difficulties during COVID pandemic	468 (62.4)	317 (37.6)	0.716			
<i>Pregnancy-related factors</i>						
Unplanned/unwanted pregnancy	157 (59)	109 (41)	0.175			
Antenatal state	153 (56.5)	118 (43.5)	0.015	1.3	0.94–1.79	0.108
Past obstetric complications	68 (49.6)	69 (50.4)	0.001	0.7	0.47–1.08	0.121
Gestational complication	89 (43.6)	115 (56.4)	0.000	0.46	0.33–0.66	0.000
Primiparous	325 (62.4)	196 (37.6)	0.983			
Previous history of child loss	15 (39.5)	23 (60.5)	0.003	0.53	0.25–1.13	0.105

N, number of subjects; %, percentage; SD, standard deviation

Risk Factors of PPD

Although univariate analysis of the risk factors for PPD showed several significant factors (Table 4), in multivariate analysis, only medical comorbidities [odds ratio (OR): 0.5; 95% CI: 0.36–0.73, $p = 0.000$], history of psychiatric illness [OR: 0.26; 95% CI: 0.11–0.62, $p = 0.002$], domestic violence [OR: 0.43 (95% CI: 0.2–0.9), $p = 0.032$] and obstetric complications [OR: 0.46; (95% CI: 0.33–0.66), $p = 0.000$] were significant risk factors for PPD.

Correlation between the Depression and Anxiety Scores

Although there was a good correlation between the EPDS total score and the EPDS anxiety subscore ($p = 0.787$, $p = 0.000$) and between the EPDS score and COVID-19 anxiety score ($p = 0.138$, $p = 0.000$), there was no correlation found between the EPDS anxiety subscore and the COVID-19 anxiety score.

Changes in Depression with Time

After 1 year, of the 317 subjects who had possible PPD, 115 subjects (36.2%) still had depression, while the rest had no depression. Most of the patients [291 out of 317 (91.7%)] were in the follow-up of the psychiatry department, while the rest (26 patients) were lost to follow-up.

DISCUSSION

In our study, we found a high prevalence of PPD (45.5%) and anxiety (90.6%). Although rates of PPD remained similar in the two groups, the prevalence of anxiety was higher among COVID non-infected subjects. On the other hand, anxiety related to the COVID-19 disease was significantly higher among the patients infected with the virus. The presence of medical comorbidities, history of psychiatric illness, obstetric complications, and domestic

abuse were significant risk factors of PPD. Awareness regarding the symptoms, mode of transmission, and preventive measures were higher among COVID-19 non-infected subjects, while fear of the adverse effect on pregnancy, breastfeeding, and offspring were more among the COVID-19-infected subjects. After one year, one in three patients with PPD remained depressed.

This study used validated scores to identify depression and anxiety, allowing assessment of mental health disorders among peripartum women who needed hospital visits and admission during the pandemic. We further focused on comparing these parameters among COVID-19-infected and non-infected subjects to determine the additional contribution of COVID-19 infection on PPD and anxiety.

Peripartum depression has increased significantly during the COVID-19 pandemic compared to the pre-COVID-19 era.^{18,30} A systematic review and meta-analysis of 23 studies by Yan et al.³¹ have shown that the pooled prevalence of anxiety and depression in peripartum subjects during the COVID-19 pandemic was 37 and 31%, respectively. In this study, the prevalence of possible PPD was 37.6%. A study conducted by the same institute during pre-COVID times showed a prevalence of peripartum depression of 22%.³² This markedly higher prevalence of PPD may be due to the adverse socioeconomic effects of the pandemic.

Most of the studies conducted to determine the prevalence of peripartum anxiety during the pandemic were based on self-reported surveys. They were dependent on mobile phones and the internet, requiring a minimum level of knowledge and understanding of electronic gadgets.^{18,30,31} As this study was conducted in a public hospital that predominantly caters to patients from low socioeconomic strata,³² we planned to conduct a person-to-person interview method for data collection to avoid potential bias and misinterpretation of the questions. In addition, we have included a significant number of subjects in our study over three months, as ours was a tertiary care center with a large draining area.

This is one of the first studies to compare the mental health status of COVID-19-infected and non-infected peripartum mothers. In addition, we further explored the knowledge, attitude, and practice regarding the coronavirus disease among these two groups.

Many factors contribute to PPD and have been widely studied.²³ Past psychiatric illness is one of the most important risk factors for PPD. In this study, 28 patients (3.3%) had a history of psychiatric illness, and 20(71.4%) had PPD.

This pandemic has brought about job loss, drastic cuts in salaries resulting in financial destabilization.⁹ The economic insecurities had brought about immense mental stress among individuals with violent outbursts of domestic abuse. In this study, we found that 58.3% of families had a monthly income below ₹11,000, only 57.2% of the family head had full-time jobs, 49.3% of husbands had some form of addiction, and 88.8% of families experienced some form of financial loss during the pandemic. Fifty-two (6.2%) subjects admitted to suffering from domestic abuse of some form and were significantly associated with PPD. A study by Almeida et al.³³ showed increased mental health problems in women who suffered domestic abuse. Thus, domestic violence is a long-standing issue that has significantly increased during the pandemic and needed to be addressed to keep mothers safe and secure during the pandemic.

In this study, the median score on the CAS was 15 (8–28), with higher anxiety found in the COVID-19-infected subjects. Similar

results were found in several studies from India,^{34–37} which were conducted during the pandemic.

In addition, we found a significant reduction in rates of PPD after 1 year. In a recent systematic review,³⁸ participants typically experienced no or mild symptoms of long-term anxiety and depression after COVID-19 infection. However, several studies³⁹ expressed their concerns regarding the effect of the pandemic on maternal mental health as well as the mental health and development of the growing child.

Limitations

There are some limitations of this study. First, the tools used to detect possible PPD and anxiety were screening instruments and are not diagnostic of the diseases. Second, the study sample we selected was peripartum mothers who have been admitted inpatient during the pandemic and may not represent the general population. Finally, the study has not included the assessment of the infants born during the pandemic.

CONCLUSION

In summary, the prevalence of PPD during the COVID-19 pandemic was significantly higher than the pre-pandemic times, without a significant difference between COVID-19-infected and -non-infected subjects. Although 9 out of 10 women had overall anxiety, fear due to COVID-19 was higher among the subjects infected with the virus. Medical, domestic, and obstetric factors play a significant role in PPD. There was a decline in depression among the mothers after 1 year. This study provides the foundation for future longitudinal studies focusing on the mental health, well-being, and development of infants born during the pandemic. It also highlights the importance of routine screening for peripartum anxiety and depression and early psychiatry referral where needed.

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