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Postpartum Depressive Symptoms and Antenatal Breastfeeding Self-Efficacy in Women with Caesarean Site Infection: A Prospective Case-Control Study

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Abstract

Background

Caesarean site infection (CSI) is a common postoperative complication following caesarean section (CS), yet its psychological sequelae remain poorly characterised. This study aimed to compare postpartum depressive symptoms and antenatal breastfeeding self-efficacy between women hospitalised for CSI and women with uncomplicated CS recovery.

Methods

This prospective case-control study was conducted at a tertiary referral centre in Istanbul, Turkey. Cases (n = 55) were women rehospitalised with confirmed CSI requiring inpatient antibiotic treatment; controls (n = 69) were women with uncomplicated CS at the same institution. Antenatal breastfeeding self-efficacy was assessed using the validated Turkish Prenatal Breastfeeding Self-Efficacy Scale (PBSES), administered the day prior to planned delivery. Postpartum depressive symptoms were assessed using the validated Turkish Edinburgh Postnatal Depression Scale (EPDS), administered at the 10th postnatal day in controls and at rehospitalisation in the study group (median day 11, IQR 8–14). Binary logistic regression and Pearson correlation analyses were performed.

Results

Mean EPDS scores were significantly higher in the CSI group (10.05 ± 5.10 vs. 7.49 ± 5.09; p = 0.004). Probable postpartum depression (EPDS ≥ 13) was markedly more prevalent in the CSI group (41.8% vs. 13.0%; p < 0.0001). Mean antenatal PBSES scores were substantially lower in the CSI group (67.05 ± 17.50 vs. 81.33 ± 15.84; p < 0.0001). On logistic regression, emergency CS (OR 3.11, 95% CI 1.33–7.28; p = 0.009) and lower antenatal PBSES score (OR 0.96, 95% CI 0.94–0.98; p = 0.001) were independently associated with CSI. The inverse EPDS–PBSES correlation observed in controls (r = − 0.333; p = 0.005) was absent in the CSI group (r = 0.052; p = 0.703).

Conclusions

Women rehospitalised for CSI carry a substantially greater burden of postpartum depressive symptoms and markedly lower antenatal breastfeeding self-efficacy than women with uncomplicated CS recovery. The PBSES association in the regression model reflects co-occurring psychosocial vulnerability rather than a causal role in infection. These findings support routine EPDS screening at rehospitalisation for CSI and antenatal identification of psychosocially vulnerable women to enable timely psychological preparation and lactation support.

Introduction

Caesarean section (CS) is one of the most frequently performed major surgical procedures worldwide, and rates have increased steadily over the past three decades across both high-income and low- and middle-income settings (1). Although CS can be a life-saving intervention for mother and neonate when clinically indicated, it is associated with a distinct profile of postoperative morbidity that is not encountered after uncomplicated vaginal delivery. Surgical site infection, which in the obstetric literature is frequently termed caesarean site infection (CSI), is among the most common complications to follow CS, with reported rates that vary considerably across health systems and regions (2). A recent global systematic review and meta-analysis estimated the pooled incidence of post-CS surgical site infection at approximately 5.6%, with markedly higher estimates reported in low-resource settings (2). A separate meta-analysis stratifying by income setting reported a pooled incidence of approximately 8.0% in low- and middle-income countries compared with 5.0% in high-income countries (3). CSI typically requires inpatient readmission, therapeutic antibiotic treatment, extended hospitalisation, and, in some cases, secondary surgical intervention, all of which contribute to maternal morbidity, healthcare costs, and a recovery trajectory that diverges substantially from that of uncomplicated CS (2, 4).

The early postpartum period is widely recognised as a phase of heightened psychological vulnerability. Postpartum depression (PPD) is among the most common mental health conditions affecting women after childbirth, with global prevalence estimates ranging between approximately 10% and 20% of women in the first postnatal year (5, 6). PPD is associated with adverse consequences that extend beyond maternal well-being, including impairment of mother–infant bonding, breastfeeding difficulties, and adverse effects on infant and child development (6, 7). The relationship between mode of delivery and PPD has been the subject of considerable investigation, and the available evidence remains mixed. Pooled estimates from recent meta-analyses suggest that CS may be associated with a modest increase in the risk of PPD compared with vaginal delivery, with the association appearing more consistent for emergency rather than elective CS(8, 9). Established risk factors for PPD after CS include younger maternal age, primiparity, lower educational attainment, and elevated antenatal depressive and anxiety symptoms (9). In addition, peripartum complications that prolong recovery, such as infectious morbidity, may plausibly contribute to psychological distress, although this specific pathway has received comparatively little empirical attention (9, 10).

Breastfeeding outcomes in the early postpartum period are similarly shaped by both psychological and situational factors. Within Bandura's Social Cognitive Theory, breastfeeding self-efficacy refers to a woman's perceived confidence in her capacity to initiate and sustain breastfeeding, and it has been shown to predict both the initiation and the duration of breastfeeding during the first postpartum months (11, 12, 13). The Prenatal Breastfeeding Self-Efficacy Scale (PBSES), developed by Wells and colleagues, was designed specifically to measure breastfeeding self-efficacy during the antenatal period, when most women make decisions about infant feeding, and has demonstrated acceptable psychometric performance across several linguistic and cultural adaptations, including a Turkish version (11, 12, 14). A growing body of evidence indicates that breastfeeding self-efficacy and postpartum depressive symptoms are reciprocally related, with lower self-efficacy associated with greater depressive symptom burden and with earlier cessation of exclusive breastfeeding (15, 16). Taken together, these observations suggest that antenatal breastfeeding self-efficacy and postpartum depressive symptoms represent interrelated but distinct dimensions of early maternal adjustment, both of which may be sensitive to the nature and course of the delivery experience.

Although the literature on mode of delivery, PPD, and breastfeeding outcomes is relatively well developed, the experience of women who develop CSI as a postoperative complication has received comparatively little attention. Existing studies have largely focused on comparisons between modes of delivery rather than on differences in postoperative course, and few have jointly examined postpartum depressive symptoms and antenatal breastfeeding self-efficacy in women with CSI compared with women with an uncomplicated CS (9). It could be presumed that this subgroup represents a distinct risk profile however the evidence is lacking.

Against this background, the present prospective case-control study aimed to compare postpartum depressive symptoms, measured by the Edinburgh Postnatal Depression Scale (EPDS), and antenatal breastfeeding self-efficacy, measured by the PBSES, between women hospitalised for CSI and women with an uncomplicated CS at the same tertiary centre. Secondary aims were to describe the demographic, obstetric, and surgical characteristics of the two groups, and to examine the relationships between EPDS and PBSES scores and relevant clinical variables.

Methods

Study Design and Setting

This was a prospective case-control study conducted at a tertiary referral centre in Istanbul, Turkey with a substantial volume of obstetric deliveries, providing an appropriate setting for the investigation of postoperative infectious complications following CS. Ethical approval was obtained from the institutional Ethics Committee (Decision No:4939, Approval Date: 01/07/2025), and the study was conducted in accordance with the principles of the Declaration of Helsinki. Written informed consent was obtained from all participants prior to enrolment.

Participants

During the study period, the Prenatal Breastfeeding Self-Efficacy Scale (PBSES) was administered as part of antenatal assessment to all women with a planned birth at the study centre, encompassing both planned vaginal deliveries and planned CS (see below). From this antenatally screened population, women whose mode of delivery was CS (elective or emergency) were eligible for inclusion in the present case-control analysis; women with planned vaginal deliveries were excluded. Group allocation among eligible women was determined post hoc on the basis of postoperative course. The study group (cases) comprised eligible women admitted or re-admitted to hospital following CS with a confirmed diagnosis of CSI, defined as wound infection at the surgical incision site requiring hospitalisation and therapeutic antibiotic treatment. The control group comprised eligible women who underwent uncomplicated CS at the same institution without evidence of postoperative wound infection or other major complications. Exclusion criteria included immunocompromising conditions not captured as documented comorbidities (e.g., active malignancy or HIV infection), receipt of systemic immunosuppressive therapy, and inability to provide informed consent. A total of 124 women were included in the final analysis: 55 in the study group and 69 in the control group.

Data Collection

Demographic, obstetric, and surgical data were collected from patient medical records and structured clinical interviews at the time of enrolment. Variables recorded included maternal age, body mass index (BMI), and active smoking status, defined as smoking more than five cigarettes per day. Obstetric history was documented, including gravidity, parity, number of prior abortions, and mode of previous deliveries, categorised as spontaneous vaginal delivery (SVD), CS, primary CS, or combined SVD and CS. Medical comorbidities were recorded, including diabetes mellitus and other chronic conditions associated with increased susceptibility to infection, such as chronic obstructive pulmonary disease (COPD), cardiac disease, and hepatic disease. Prior surgical history was also documented. Surgical variables relating to the index CS included the indication (elective or emergency), skin closure suture material (Vicryl absorbable suture or Prolene non-absorbable suture), and operative duration in minutes. Rehospitalisation day post CS and hospital length of stay was recorded for all participants.

Wound Assessment and Microbiological Evaluation

In the study group, wound assessment was performed by the attending clinical team at the time of admission for CSI. Wound swab cultures were obtained from the site of infection prior to initiation of therapeutic antibiotics wherever clinically feasible, and microbiological results, including identification of causative organisms, were recorded. Antibiotic treatment regimens administered during the inpatient episode were documented for all study group participants. In the control group, all patients received standard institutional perioperative prophylaxis with intravenous cefazolin; wound cultures were not performed in this group given the absence of infectious complications.

Psychosocial and Breastfeeding Assessments

Two validated patient-reported outcome measures were administered to all participants: the Prenatal Breastfeeding Self-Efficacy Scale (PBSES) and the Edinburgh Postnatal Depression Scale (EPDS). These instruments were administered at different time points, as described below.

Antenatal breastfeeding self-efficacy was assessed using the PBSES, a 20-item self-report instrument developed by Wells et al. to measure a pregnant woman's confidence in her ability to initiate and sustain breastfeeding (11). Items are rated on a five-point Likert scale ranging from 1 (definitely not confident) to 5 (completely confident), yielding a total score between 20 and 100, with higher scores indicating greater breastfeeding self-efficacy. The scale encompasses four domains: desires and skills necessary for breastfeeding, information collection, breastfeeding near other people, and resistance to social pressure. The Turkish version of the PBSES, validated by Uyar Hazar and Uzar Akça among 200 pregnant women in Turkey, was used in the present study (14). The Turkish validation demonstrated good content validity (Content Validity Index = 0.98), a four-factor structure explaining 59.06% of total variance, and acceptable internal consistency reliability (Cronbach's alpha = 0.86). The PBSES was administered as part of antenatal assessment to all women with a planned birth at the study centre during the study period, comprising both planned vaginal deliveries and planned CS, on the day prior to the scheduled delivery date. As described in Section 2.2, only women whose mode of delivery was CS were subsequently included in the present case-control analysis. For these women, the PBSES therefore provided a standardised antenatal baseline measure

of breastfeeding self-efficacy that was obtained prior to delivery and prior to the development of any postoperative complication, and thus independently of subsequent group allocation.

Postpartum depressive symptoms were assessed using the EPDS, a 10-item self-report questionnaire validated for use in the postnatal period. The Turkish version of the EPDS, validated by Aydın et al. in a sample of 341 postpartum women using the Structured Clinical Interview for DSM-IV (SCID-I) as the gold standard, was used in the present study (17). The Turkish validation demonstrated acceptable reliability (Cronbach's alpha = 0.72), a sensitivity of 75.5%, and a specificity of 71.5%. Total scores range from 0 to 30, with a threshold score of ≥ 13 applied to identify probable postpartum depression, consistent with the cut-off recommended by both Turkish validation studies and established international guidelines. The EPDS was administered postnatally, at different time points between the two groups: in the control group, it was completed at the routine 10th-day postnatal clinic appointment; in the study group, it was administered at the day of rehospitalisation for CSI. Rehospitalisation day was also calculated for each patients and presented in the results section.

Statistical Analysis

Statistical analyses were performed using NCSS 2007 (Number Cruncher Statistical System; Utah, USA). Normality of continuous variable distributions was assessed using the Shapiro–Wilk test. Normally distributed continuous variables are presented as mean ± standard deviation (SD) and were compared between groups using the independent samples t-test. Non-normally distributed continuous variables are presented as median with interquartile range (IQR) and were compared using the Mann–Whitney U test. Categorical variables are presented as absolute frequencies and percentages and were compared using the chi-square test. Pearson correlation analysis was performed to examine associations between EPDS and PBSES scores and continuous clinical variables, reported separately for the control group, the study group, and the combined cohort. Binary logistic regression analysis was conducted to identify factors independently associated with CSI. Covariates were selected a priori on the basis of clinical relevance and included CS indication (emergency vs. elective), skin closure suture material (Prolene vs. Vicryl, reference category), EPDS score, and PBSES score. Hospital length of stay was excluded from the regression model as it is a defining characteristic of the study group by design rather than an independent predictor of infection. Comorbidity was also excluded from the regression model owing to the small number of affected women (n = 5, 4.0% of the total cohort), which precluded stable estimation of a covariate-specific odds ratio. Results of logistic regression are reported as odds ratios (OR) with 95% confidence intervals (CI). A p-value of less than 0.05 was considered statistically significant for all analyses. A formal a priori power calculation was not performed; however, a post hoc power analysis based on the observed difference in the prevalence of probable PPD (EPDS ≥ 13) between groups (41.8% vs. 13.0%) indicated that the study achieved 95.9% power at a two-sided α of 0.05 (Cohen's h = 0.669), suggesting that the sample size was adequate to detect the primary between-group difference.

Results

Demographic and Obstetric Characteristics

A total of 124 women were included in the study: 69 in the control group and 55 in the study group. The demographic and clinical characteristics of both groups are presented in Table 1. The mean age of the control and study groups was 30.83 ± 5.42 and 29.36 ± 5.71 years, respectively, with no statistically significant difference between groups (p = 0.148). Obstetric history, including the distribution of vaginal deliveries, CS, primary CS, and combined delivery histories, did not differ significantly between groups (p = 0.063). Mean gravidity (2.35 ± 0.95 vs. 2.20 ± 1.38; p = 0.100), parity (2.22 ± 0.95 vs. 1.98 ± 1.16; p = 0.077), and number of prior abortions (0.13 ± 0.42 vs. 0.20 ± 0.49; p = 0.316) were also comparable across groups. BMI did not differ significantly (31.62 ± 4.46 vs. 32.49 ± 4.93 kg/m²; p = 0.300). Active smoking status was similarly distributed between groups (p = 0.741).

Table 1

Demographic, obstetric, and clinical characteristics of the control and study groups, with Edinburgh Postnatal Depression Scale (EPDS) and Prenatal Breastfeeding Self-Efficacy Scale (PBSES) scores.

Variable		Control Group (n = 69)		Study Group (n = 55)		p-value
Age (years)	Mean ± SD	30.83 ± 5.42		29.36 ± 5.71		0.148*
Obstetric history	SVD (n, %)	0	0.00%	2	3.64%	0.063†
	CS (n, %)	47	68.12%	26	47.27%	
	Primary CS (n, %)	14	20.29%	19	34.55%	
	SVD + CS (n, %)	8	11.59%	8	14.55%	
Gravidity	Mean ± SD	2.35 ± 0.95		2.20 ± 1.38		0.100‡
	Median (IQR)	2 (2–3)		2 (1–3)		
Parity	Mean ± SD	2.22 ± 0.95		1.98 ± 1.16		0.077‡
	Median (IQR)	2 (2–3)		2 (1–3)		
Abortions	Mean ± SD	0.13 ± 0.42		0.20 ± 0.49		0.316‡
	Median (IQR)	0 (0–0)		0 (0–0)		
BMI (kg/m²)	Mean ± SD	31.62 ± 4.46		32.49 ± 4.93		0.300*
Smoking (> 5/day)	No (n, %)	58	84.06%	45	81.82%	0.741†
	Yes (n, %)	11	15.94%	10	18.18%	
Comorbidity	None (n, %)	69	100.00%	50	90.91%	**0.038†**
	DM (n, %)	0	0.00%	1	1.82%	
	Other (n, %)	0	0.00%	4	7.27%	
Prior surgery	None (n, %)	20	28.99%	22	40.00%	0.104†
	CS (n, %)	49	71.01%	30	54.55%	
	Laparotomy (myomectomy/hysterectomy) (n, %)	0	0.00%	1	1.82%	
	Other (n, %)	0	0.00%	2	3.64%	
CS indication	Elective (n, %)	44	63.77%	22	40.00%	**0.008†**

Variable		Control Group (n = 69)		Study Group (n = 55)		p-value
	Emergency (n, %)	25	36.23%	33	60.00%	
Skin suture material	Prolene (n, %)	4	5.80%	12	21.82%	**0.008†**
	Vicryl (n, %)	65	94.20%	43	78.18%	
Operative duration (min)	Mean ± SD	37.38 ± 10.68		38.76 ± 15.68		0.748‡
	Median (IQR)	35 (30–43)		34 (27.75–46)		
Rehospitalisation (days post-CS)	Median (IQR)	-	-	11 (8–13)		
Hospital LOS (days)	Mean ± SD	2.10 ± 0.35		9.62 ± 6.18		**< 0.0001‡**
	Median (IQR)	2 (2–2)		8 (5–12)		
EPDS score	Mean ± SD	7.49 ± 5.09		10.05 ± 5.10		**0.004‡**
	Median (IQR)	8 (4–10)		9 (6–14)		
EPDS category	< 13 (n, %)	60	87.0%	32	58.18%	**< 0.0001†**
	≥ 13 (n, %)	9	13.0%	23	41.82%	
PBSES score	Mean ± SD	81.33 ± 15.84		67.05 ± 17.50		**< 0.0001***
PBSES category	Low (20–50) (n, %)	4	5.8%	14	25.45%	**< 0.0001†**
	Moderate (51–80) (n, %)	20	29.0%	25	45.45%	
	High (81–100) (n, %)	45	65.2%	16	29.09%	

** Independent samples t-test; ‡ Mann–Whitney U test; † Chi-square test. LOS = length of stay; SVD = spontaneous vaginal delivery; CS = caesarean section; BMI = body mass index; EPDS = Edinburgh Postnatal Depression Scale; PBSES = Prenatal Breastfeeding Self-Efficacy Scale. Bold p-values indicate statistical significance (p < 0.05).*

Clinical and Surgical Characteristics

The presence of a medical comorbidity was significantly more frequent in the study group compared to controls (9.09% vs. 0.00%; p = 0.038), with conditions including diabetes mellitus and other chronic conditions such as COPD, cardiac or liver diseases that increases susceptibility to infection. Prior surgical history, predominantly previous CS, did not differ significantly between groups (p = 0.104).

Emergency CS was significantly more common in the study group (60.00%) compared to the control group (36.23%), whereas elective CS predominated among controls (63.77%; p = 0.008). Prolene non-absorbable suture material for skin closure was used significantly more often in the study group (21.82% vs. 5.80%; p = 0.008), with Vicryl absorbable suture used in the majority of both groups (78.18% vs. 94.20%, respectively). Operative duration was comparable between groups (37.38 ± 10.68 vs. 38.76 ± 15.68 minutes; p = 0.748). The median day of rehospitalisation in the study group was 11 days post-CS (IQR 8–14), which is broadly comparable to the 10th postnatal day at which EPDS was administered in the control group. As expected by study design, mean hospital length of stay was substantially longer in the study group (9.62 ± 6.18 days; median 8, IQR 5–12) compared to controls (2.10 ± 0.35 days; median 2, IQR 2–2; p < 0.0001).

Edinburgh Postnatal Depression Scale

Mean EPDS scores were significantly higher in the study group compared to controls (10.05 ± 5.10 vs. 7.49 ± 5.09; p = 0.004). Applying the standard clinical threshold of ≥ 13, which is widely used to identify probable postpartum depression, a significantly greater proportion of women in the study group scored at or above this cut-off (41.82%) compared to controls (13.0%; p < 0.0001).

Breastfeeding Self-Efficacy

Mean PBSES scores were significantly lower in the study group than in controls (67.05 ± 17.50 vs. 81.33 ± 15.84; p < 0.0001). Categorical analysis further demonstrated marked differences in self-efficacy distribution: low self-efficacy (score 20–50) was present in 25.45% of the study group versus 5.8% of controls; moderate self-efficacy (51–80) in 45.45% versus 29.0%; and high self-efficacy (81–100) in 29.09% versus 65.2% (p < 0.0001).

Logistic Regression Analysis

To identify independent predictors of CSI, binary logistic regression was performed including emergency CS indication, Prolene skin suture use (reference: Vicryl), EPDS score, and PBSES score as covariates (Table 2). Hospital length of stay was excluded from the model as it is a defining characteristic of the study group rather than an independent predictor. Emergency CS indication (OR 3.11, 95% CI 1.33–7.28; p = 0.009) and lower PBSES score (OR 0.96, 95% CI 0.94–0.98; p = 0.001) were independently associated with CSI. EPDS score did not reach statistical significance as an independent predictor in the multivariate model (OR 1.08, 95% CI 1.00–1.18; p = 0.056).

Table 2
Logistic regression analysis: predictors of caesarean site infection.

Variable	OR (95% CI)	p-value
CS indication (emergency vs. elective)	3.11 (1.33–7.28)	**0.009**
Skin suture material (Vicryl vs. Prolene)	0.20 (0.05–0.77)	**0.019**
Edinburgh Postnatal Depression Scale score	1.08 (1.00–1.18)	0.056
Prenatal Breastfeeding Self-Efficacy Scale score	0.96 (0.94–0.98)	**0.001**

OR = odds ratio; CI = confidence interval. Reference category for CS indication: elective. Bold p-values indicate statistical significance (p < 0.05).

Correlation Analysis

Pearson correlation analyses between EPDS and PBSES scores and continuous clinical variables are presented in Table 3, stratified by group and for the combined cohort. In the control group, EPDS score was significantly and negatively correlated with PBSES score (r = − 0.333; p = 0.005), indicating that higher depressive symptom burden was associated with lower breastfeeding self-efficacy among women with uncomplicated CS. A significant negative correlation was also observed between EPDS score and operative duration in the control group (r = − 0.267; p = 0.026). No significant correlations were identified between EPDS or PBSES scores and age, gravidity, parity, abortion history, BMI, or hospital length of stay in the control group (all p > 0.05).

In the study group, no significant correlations were observed between EPDS score and any of the continuous variables examined, including PBSES score (r = 0.052; p = 0.703), age, gravidity, parity, abortion history, BMI, operative duration, or hospital length of stay (all p > 0.05). Similarly, PBSES score in the study group was not significantly correlated with any continuous clinical variable (all p > 0.05).

Across the combined cohort, EPDS score was significantly negatively correlated with PBSES score (r = − 0.233; p = 0.009) and positively correlated with hospital length of stay (r = 0.188; p = 0.036), indicating that longer hospitalisation was associated with greater depressive symptom severity. No significant correlations between EPDS or PBSES scores and age, gravidity, parity, abortion history, BMI, or operative duration were identified in the combined cohort (all p > 0.05).

Table 3
Pearson correlation coefficients (r) and p-values for EPDS and PBSES scores with continuous clinical variables, by group and in the combined cohort.

Variable		Control Group		Study Group		Combined Cohort	
		EPDS	PBSES	EPDS	PBSES	EPDS	PBSES
EPDS	r	—	**-0.333**	—	0.052	—	**-0.233**
	p	—	**0.005**	—	0.703	—	**0.009**
PBSES	r	**-0.333**	—	0.052	—	**-0.233**	—
	p	**0.005**	—	0.703	—	**0.009**	—
Age (years)	r	-0.074	-0.013	0.040	-0.005	-0.053	0.043
	p	0.545	0.917	0.772	0.970	0.557	0.632
Gravidity	r	0.098	-0.167	-0.146	-0.100	-0.047	-0.092
	p	0.425	0.171	0.286	0.467	0.604	0.307
Parity	r	0.138	-0.181	-0.065	-0.074	0.009	-0.070
	p	0.257	0.136	0.635	0.593	0.920	0.437
Abortions	r	-0.093	0.033	-0.191	-0.110	-0.116	-0.066
	p	0.447	0.785	0.162	0.424	0.198	0.463
BMI	r	-0.187	0.046	-0.229	-0.097	-0.176	-0.059
	p	0.124	0.708	0.093	0.482	0.054	0.512
Operative duration (min)	r	**-0.267**	0.048	0.082	-0.144	-0.064	-0.075
	p	**0.026**	0.698	0.555	0.298	0.484	0.412
Hospital LOS (days)	r	-0.086	0.124	0.056	-0.133	**0.188**	**-0.326**
	p	0.480	0.310	0.685	0.332	**0.036**	**0.0001**

Wound Culture Results and Antibiotic Treatment

Antibiotic regimens and wound culture results in the study group are presented in Table 4. All control group patients received standard prophylactic antibiotic therapy with cefazolin (100%). In the study group, the most commonly administered therapeutic regimen was ceftriaxone plus metronidazole (67.27%), followed by gentamicin plus clindamycin, piperacillin-tazobactam, and ampicillin-sulbactam (7.27% each), with escalation regimens including meropenem and combination therapies used in the remainder.

Wound culture results in the study group revealed no pathogen growth in 29.09% of cases. Among culture-positive cases, *Staphylococcus aureus* (23.64%) and normal skin flora organisms (23.64%) were the most frequently isolated pathogens, followed by *Klebsiella pneumoniae* (5.45%), *Escherichia coli* (5.45%), *Proteus mirabilis* (3.64%), *Enterococcus faecalis* (1.82%), and multiple concurrent pathogens (7.27%).

Table 4
Antibiotic treatment regimens and wound culture pathogen distribution in the study group.

Variable		Control Group (n = 69)		Study Group (n = 55)	
		n	%	n	%
Antibiotic regimen	Cefazolin	69	100.0%	0	0.0%
	Ceftriaxone + metronidazole	0	0.0%	37	67.27%
	Gentamicin + clindamycin	0	0.0%	4	7.27%
	Piperacillin-tazobactam	0	0.0%	4	7.27%
	Ampicillin-sulbactam	0	0.0%	4	7.27%
	Meropenem	0	0.0%	1	1.82%
	Ceftriaxone + metronidazole + piperacillin-tazobactam	0	0.0%	2	3.64%
	Teicoplanin + meropenem	0	0.0%	1	1.82%
	Teicoplanin + meropenem + piperacillin-tazobactam	0	0.0%	1	1.82%
	Piperacillin-tazobactam + ampicillin-sulbactam	0	0.0%	1	1.82%
Wound culture pathogen	No growth	—	—	16	29.09%
	Staphylococcus aureus	—	—	13	23.64%
	Skin flora organisms	—	—	13	23.64%
	Klebsiella pneumoniae	—	—	3	5.45%
	Escherichia coli	—	—	3	5.45%
	Proteus mirabilis	—	—	2	3.64%
	Enterococcus faecalis	—	—	1	1.82%
	Multiple pathogens	—	—	4	7.27%

Discussion

This prospective case-control study is among the first to jointly examine postpartum depressive symptoms and antenatal breastfeeding self-efficacy in the specific context of CSI, addressing a gap in the literature on the psychological sequelae of postoperative obstetric complications. Three principal findings emerged: the prevalence of probable PPD (EPDS ≥ 13) was markedly higher in the CSI group than in controls ($p < 0.0001$), with significantly higher mean EPDS scores ($p = 0.004$); antenatal PBSES scores were substantially lower in the CSI group and lower PBSES score was retained as an independent covariate in the logistic regression

model (p = 0.001); and the inverse EPDS–PBSES correlation observed in controls (r = − 0.333; p = 0.005) was absent in the CSI group (r = 0.052; p = 0.703).

Postpartum depressive symptoms in the context of caesarean site infection

The 41.8% prevalence of probable PPD in the CSI group substantially exceeds the 10–20% global pooled estimate for PPD following caesarean section (5, 6). This elevated prevalence is likely the product of at least three converging factors in the CSI group. First, emergency CS was significantly more common among women who developed CSI (60.0% versus 36.2%; p = 0.008); emergency CS is both a well-established risk factor for surgical site infection due to compromised preparation time and antibiotic prophylaxis, (2, 10) and independently associated with elevated PPD risk relative to elective CS (8, 9). Second, the substantially lower antenatal PBSES scores in the CSI group indicate that these women entered the postpartum period with a pre-existing psychosocial vulnerability, reduced breastfeeding confidence that likely reflects broader subclinical antenatal distress or anxiety, which may have lowered their psychological threshold for developing clinically significant depressive symptoms when a postoperative complication arose (13, 15). Third, the acute experience of an unexpected postoperative complication with its associated wound pain, treatment uncertainty, and disruption to early maternal–infant bonding constitutes an independent psychological stressor in its own right. The convergence of these three factors in the same women makes the elevated PPD prevalence both clinically explicable and unsurprising.

Although EPDS score did not independently predict CSI in the logistic regression model (OR 1.08, 95% CI 1.00–1.18; p = 0.056), the consistently directional odds ratio warrants acknowledgement. The EPDS was administered at the time of rehospitalisation rather than after a prolonged inpatient stay, meaning that the effect of hospitalisation duration on scores is excluded by design. The elevated scores at presentation may reflect the acute psychological response to an unexpected complication, the uncertainty of treatment, and the anticipatory anxiety of separation from a newborn during a biologically sensitive period for maternal–infant attachment, which are recognised precipitants of postpartum depressive and anxiety symptoms (8, 9). Equally, the directionality may run in the opposite direction: PPD is characterised by fatigue, reduced motivation, and impaired capacity for self-care, (6) and women who enter the postpartum period with significant depressive symptom burden may be less able to adhere to wound hygiene, dressing changes, and early infection recognition after discharge, thereby creating conditions that favour the development of CSI prior to rehospitalisation. This pathway is mechanistically consistent with PPD symptomatology but cannot be confirmed from these cross-sectional data. What the findings confirm is that elevated depressive symptoms and CSI co-occur at a frequency substantially exceeding that of an uncomplicated postoperative population, with direct implications for clinical care.

Antenatal breastfeeding self-efficacy as a prenatal psychosocial marker

PBSES scores were obtained antenatally, on the day prior to planned delivery, before any postoperative complication had occurred. This temporal design reduces reverse causation bias and supports a coherent interpretation of the regression finding. Low self-efficacy scores were present in 25.4% of the CSI group

versus 5.8% of controls; high scores in only 29.1% versus 65.2%. The PBSES is an instrument designed to assess a pregnant woman's confidence in initiating and sustaining breastfeeding and was not developed as a surgical risk prediction tool (11). The per-unit OR of 0.96 reflects a modest incremental association, and the overlapping score distributions confirm that no clinically meaningful discrimination between women who will or will not develop CSI is achievable from PBSES score alone. The determinants of CSI are surgical, microbiological, and host-related, and no psychosocial measure can substitute for these (2, 10).

The more appropriate interpretation is that lower antenatal breastfeeding self-efficacy serves as a proxy marker of broader psychosocial vulnerability. Within Bandura's Social Cognitive Theory, breastfeeding self-efficacy reflects generalised confidence in performing a demanding health behaviour under uncertainty (11) and low prenatal PBSES scores have been associated with reduced social support, subclinical antenatal psychological distress, and poorer postpartum outcomes (13, 15). A robust inverse association between BSES-SF and EPDS scores has been confirmed in Turkish postpartum samples (β = −0.178), (18) and CS-delivered women consistently demonstrate lower breastfeeding self-efficacy than those delivering vaginally, with lowest scores in those undergoing CS under general anaesthesia (19). Ahmadinezhad et al. (2024) further confirmed in a meta-analysis that postpartum depression is significantly associated with reduced breastfeeding self-efficacy in the first days after delivery (day 1: SMD = 0.62; day 3: SMD = 0.84) (15). The present findings extend this literature to a specific postoperative complication, identifying women with CSI as a subgroup with particularly compromised antenatal breastfeeding self-efficacy and elevated postpartum depressive burden.

The complete loss of the EPDS–PBSES correlation in the CSI group ($r = 0.052$; $p = 0.703$), in contrast to controls ($r = -0.333$; $p = 0.005$), suggests that rehospitalisation for wound infection may produce a form of situational distress sufficiently acute to decouple these psychosocial constructs, an observation without precedent in the literature and warranting longitudinal investigation. Figueiredo et al. (2013) have detailed how breastfeeding may attenuate the cortisol stress response and offer protection against PPD, (20) a pathway likely disrupted when wound infection delays or prevents breastfeeding establishment.

Implications for clinical practice

These findings do not support repurposing the PBSES as a CSI risk screening tool; infection risk is determined by surgical and microbiological factors that no psychosocial instrument can predict (2, 10). What they do support is the use of routinely collected antenatal PBSES scores to identify psychosocially vulnerable women for targeted antenatal support. Antenatal interventions combining psychological support with breastfeeding education have been shown to improve breastfeeding self-efficacy and reduce postpartum depressive symptoms in women at risk, (21) and support-based interventions to improve breastfeeding self-efficacy are effective and modifiable, (22) suggesting that proactive antenatal psychological preparation and lactation counselling particularly for women facing CS may reduce both the psychological burden and the functional impairment that appear to converge in women who subsequently develop CSI. At rehospitalisation for CSI, the 41.8% prevalence of probable PPD argues for systematic EPDS screening as part of the infection management pathway, with direct referral to psychiatric or psychological services where indicated. The bidirectional relationship between depressive symptoms and breastfeeding self-efficacy (15, 16, 20) suggests that supporting breastfeeding confidence alongside mental health intervention during the inpatient episode may offer mutually reinforcing benefits for maternal recovery.

Strengths and limitations

Strengths include the prospective case-control design, use of validated Turkish-language instruments (EPDS (17), PBSES (14)), and the critical temporal feature that PBSES scores were collected antenatally, before any complication had occurred, reducing reverse causation bias. Limitations include the single-centre design, modest sample size, and the differential timing of EPDS administration between groups which introduces a confound that cannot be fully resolved. The absence of data on antenatal psychiatric history, social support, and longitudinal breastfeeding outcomes limits characterisation of psychosocial trajectories. Causal inference is not possible from these cross-sectional assessments. Larger multicentre prospective studies with repeated psychosocial measurement are needed to confirm and extend these findings.

Conclusion

Women rehospitalised for CSI carry a substantially greater burden of postpartum depressive symptoms and demonstrate markedly lower antenatal breastfeeding self-efficacy than women with uncomplicated caesarean recovery. The PBSES association with CSI on logistic regression should not be interpreted as a predictive relationship; it reflects the co-occurrence of psychosocial vulnerability with postoperative infectious morbidity. The decoupling of EPDS and PBSES scores in the CSI group points to a qualitatively distinct psychological experience in this population. These findings support the importance of routine EPDS screening at rehospitalisation for CSI, and the case for antenatal identification of psychosocially vulnerable women to enable timely psychological support before and during a complicated postoperative course.

Declarations

Ethics approval and consent to participate: Ethical approval was obtained from the institutional Clinical Research Ethics Committee (Decision No:4939, Approval Date: 01/07/2025). The study was conducted in accordance with the principles of the Declaration of Helsinki. Written informed consent was obtained from all participants prior to enrolment.

Consent for publication: Not applicable.

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