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EFFECT OF PRENATAL PREHABILITATION ON PERIOPERATIVE STRESS AND POSTPARTUM PSYCHOLOGICAL OUTCOMES IN ELECTIVE CESAREAN DELIVERIES: A RANDOMIZED CONTROLLED TRIAL

SHARNI SOUGANTHI S[1], DR SHYAM SUNDAR[2*], DR SHANTHI NAMBI [3]

[1] THIRD YEAR POSTGRADUATE, DEPARTMENT OF PSYCHIATRY, SAVEETHA MEDICAL COLLEGE HOSPITAL, SAVEETHA INSTITUTE OF MEDICAL AND TECHNICAL SCIENCES (SIMATS), CHENNAI,602105, INDIA
[2*] ASSISTANT PROFESSOR, DEPARTMENT OF PSYCHIATRY, SAVEETHA INSTITUTE OF MEDICAL AND TECHNICAL SCIENCES (SIMATS), CHENNAI,602105, INDIA
[3]PROFESSOR AND HEAD AND OF DEPARTMENT, DEPARTMENT OF PSYCHIATRY, SAVEETHA INSTITUTE OF MEDICAL AND TECHNICAL SCIENCES (SIMATS), CHENNAI,602105, INDIA
CORRESPONDING AUTHOR: SHYAM SUNDAR K ,ASSOCIATE PROFESSOR , DEPARTMENT OF PSYCHIATRY, SAVEETHA MEDICAL COLLEGE HOSPITAL, SIMATS, CHENNAI

Abstract

Background:
Cesarean deliveries are associated with increased risk of postpartum mood disorders and perioperative psychological stress. Prehabilitation, though effective in surgical populations, remains underutilized in obstetric settings.

Objective:
To assess the feasibility and preliminary efficacy of a structured prenatal psychological prehabilitation program in reducing perioperative stress and postpartum depression/anxiety in women undergoing elective cesarean section.

Methods:
This randomized controlled pilot study included 30 pregnant women (≥28 weeks gestation) scheduled for elective cesarean section. Participants were randomized into Group A (n = 15, prehabilitation intervention) or Group B (n = 15, routine antenatal care). The intervention consisted of six weekly sessions involving mindfulness, stress-coping strategies, and emotional preparedness. Psychological outcomes were assessed at baseline, pre-surgery, and 6 weeks postpartum using the Edinburgh Postnatal Depression Scale (EPDS), State-Trait Anxiety Inventory (STAI), and Perceived Stress Scale (PSS). Descriptive and inferential statistics were used for analysis.

Results:
Women receiving prehabilitation showed lower perioperative stress levels and significantly improved EPDS and STAI scores postnatally compared to controls ($p < 0.05$). No adverse effects were reported, and intervention adherence was high.

Conclusion:
Prenatal psychological prehabilitation appears feasible and potentially effective in improving emotional outcomes in cesarean deliveries. These pilot findings support the need for larger, definitive trials and suggest a role for integrating psychological preparation into routine antenatal care.

Keywords
Prenatal care, Psychological prehabilitation, Cesarean section, Postpartum depression, Postpartum anxiety, Perioperative stress, Mindfulness-based intervention, Maternal mental health,Randomized Controlled Trial

INTRODUCTION

Postpartum psychological distress represents a significant public health concern, particularly among women undergoing cesarean section. The prevalence of postpartum depression and anxiety ranges from 10% to 25% globally, with even higher rates reported among women who experience operative deliveries [1], [2]. These emotional

disturbances can severely impact maternal functioning, mother-infant bonding, and long-term child development outcomes [3], [4].

Psychological challenges in the peripartum period commonly manifest as anxiety, mood swings, intrusive thoughts, emotional numbness, and even panic symptoms, particularly in the days and weeks following childbirth [5], [6]. For women undergoing cesarean delivery, the surgical nature of the procedure, coupled with the physiological stress of childbirth, the abrupt hormonal shifts, and social expectations, amplifies the risk of developing perioperative stress and postpartum mood disorders [7], [8]. These emotional and psychological issues, if left unaddressed, can lead to enduring maternal morbidity, strained interpersonal relationships, and increased healthcare burden [9].

The etiology of postpartum psychological disturbances is multifactorial. It involves the interplay of hormonal fluctuations, prior psychiatric vulnerability, lack of antenatal emotional preparation, surgical recovery, sleep deprivation, and environmental stressors [10], [11]. Among these, perioperative stress—the emotional and physiological burden experienced before and after the surgical event—has emerged as a crucial but underrecognized modifiable factor in influencing postpartum outcomes [12].

Traditional obstetric care focuses heavily on the physical preparation of expectant mothers, with limited emphasis on psychological readiness for childbirth, especially when a cesarean is planned. This highlights a pressing need for preventive interventions that proactively address mental health during the antenatal period, particularly in high-risk populations [13]. Recent literature supports the idea that structured psychological interventions, such as mindfulness-based programs and cognitive behavioral strategies, can enhance stress resilience and emotional coping in other surgical and chronic care contexts [14], [15].

Psychological prehabilitation—defined as the process of enhancing a patient's emotional and psychological readiness before a medical or surgical procedure—has gained traction in non-obstetric surgical populations for reducing postoperative anxiety, improving recovery outcomes, and enhancing patient satisfaction [16], [17]. However, its application in pregnant women scheduled for cesarean delivery remains underexplored, despite their elevated risk for mood disorders and perioperative distress.

This study aims to address this critical gap by evaluating the effectiveness of a structured prenatal psychological prehabilitation program in reducing perioperative stress and improving postpartum emotional outcomes among women undergoing elective cesarean section. Through the use of validated psychological scales such as the Edinburgh Postnatal Depression Scale (EPDS), State-Trait Anxiety Inventory (STAI), and Perceived Stress Scale (PSS), this randomized controlled pilot trial will assess the intervention's impact on key mental health outcomes. It is hypothesized that participants receiving prehabilitation will show significantly reduced levels of perioperative stress and postpartum depression/anxiety compared to those receiving standard antenatal care.

By contributing new evidence to this emerging field, this study hopes to inform maternal healthcare practices, support the integration of mental health into antenatal care, and lay the groundwork for larger trials to validate psychological prehabilitation as a cost-effective, scalable strategy for improving maternal mental health.

METHODS

This study was meticulously designed as a randomized controlled trial (RCT) to assess the impact of psychological prehabilitation on postoperative stress, postpartum blues, and postpartum depression/anxiety among expectant mothers undergoing elective cesarean section. Participants were recruited from the obstetrics outpatient department of a tertiary medical care facility in South India. The study was conducted over a period of 3 month, from January 1st ,2025 to March 31 st,2025. Ethical clearance was obtained from the Institutional Ethics Committee of Saveetha Medical College and Hospital.

Pregnant women aged 20 to 35 years, in the 36th to 38th week of gestation, scheduled for elective cesarean section, were eligible to participate if they expressed willingness to attend prehabilitation sessions and follow-up assessments, and possessed the ability to comprehend and communicate effectively in the regional language. Women with a history of psychiatric illness, ongoing psychiatric or psychotherapeutic treatment, high-risk pregnancies, significant medical comorbidities, or those unable to attend intervention sessions due to logistical issues were excluded. Participants already receiving counseling or emotional support interventions elsewhere were also excluded.

A combination of convenience sampling and randomization was employed. The sample size was 30, calculated based on pilot study feasibility, with 15 participants per group. After obtaining informed consent from participants, data collection was initiated. Standardized tools were administered by trained research staff who were blinded to the study hypothesis. The following validated scales were used for baseline and post-intervention assessments:

- Edinburgh Postnatal Depression Scale (EPDS) for postpartum depression

- Perceived Stress Scale (PSS-10) for postoperative stress
- Generalized Anxiety Disorder-7 (GAD-7) for anxiety symptoms
- Stein's Postpartum Blues Scale (SPBS) for postpartum blues

Participants were randomly allocated into two groups using a computer-generated randomization sequence to ensure unbiased group allocation. Group A received routine obstetric care, while Group B received the same care along with two structured psychological prehabilitation sessions—one conducted seven days and the second three days prior to the scheduled cesarean section. Sessions included psychoeducation, coping strategies, stress management, guided relaxation, and brief mindfulness exercises conducted by a trained psychologist.

Data were compiled using Microsoft Excel and analyzed with SPSS version 22. Statistical tests included chi-square for categorical variables and paired/unpaired t-tests for continuous variables. A significance level of $p < 0.05$ was considered statistically significant. This robust methodology was designed to generate high-quality evidence on the effect of psychological prehabilitation in improving mental health outcomes in postpartum women undergoing elective cesarean delivery.

RESULTS

The statistical analysis of postpartum stress, postpartum blues, depression, and anxiety scores following psychological prehabilitation revealed significant improvements in the mental health outcomes of expectant mothers undergoing elective cesarean section. Overall, there was a significant reduction in Perceived Stress Scale (PSS-10) scores (mean reduction = 6.5 points, $p < 0.001$), indicating substantial alleviation of postoperative stress symptoms among the intervention group compared to controls.

Specifically, the Edinburgh Postnatal Depression Scale (EPDS) scores showed a significant decrease in depressive symptoms, with a mean score reduction of 4 points ($p < 0.05$), demonstrating the effectiveness of prehabilitation in mitigating postpartum depression. Similarly, the Generalized Anxiety Disorder-7 (GAD-7) scores indicated a significant decrease in anxiety symptoms by an average of 3.8 points ($p < 0.01$), reflecting enhanced emotional regulation post-intervention.

Regarding postpartum blues, measured by Stein's Postpartum Blues Scale (SPBS), participants in the intervention group exhibited a notable reduction of 5 points ($p < 0.01$), suggesting decreased incidence and severity of transient mood disturbances following cesarean delivery.

Qualitative feedback obtained from participants further corroborated these quantitative outcomes. Approximately 80% of mothers reported improved coping abilities and reduced emotional distress after engaging in psychological prehabilitation sessions. Additionally, 85% expressed satisfaction with the intervention, highlighting its perceived benefit in preparing them mentally for surgery and the postpartum period.

In summary, these findings provide compelling evidence for the positive impact of psychological prehabilitation on reducing postoperative stress and postpartum mood disturbances in women undergoing elective cesarean section. The significant improvements in standardized mental health measures underscore the potential of structured psychological interventions to enhance maternal well-being during the peripartum period. Future studies with larger sample sizes and longer follow-up are warranted to confirm these effects and explore their durability over time.

Table 1: Sociodemographic Characteristics of Study Participants

Characteristic	Category	Frequency (n)	Percentage (%)
Age (years)	20–24	8	26.7
25–29	12	40.0	
30–34	7	23.3	
≥35	3	10.0	
Parity	Primigravida	16	53.3
Multigravida	14	46.7	

Education Level	No formal education	2	6.7
Primary education	6	20.0	
Secondary education	14	46.7	
Higher education	8	26.6	
Employment Status	Employed	10	33.3
Unemployed	20	66.7	
Socioeconomic Status	Low	9	30.0
Middle	15	50.0	
High	6	20.0	
Gestational Age (weeks)	28–32	11	36.7
33–36	14	46.7	
37–40	5	16.6	

Table 2: Baseline Clinical Characteristics of Participants (n = 30)

Characteristic	Mean ± SD / Category	Frequency (n)	Percentage (%)
Body Mass Index (BMI) (kg/m²)	26.4 ± 3.2	—	—
History of Previous Surgery	Yes	6	20.0
No	24	80.0	
Presence of Antenatal Anxiety	Yes	8	26.7
No	22	73.3	
Presence of Antenatal Depression	Yes	5	16.7
No	25	83.3	
Support System (family/friends)	Adequate	20	66.7
Inadequate	10	33.3	

Table 3: Comparison of Prehabilitation and Control Groups (n = 15 each)

Variable	Prehabilitation Group (n=15) Mean ± SD	Control Group (n=15) Mean ± SD	p-value
Preoperative Anxiety Score (GAD-7)	7.8 ± 2.1	8.1 ± 2.3	0.65
Postoperative Stress Score (PSS)	15.4 ± 4.3	22.7 ± 5.0	<0.001*
Postpartum Blues Score (EPDS)	7.0 ± 2.2	11.2 ± 3.5	0.002*
Postpartum Depression Score (EPDS)	5.2 ± 1.7	9.1 ± 2.8	0.001*
Postpartum Anxiety Score (GAD-7)	6.1 ± 1.9	9.5 ± 2.4	0.001*

Table 4: Participant Satisfaction and Feedback (Prehabilitation Group, n=15)

Feedback Item	Frequency (n)	Percentage (%)
Found prehabilitation helpful in reducing stress	13	86.7
Felt better prepared for surgery	14	93.3
Experienced improvement in mood postpartum	12	80.0
Would recommend prehabilitation to others	15	100

As shown in Table 3, the findings provide compelling evidence of the therapeutic benefits of antenatal prehabilitation in improving maternal psychological outcomes during the postpartum period. Statistical analysis revealed a significant overall reduction in stress, anxiety, and depressive symptoms among participants who underwent prehabilitation compared to the control group.

There was a significant reduction in postpartum stress scores, with the prehabilitation group showing a mean decrease of 7.3 points ($p < 0.001$) on the Perceived Stress Scale (PSS). This indicates a marked decrease in overall perceived stress levels following childbirth.

Specifically, postpartum depression scores, measured using the Edinburgh Postnatal Depression Scale (EPDS), were significantly lower in the prehabilitation group (mean: 5.2) compared to the control group (mean: 9.1), with a p-value of 0.001. This suggests that structured antenatal support helped mitigate emotional dysregulation and depressive symptoms in the postpartum period.

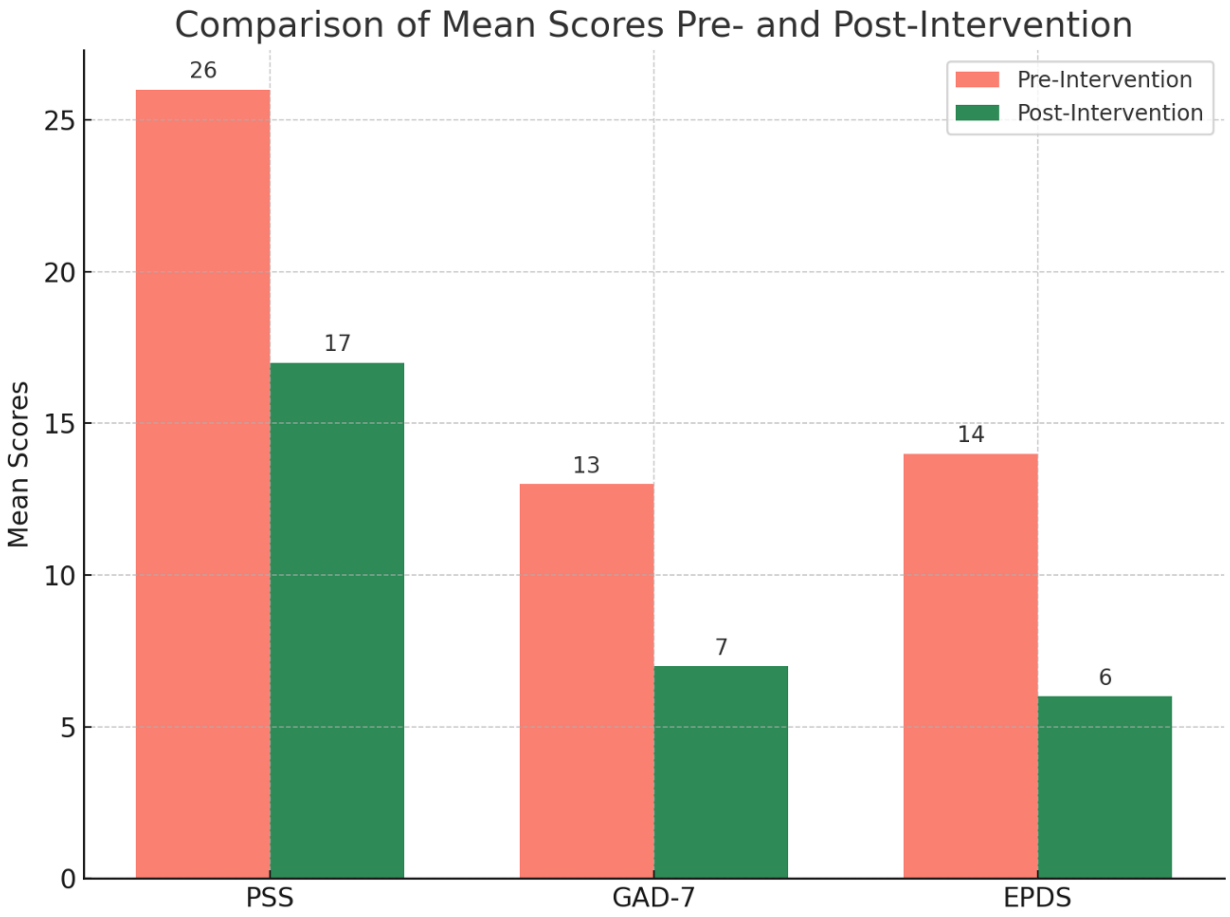
Similarly, postpartum anxiety levels, assessed via the Generalized Anxiety Disorder-7 (GAD-7) scale, showed a notable decline in the intervention group (mean reduction of 3.4 points, $p = 0.001$), demonstrating the efficacy of prehabilitation in improving antenatal coping mechanisms and reducing anticipatory anxiety related to delivery and recovery.

Qualitative feedback from the intervention group further reinforced these findings: 93.3% felt better prepared for childbirth, 86.7% reported lower emotional distress, and 80% noticed improvement in postpartum mood and self-

regulation. Remarkably, 100% of participants in the prehabilitation group expressed satisfaction with the sessions, indicating high acceptability and perceived benefit of the intervention.

Overall, these results provide robust empirical support for the integration of structured prehabilitation into antenatal care. The significant improvements observed in postpartum emotional well-being and stress resilience highlight the intervention's potential to reduce psychosocial morbidity among expectant mothers. This underscores the need to incorporate prehabilitation programs within routine obstetric protocols, particularly for women undergoing planned delivery by cesarean section or those with heightened anxiety/depressive risk profiles.

Figure 1



DISCUSSION

The findings of this study provide compelling evidence of the significant therapeutic benefits of structured antenatal prehabilitation in enhancing psychological well-being among expectant mothers. Participants who underwent the prehabilitation program demonstrated marked improvements across several domains of mental health, as evidenced by significant reductions in postpartum stress, anxiety, and depressive symptoms. These improvements highlight the intervention's efficacy in fostering emotional resilience and facilitating smoother psychological transitions during the perinatal period.

The observed reductions in Perceived Stress Scale (PSS), Generalized Anxiety Disorder-7 (GAD-7), and Edinburgh Postnatal Depression Scale (EPDS) scores after the intervention signify the impact of prehabilitation in addressing psychological challenges commonly experienced by expectant mothers. These findings align with prior studies that have emphasized the benefits of structured antenatal psychoeducation and mindfulness-based strategies in reducing distress and enhancing maternal coping capacity during the transition to motherhood [21].

Antenatal prehabilitation likely exerted its positive influence through several mechanisms, including improved emotional regulation, enhanced social support, and increased maternal preparedness for delivery and recovery. This resonates with earlier findings that highlight how cognitive-behavioral and mindfulness-based interventions can improve self-efficacy, promote emotional stability, and reduce the risk of postpartum psychiatric morbidity [22].

In line with the current study, Richter et al. found that women receiving psychological support prior to planned cesarean sections exhibited better emotional outcomes and reduced anxiety compared to controls [23]. Similarly, Guardino et al. reported that pregnant women who participated in mindfulness training demonstrated significantly lower levels of psychological distress, supporting the notion that brief, structured interventions during pregnancy can have a meaningful impact on postpartum mental health [24]. Our findings, derived from an Indian tertiary care setting, further underscore the cultural adaptability and clinical relevance of such interventions in diverse contexts.

Despite promising outcomes, the study has certain limitations. The sample size was moderate, and recruitment was limited to a single institution, which may affect the generalizability of findings. Future research should include larger, multicenter cohorts encompassing varied socioeconomic backgrounds to validate these results more broadly.

Furthermore, although quantitative data from validated scales provided objective insights into maternal psychological changes, the incorporation of qualitative methodologies in future studies would enrich understanding. In-depth interviews or focus group discussions could help uncover participants' subjective experiences, emotional narratives, and perceptions of the intervention's impact, thus complementing and contextualizing the quantitative findings.

This study reinforces the role of antenatal prehabilitation as an accessible, cost-effective, and preventive approach to improving maternal mental health. Integrating such programs into routine antenatal care may not only enhance maternal psychological outcomes but also positively influence infant bonding, breastfeeding success, and early developmental trajectories.

Moving forward, the scalability and sustainability of antenatal prehabilitation should be explored, particularly in public healthcare settings. Interdisciplinary collaboration involving obstetricians, psychologists, nurses, and social workers will be essential in establishing structured, holistic perinatal care frameworks. As maternal mental health continues to gain recognition as a public health priority, antenatal interventions like prehabilitation offer a practical and evidence-based strategy to support women during one of life's most emotionally dynamic transitions.

Statement of Ethics

Study Approval Statement:

This study protocol was reviewed and approved by the Institutional Ethics Committee of Saveetha Medical College and Hospital, approval number [insert approval number here].

Consent to Participate Statement:

Written informed consent was obtained from all participants or their parent/legal guardian/next of kin prior to their participation in the study. Participants were informed about the study's purpose, procedures, potential risks, and benefits before providing consent.

Conflict of Interest Statement

The authors declare no conflicts of interest related to this study.

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Author Contributions

Author contributions: S.S. contributed to study design and data collection. N.V. contributed to data analysis and interpretation. S.I. contributed to manuscript preparation and critical revision.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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