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RESEARCH ARTICLE

Postnatal Counseling on Cortisol Levels and Edinburgh Postnatal Depression Scale Scores of Postpartum Depression Patients

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ABSTRACT

Childbirth, or parturition, is a physiological process that can lead to significant psychological challenges, including postpartum depression, approximately 15.6% of mothers in developed countries and up to 22.4% in Indonesia. This study evaluates the effects of postnatal counseling on cortisol levels and Edinburgh Postnatal Depression Scale scores among postpartum women at Dr. Soetomo General Academic Hospital (RSUD Dr. Soetomo) in Surabaya. A quasi-experimental, prospective cohort study was performed in 2024 with 20 postpartum women having EPDS scores ≥13. Participants were separated into a counseling group and a control group. Salivary cortisol levels and EPDS scores were measured before and after a 14-day counseling intervention. Statistical analyses used paired and independent t-tests, with $p < 0.05$ as the threshold for significance. The average initial EPDS score was 15 (SD±1.84), and the salivary cortisol level was 18.13 g/dL (SD±8.19). After 14 days, the counseling group showed significant reductions in both EPDS scores (d=1.879; p<0.001) and cortisol levels (d=1.347; p=0.002). In contrast, the control group exhibited no significant changes. Reductions were markedly larger in the counseling group than in the control group for EPDS scores (9.72 vs. 2.62; p=0.014) and cortisol levels (6.1 vs. 0.5; p<0.001). A strong correlation was found between cortisol reduction and EPDS score improvement (r=0.506; p=0.023). Postnatal counseling effectively reduces EPDS scores and cortisol levels, alleviating postpartum depression. These results support integrating counseling into maternal healthcare and further research on its implementation.

INTRODUCTION

Childbirth is a series of physiological processes experienced by women to deliver the product of conception through the birth canal, followed by psychological adaptation during the postpartum period. This adaptation involves the phases of taking in, taking hold, and letting go, where failure to progress through these phases may lead to postpartum depression (Bahiyatun, 2009). Postpartum depression (PPD) is a global public health issue with prevalence rates ranging from 5% to 60.8% worldwide, specifically 7.4–13% in developing countries and 15.6% in developed countries (Ghaedrahmati et al., 2017). In Indonesia, the prevalence of postpartum depression (PPD) reaches 18.37%, with a study in Malang City reporting that 22.8% of postpartum mothers experienced PPD on the seventh day after childbirth. Meanwhile, in Surabaya, the incidence of PPD was reported at 22% in 2003. Many cases of PPD remain undiagnosed due to societal stigma surrounding mental health disorders (Ghaedrahmati et al., 2017).

PPD is often linked to self-injurious behavior and has significant adverse effects on child development and maternal mental health. Mothers affected by PPD are generally less attentive to the needs of their baby, which can impact the child's cognitive, emotional, social, and physical development.

Additionally, PPD increases the risk of marital relationship disturbances, suicidal ideation, and even thoughts of harming or killing the baby (Ghaedrahmati et al., 2017; Reeder et al., 2011). Twenty percent of maternal deaths are attributed to suicide, while social stigma prevents many cases of postpartum depression (PPD) from being diagnosed. In the United States, a survey of 1,400 mothers revealed that nearly 40% of those experiencing PPD symptoms avoided seeking medical help due to shame, fear of stigma, or the belief that their condition did not require treatment (Manso-Córdoba et al., 2020). In Indonesia, the prevalence of PPD stands at 18.37%. Many postpartum mothers appear clinically normal but experience undiagnosed PPD, which often goes untreated as it is dismissed as a normal emotional and psychological adjustment.

To detect postpartum depression (PPD), several countries utilize the Edinburgh Postnatal Depression Scale (EPDS), a highly valid screening tool capable of assessing mood changes quickly without requiring healthcare providers with specialized psychiatric expertise (Gondo, 2022). The EPDS is a commonly utilized tool for screening symptoms of anxiety and depression during the perinatal period. The emotional experiences of the preceding week are evaluated through a ten-item Likert scale. Developed in 1987 by Cox, Sagovsky, and Holden, this self-report instrument originated in the United Kingdom and has since been widely adopted beyond the UK. The EPDS has demonstrated high validity, as reflected in the original UK validation study, where nine out of ten women diagnosed with postpartum depression by a psychiatrist were correctly identified using a cut-off score on the EPDS in a blinded comparison. The EPDS questionnaire consists of 10 items, including favorable and unfavorable items (Shrestha et al., 2016). It the primary tool used for screening perinatal depression, with 10 or higher and 13 or higher frequently used as cut-off scores to identify women potentially suffering from depression. The EPDS is a reliable method for screening pregnant and postpartum women effectively, but specific cut-off values vary. A meta-analysis examining EPDS screening accuracy, which included studies up to February 2007, found that a cut-off score of 12 or higher had greater combined specificity (0.87) and sensitivity (0.86) for detecting major depression in postpartum women (based on 15 studies) compared to a cut-off score of 13 or higher (with a specificity of 0.89 and a sensitivity of 0.79 from 18 studies) or 10 or higher (with a specificity of 0.77 and a sensitivity 0.92 from 14 studies) (Levis et al., 2020).

Postpartum depression (PPD) shares a similar pathophysiology with general depression, one of which is characterized by elevated salivary cortisol levels due to hypothalamic-pituitary-adrenal (HPA) axis dysfunction. The HPA axis is essential for managing both stress responses and metabolism in the body by secreting cortisol under the influence of ACTH. Cortisol functions in carbohydrate, protein, and fat metabolism, including supporting gluconeogenesis to maintain blood glucose levels during fasting conditions. When cortisol levels in the body are insufficient, metabolic functions become impaired, leading to reduced liver glycogen, hypoglycemia, and increased tissue sensitivity to insulin. These conditions result in the body's inability to sustain adequate energy, especially for the brain and muscles, causing physical weakness and intolerance to prolonged food deprivation (Seth et al., 2016).

Monitoring cortisol levels through saliva is a valuable method for identifying hormonal changes in postpartum patients. Salivary cortisol measurement is considered more practical and non-invasive compared to total plasma cortisol measurement, especially since changes in corticosteroid-binding globulin concentrations during the postpartum period can complicate result interpretation (Iliadis et al., 2015). Along with hormonal monitoring, psychosocial interventions, including counseling and early screening for PPD symptoms are equally important. Postpartum visits provide healthcare professionals with opportunities to identify risk factors and symptoms of depression, facilitating early detection and intervention for conditions that may endanger maternal mental health. Early postpartum screening, for example, has been shown to effectively lower the occurance of PPD and other mental disorders in postpartum mothers (Thompson & Fox, 2010). Combining hormonal monitoring with psychosocial interventions represents a strategic approach to comprehensively prevent and manage PPD.

METHODS

This quasi-experimental study employs a prospective cohort design utilizing primary and secondary data from medical records of postpartum patients at Dr. Soetomo General Academic Hospital (RSUD Dr. Soetomo), Surabaya, in 2024. The research adopts a pretest-posttest control group design. The

study sample includes postpartum mothers examined at the Postpartum Clinic of RSUD Dr. Soetomo in 2024 who meet the inclusion criteria. Inclusion criteria consisted of postpartum patients within 14 days after delivery at the hospital, those willing to participate by signing an informed consent form, subjects completing the EPDS questionnaire with a score >13 and a score <3 for item 10 (indicating no desire for self-harm), and those willing to undergo salivary cortisol assessment at the start and after counseling sessions. Exclusion criteria include patients who passed away, those with severe hormonal disorders (e.g., hypercortisolism or uncontrolled thyroid disorders), patients undergoing steroid therapy during the study, individuals with psychotic disorders, or those opting out of follow-up during the postpartum period. Additional exclusions involve patients dropping out due to worsening depressive symptoms, psychiatric emergencies, travel distance challenges, or lack of family support for follow-up visits.

The sample size comprises 20 participants, equally divided between treatment and control groups. Consecutive sampling was used, wherein postpartum patients visiting the Obstetrics Clinic of RSUD Dr. Soetomo who met inclusion criteria were matched based on age, parity, obstetric risk factors, delivery plans, and initial EPDS scores until the desired sample size for each group was achieved. Counseling serves as the independent variable, while salivary cortisol levels and EPDS scores are the dependent variables. Postpartum depression (PPD) screening was conducted using the EPDS questionnaire, guided by researchers. Patients with EPDS scores ≥13 were included as subjects and had their salivary cortisol levels measured initially. Subjects were separated into two distinct groups: those receiving counseling and those not receiving counseling. Fourteen days after the initial EPDS screening and cortisol measurement, follow-up evaluations of EPDS scores and salivary cortisol levels were conducted, and all data were recorded.

The analysis used paired t-tests for within-group comparisons if the data were normally distributed (verified using the Shapiro-Wilk test for datasets <50) or the Wilcoxon Signed Rank Test for non-normally distributed data. For between-group comparisons, independent t-tests were used for normally distributed data and Mann-Whitney U tests for non-normally distributed data. A p-value <0.05 indicated a statistically significant difference, while a p-value >0.05 suggested no significant difference. These analyses aimed to investigate how counseling affects EPDS scores and salivary cortisol levels, using SPSS version 26. This study received ethical approval from the Ethics Committee of RSUD Dr. Soetomo to ensure adherence to ethical standards.

RESULTS

This quasi-experimental study employed a prospective cohort design, utilizing primary and secondary data from medical records of postpartum patients at RSUD Dr. Soetomo, Surabaya, in 2024. A total of 20 PPD patients were separated into two distinct treatment groups to receive postpartum counseling. Descriptive data on sociodemographic, obstetric, perinatal, and postpartum characteristics were collected, while independent t-tests and paired t-tests were conducted to evaluate the effects of counseling on salivary cortisol levels and EPDS scores.

During the study, two patients discontinued participation due to travel constraints and the absence of support persons for hospital visits. Other challenges included difficulty in follow-up visits due to long travel distances, lack of companions, or childcare responsibilities. Additionally, the study's short duration of only 14 days post-initial counseling session was a limitation in capturing the long-term effects of counseling, as PPD can persist for as long as 12 months after childbirth. To address these limitations, patients could be provided with an early warning system (EWS) to independently detect PPD symptoms beyond the study period, enabling early monitoring of their condition.

Sociodemographic characteristics such as age, education level, occupation, monthly income, residence, and family size are displayed in **Table 1.**

Table 1: Sociodemographic characteristics of postpartum depression patients at the postpartum Apoclinic of RSUD Dr. Soetomo, Surabaya (N=20)

Characteristic	Total (%)	Counseling	No Counseling	p-value
Age (years), mean±SD	27.85 (5.24)	29.7±4.95	26±5.09	0.117
Education Level				
Elementary school	2 (10%)	2 (100%)	0	0.271
Junior School	4 (20%)	2 (50%)	2 (50%)	

High School	9 (45%)	5 (55.6%)	4 (44.4%)	
College	5 (25%)	1 (20%)	4 (80%)	
Occupation				
Housewives	14 (70%)	8 (57,1%)	6 (42,9%)	0.214
Private Employees	5 (25%)	1 (20%)	4 (80%)	
Farmer	1 (5%)	1 (100%)	0	
Monthly Income				
<1.5 million Rupiah	2 (10%)	1 (50%)	1 (50%)	0.548
1.5-2.5 million Rupiah	3 (15%)	1 (33.3%)	2 (66.7%)	
2.5-3.5 million Rupiah	7 (35%)	5 (71.4%)	2 (28.6%)	
>3.5 million Rupiah	8 (40%)	3 (37.5%)	5 (62.5%)	
Residence				
Own House	4 (20%)	2 (50%)	2 (50%)	0.432
Rented	7 (35%)	4 (57.1%)	3 (42.9%)	
Parents' Home	6 (30%)	4 (66.7%)	2 (33.3%)	
In-laws' Home	1 (5%)	0	1 (100%)	
Boarding	2 (10%)	0	2 (100%)	
Number of Family Members				
2 members	3 (15%)	1 (33.3%)	2 (66.7%)	0.801
3-4 members	8 (40%)	4 (50%)	4 (50%)	
>4 members	9 (45%)	5 (55.6%)	4 (44.4%)	

This study involved 20 postpartum depression (PPD) patients from the Postpartum Clinic at RSUD Dr. Soetomo, Surabaya, selected using consecutive sampling. The mean age of the patients was 27.85 years (SD ±5.24), with the counseling group averaging 29.7 years (SD ±4.95) and the non-counseling group averaging 26 years (SD ±5.09). Educational levels showed that most patients had completed high school or vocational school (45%), followed by bachelor's degree holders (25%), middle school graduates (20%), and elementary school graduates (10%). The majority of patients were homemakers (70%), with 57,1% in the counseling group and 42,9% in the non-counseling group. In terms of monthly income, 40% of patients earned over 3.5 million rupiahs, followed by 35% earning 2.5–3.5 million, 15% earning 1.5–2.5 million, and 10% earning less than 1.5 million. Regarding housing, most patients lived in rented houses (35%), followed by those living with their parents (30%), in their own homes (20%), in boarding houses (10%), and with their in-laws (5%). For family size, the majority had more than four family members (45%), followed by those with three to four members (40%) and two members (15%). These variables illustrate the sociodemographic characteristics of the patients included in this study

Obstetric-perinatal characteristics in the form of type of childbirth, gravida, child condition, contraception, and comorbidities are displayed in **Table 2**

Table 2: Obstetric-perinatal characteristics of postpartum depression patients at the postpartum polyclinic of RSUD Dr. Soetomo, Surabaya (N=20)

Characteristic	Total (%)	Counseling	Non Counseling	p-value
Types of Childbirth				
Sectio Caesarea (SC)	13 (65%)	4 (66.7%)	2 (33.3%)	0.418
Spontan	6 (30%)	6 (46.2%)	7 (53.8%)	
Forcep extraction (FE)	1 (5%)	0	1 (100%)	
Gravida				
Primigravida	11 (55%)	4 (36.4%)	7 (63.6%)	0.370
Multigravida	9 (45%)	6 (66.7%)	3 (33.3%)	
Child Condition				
Born alive	16 (80%)	6 (37.5%)	10 (62.5%)	0.025*
Stillborn	4 (20%)	4 (100%)	0	
Contraceptives				
IUD	10 (50%)	6 (60%)	4 (40%)	0.587
Sterilization	4 (20%)	2 (50%)	2 (50%)	
None	6 (30%)			
Comorbidities				
Yes	6 (30%)	2 (33.3%)	4 (66.7%)	0.329

No	14 (70%)	1 (57.1%)	6 (42.9%)	

More than 50% of postpartum depression (PPD) patients underwent cesarean section (65%), either elective or emergency, followed by spontaneous vaginal delivery (30%) and forceps delivery (5%). Regarding gravida status, 55% of patients were primigravida, while the remaining 45% were multigravida. A total of 80% of cases involved live births, whereas 20% were stillbirths. Patients with stillbirths were more likely to receive counseling compared to those with live births (p=0.025).

Most patients used contraception (70%), with intrauterine devices (IUDs) being the most common choice (50%), followed by sterilization (20%), while 30% did not use any form of contraception. Additionally, 70% of patients had no comorbidities, while 30% had comorbidities, including thalassemia, asthma, uterine myomas, diabetes mellitus, hyperthyroidism, or epilepsy. These variables offer an overview of the obstetric and perinatal characteristics of the patients in this study.

Postpartum characteristics such as breastfeeding practices, the presence of psychological stressors, psychological disturbances including negative attitudes towards pregnancy or mood disorders during menstruation, the presence of spousal or family support, as well as salivary cortisol levels and EPDS scores, are displayed in **Table 3.**

Table 1: Characteristics of postpartum depression patients at the postpartum depression polyclinic of RSUD Dr. Soetomo, Surabaya (N=20)

Characteristic	Total (%)	Counseling	Non Counseling	p-value
Breast milk				
Yes	12 (60%)	6 (50%)	6 (50%)	1.000
No	8 (40%)	4 (50%)	4 (50%)	
Psychological stressors				
Yes	11 (55%)	8 (72.7%)	3 (27.3%)	0.025*
No	9 (45%)	2 (22.2%)	7 (77.8%)	
Psychological disorders				
Negative attitudes towards pregnancy	2 (10%)	1 (50%)	1 (50%)	0.819
Mood disorders during menstruation	3 (15%)	1 (33.3%)	2 (66.7%)	
No	15 (75%)	8 (53.3%)	7 (46.7%)	
Support				
Husband	6 (30%)	4 (66.7%)	2 (33.3%)	0.418
Family	13 (65%)	6 (46.2%)	7 (53.8%)	
No	1 (5%)	0	1 (100%)	
Initial EPDS score, mean±SD	15±1.84	16.4±1.58	13.6±0.52	<0.001
Final EPDS score, mean±SD	11.7±3.06	10.3±3.43	13.1±1.91	0.035
Initial salivary cortisol (g/dL), mean±SD	18.13±8.19	17.68±6.47	18.59±9.96	0.811
Final salivary cortisol (g/dL), mean±SD	11.97±7.17	7.96±4.07	15.98±7.50	0.117

A total of 12 patients (60%) practiced breastfeeding, evenly distributed between the counseling (50%) and non-counseling (50%) groups, with a p-value of 1.00. Meanwhile, 8 patients (40%) did not practice breastfeeding. Psychological stressors were reported by 11 patients (55%), with a higher proportion in the counseling group (72.7%) compared to the non-counseling group (27.3%), yielding a significant p-value of 0.025. These stressors included feelings of anxiety or sadness caused by premature birth, the loss of a child, long-distance relationships with spouses, or comorbid conditions.

Psychological disturbances were identified in 5 cases: 2 were related to negative attitudes toward pregnancy (evenly distributed between counseling and non-counseling groups) and 3 were associated with mood disorders during menstruation, with a significant p-value of 0.025.

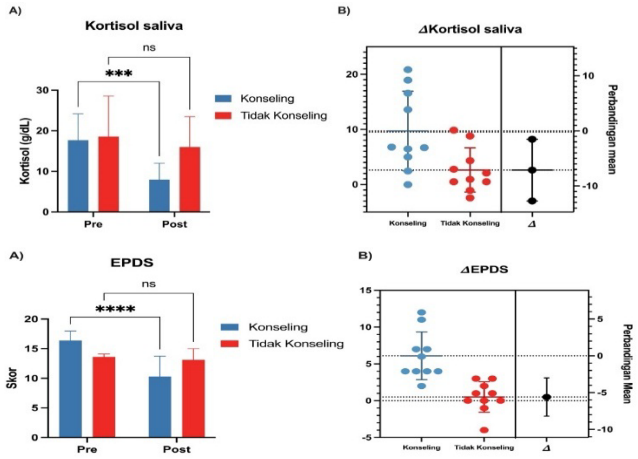
Support from spouses was reported by 6 patients (30%), while family support was reported by 13 patients (65%). Spousal support was substantially greater in the counseling group (66.7%) in comparison to the non-counseling group (33.3%), with a p-value of 0.025. Patients with

psychological stressors were significantly more likely to undergo counseling compared to those without stressors (p=0.025)

This study involved 20 patients with EPDS scores ≥13, all included in the analysis. At baseline screening, the mean EPDS score was 15±1.84, with higher scores in the counseling group (16.4±1.58) compared to the non-counseling group (13.6±0.52, p<0.001). Following the intervention, the overall mean EPDS score decreased to 11.7±3.06, with a more significant reduction in the counseling group (10.3±3.43) compared to the non-counseling group (13.1±1.91, p=0.035). These results indicate that counseling was effective in reducing postpartum depression symptoms. Initial salivary cortisol levels averaged 18.13 g/dL (SD ±8.19), with no significant difference between the counseling group (17.68±6.47) and the non-counseling group (18.59±9.96, p=0.811). After the intervention, mean cortisol levels decreased to 11.97 g/dL (SD ±7.17), with final levels of 7.96±4.07 in the counseling group and 15.98±7.50 in the non-counseling group. However, no notable differences existed between the groups, either at baseline or after the intervention (p > 0.05). The Independent T-test revealed substantial differences in pre- and post-intervention EPDS scores between the counseling group (p < 0.001) and non-counseling group (p = 0.035). In contrast, the groups did not exhibit substantial differences in their salivary cortisol levels. These findings affirm that counseling effectively reduces postpartum depression symptoms but does not have a significant effect on salivary cortisol levels.

Table 4: Comparison of saliva cortisol and EDPS Levels

Variable	Test Group	Mean ± SD		Cohen's d	p-value
Levels cortisol saliva	Paired T-test	Pre	Post		
	Counseling	17.68±6.47	7.96±4.07	1.347	0.002*
	Non Counseling	18.59±9.97	15.98±7.50	0.652	0.069
Score EPDS	Uji paired T-test	Pre	Post		
	Counseling	16.4±1.58	10.3±3.4	1.879	<0.001*
	Non Counseling	13.6±0.52	13.1±1.91	0.371	0.464
Levels cortisol saliva	Independent T-test	***Δ*** (Pre – Post)			
	Counseling	9.72±7.22		1.217	0.014*
	Non Counseling	2.62±4.01			
Score EPDS	Independent T-test	***Δ*** (Pre – Post)			
	Counseling	6.1±3.25		2.057	<0.001*
	Non Counseling	0.5±2.07			



Cortisol saliva EDPS

Figure 1: A) Comparison of salivary cortisol levels and EPDS scores in the counseling and non-counseling groups based on paired T-test results at baseline (pre) and after 14 days (post). B) Comparison of changes in salivary cortisol levels and EPDS scores after 14 days between the counseling and non-counseling groups based on Independent T-test results.

The paired t-test results revealed that postpartum depression patients who underwent postnatal counseling exhibited a substantial decrease in salivary cortisol levels by the end of the study (d=1.347; p=0.002), whereas patients who did not receive counseling showed no significant change in salivary cortisol levels (p=0.069) (**Table 4; Figure 1A**). Similarly, patients who underwent postnatal counseling experienced a substantial reduction in EPDS scores by the conclusion of the study (d=1.879; p<0.001), while those who did not undergo counseling showed no significant change in EPDS scores (p=0.464) (**Table 4; Figure 1A**). The independent t-test results revealed that the counseling group experienced a substantially larger decrease in EPDS scores in comparison to the non-counseling group (6.1 vs. 0.5; d=2.057; p<0.001). This indicates that postnatal counseling provides meaningful benefits in improving postpartum depression status, as evidenced by EPDS scores, compared to those who did not receive counseling. Furthermore, the independent t-test also showed that the counseling group experienced a substantially larger decrease in salivary cortisol levels compared to the non-counseling group (9.72 vs. 2.62; d=1.217; p=0.014) (**Table 4; Figure 1B**). This finding suggests that postnatal counseling significantly improves salivary cortisol levels compared to those who did not undergo counseling

Changes in EPDS scores and their connection to variations in salivary cortisol levels at the end of the study compared to baseline was evaluated using Pearson's correlation test with a 95% confidence interval.

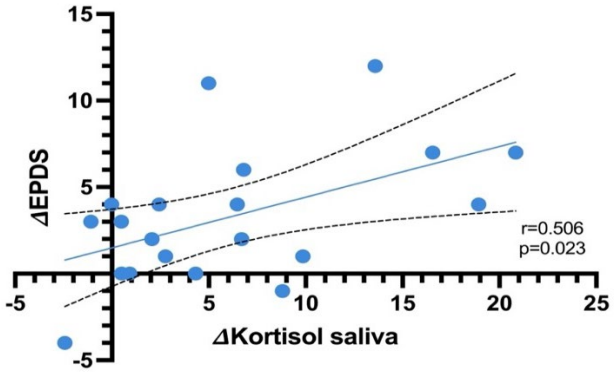


Figure 2: Presents the correlation curve between changes in salivary cortisol levels and changes in EPDS scores in postpartum depression patients based on Pearson's test.

The results revealed a significant and strong correlation between EPDS score and salivary cortisol level changes at the end of the study compared to baseline (r=0.506; p=0.023) (Figure 5.3). This finding indicates that a reduction in salivary cortisol levels is closely associated with improvements in postpartum depression status, as measured by EPDS scores.

DISCUSSION

PPD is a major public health concern that impacts both mothers and their families. This condition can lead to persistent depression, which is associated with marital disturbances and complications in newborn development and behavior. While the precise cause of postpartum depression remains unclear, it is thought to result from a combination of physical, emotional, social, and genetic factors. Contributing elements include hormonal changes, insomnia, and the additional care required for newborns. Together, these factors critically influenced PPD development (Alloghani et al., 2024). PPD affects approximately 10-15% of women, with one in five exhibiting suicidal tendencies (Ding et al., 2023). Postpartum women in Asia experience varying rates of depression, ranging from 3.5%–63.3% (Azad et al., 2019; Klainin-Yobas & Arthur, 2009). The risk of premature birth and low birth weight increases with maternal depression during pregnancy (Dadi et al., 2020).

This study reveals that most patients had completed high school or vocational school education (45%) and a bachelor's degree (25%), aligning with previous research indicating that maternal education level is a risk factor for postpartum depression (PPD). Mothers with lower educational attainment were found to have a higher risk of PPD (OR = 5.10, 95% CI: 4.30–16.58) (Alloghani et al., 2024). Research conducted in Denpasar showed that the majority of PPD patients had a good level of education (Purwanti et al., 2022). Most of the patients in the study were housewives (70%), according to the findings which shows that the DPP level is significantly higher in housewives

(Turkcapar et al., 2015). In terms of economy, the majority of patients have a family income of >3.5 million rupiahs, in line with studies that show a significant relationship between economic status and PPD, where women with lower wealth are more susceptible to DPP symptoms (Alikamali et al., 2020; Hazavehei et al., 2019). Nevertheless, the findings in Denpasar show that the majority of PPD patients have very high incomes (Purwanti et al., 2022). The majority of patients lived in rented homes, while previous studies reported that living in one's own home increased the likelihood of PPD although the results were not statistically significant ($p > 0.05$) (Alloghani et al., 2024). These findings underscore that sociodemographic factors, such as education, employment, economy, and residence, can affect the risk of PPD.

This study found that the majority of postpartum depression (PPD) patients underwent cesarean section (SC) (65%). This finding is consistent with previous research indicating that SC increases the risk of PPD, with an odds ratio (OR) of 1.33 (95% CI, 1.28–1.38) and an incidence rate ratio (IRR) of 1.32 (95% CI, 1.13–1.53) (Meltzer-Brody et al., 2018; Youn et al., 2017). Other risk factors such as severe postoperative pain, negative labor experiences, and obstetric complications also contribute to the increased risk of PPD (Gamez & Habib, 2018; Lin et al., 2022). The study in Denpasar revealed that 44.12% of post-SC women experienced psychological disorders, while the study in Yogyakarta reported a significant correlation between SC and DPP labor pain ($p=0.002$) (Purwanti et al., 2022; Utami et al., 2020). More than 50% of patients were primigravida (55%), which had a higher risk of DPP than multigravida (OR = 0.92, 95% CI: 0.88–0.97, $p < 0.001$) (Alikamali et al., 2020). The transition to motherhood initially increases the likelihood of postpartum depression, with the first 90 days after childbirth being especially critical, as inexperience can interfere with the mother's initial interaction with the baby (Deave et al., 2008; Righetti-Veltema et al., 2002). Furthermore, the majority of patients in this study delivered live births (80%), while intrauterine fetal death (IUFD) has been shown to significantly increase the risk of post-traumatic stress disorder (PTSD), anxiety, and depression, particularly in subsequent pregnancies (Boyle et al., 1996; Hughes et al., 1999). Other obstetric factors linked to PPD include younger infant age, unintended pregnancies, and dissatisfaction with the baby's gender (Alikamali et al., 2020). PPD is highly influenced by unintended pregnancy as a major risk factor, with serious consequences such as an increased likelihood of diminished quality of mother-infant bonding, inadequate prenatal care, and abortion (Hazavehei et al., 2019). Family support and postnatal counseling are crucial in preventing negative psychological impacts, especially for mothers who have experienced traumatic events such as intrauterine fetal death (IUFD) or unintended pregnancies (Koopmans et al., 2013; Temple & Smith, 2014).

This study found that the majority of patients breastfed their infants (60%), consistent with previous research indicating that breastfeeding has the potential to protect against PPD and facilitate faster recovery from depressive symptoms (Figueiredo et al., 2014). However, this relationship is bidirectional, where depression can reduce breastfeeding rates, while not breastfeeding elevates the risk of PPD. Breastfeeding efficacy and negative perceptions of breastfeeding contribute to this relationship, with depressed mothers being more likely to experience breastfeeding difficulties (Dennis & McQueen, 2007). More than 50% of patients in this study reported psychological stressors (55%), such as unintended pregnancies, family issues, or adverse events during previous pregnancies, which have substantial correlations with PPD (Alloghani et al., 2024; Hazavehei et al., 2019; Nakano et al., 2020). Women who have experienced depression are more vulnerable to postpartum hormonal fluctuations, while antenatal anxiety is a significant predictor of PPD (Verreault et al., 2014). Although the majority of patients (75%) had no psychological disorders before pregnancy, previous studies link a history of premenstrual syndrome (PMS), suicidal thoughts, and adverse pregnancy outcomes to PPD (Alloghani et al., 2024). Changes in serotonin transport systems, particularly serotonin transporter polymorphisms, have been found to contribute to PPD through reduced tryptophan levels, triggering major depression (Cao et al., 2020; Räikkönen et al., 2015; Yu et al., 2021). Other risk factors include negative attitudes toward a history of sexual abuse, pregnancy, and stressful life events (Smorti et al., 2019). More than 50% of patients in this study also had family support (65%), which serves as a protective factor against PPD. Conversely, poor emotional support, marital conflict, or domestic violence increases the risk of PPD up to fivefold (Bedaso et al., 2022). A key predictor for PPD is the quality of the relationship with a partner, with good relationships significantly reducing the likelihood of PPD (White et al., 2023). Additionally, sexual violence and other forms of domestic violence contribute to postpartum depression (Taylor

et al., 2022). These findings highlight the key roles of stressor management, family support, and breastfeeding in reducing the risk of PPD.

This study indicates that patients who underwent 14 days of postnatal counseling experienced a significant reduction in salivary cortisol levels compared to their initial conditions, with a more pronounced decrease in the counseling group than in the non-counseling group. Furthermore, changes in salivary cortisol levels were strongly correlated with postpartum depression symptoms measured by the EPDS. These findings align with Iliadis et al. (2015), who identified a positive relationship between nighttime salivary cortisol levels and postpartum depression, even after accounting for confounding factors, including a history of depression, life stressors, and sleep disturbances (Iliadis et al., 2015). Various studies support the effectiveness of counseling in lowering salivary cortisol levels. Matvienko-Sikar and Dockray (2017) found that gratitude and mindfulness-based counseling substantially decreased morning and evening salivary cortisol levels. Similarly, Richter et al. (2012) and Urizar and Muñoz (2011) reported decreases in cortisol levels in mothers who underwent cognitive behavioral therapy, both during pregnancy and up to 18 months postpartum. However, research by Maguet et al. (2024) observed no substantial differences in salivary cortisol levels between women with postpartum depression and those without, although high cortisol levels in the third trimester were linked to a greater risk of developing the condition. Riazanova et al. (2018) showed that administering pain relief during childbirth can reduce cortisol levels and the risk of PPD. Wang et al. (2018) found that increased salivary cortisol levels, especially upon waking, are closely linked to postpartum depression and anxiety. Dombrowska-Pali et al. (2022) reported similar findings, observing a direct relationship between salivary cortisol levels in breast milk and blood, but no substantial difference in PPD risk. Dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis is a primary mechanism in the pathophysiology of postpartum depression, where pregnancy, childbirth, and breastfeeding alter HPA axis function and circulating cortisol (Dickens & Pawluski, 2018; Hantsoo et al., 2014). Patterns of cortisol secretion that follow circadian rhythms, including the cortisol awakening response and diurnal slope, also play important roles as predictors of postpartum depression (Epstein et al., 2021; Scheyer & Urizar, 2016). Although most studies show a positive relationship between salivary cortisol levels and PPD, these results remain susceptible to bias due to sample variability and non-uniform data collection methods (Epstein et al., 2021).

This study demonstrates that 14 days of postnatal counseling significantly reduced EPDS scores in postpartum depression (PPD) patients, with a greater reduction observed in the counseling group compared to the non-counseling group. These findings align with Bahari et al. (2021) in Iran, who reported that supportive counseling significantly alleviated PPD and PTSD symptoms while improving mother-infant bonding following psychologically traumatic births. Similarly, a systematic review and meta-analysis by Shang et al. (2022) of nine RCTs showed that postnatal lifestyle interventions reduced depressive symptoms, as measured by HDRS and SRDS scales. Psychotherapeutic modalities, including interpersonal therapy, psychodynamic therapy, and cognitive-behavioral therapy (CBT), have also been proven effective in meta-analyses (Pett et al., 2023; Valverde et al., 2023; Wang et al., 2023). However, pharmacological management for severe depression remains less effective than psychotherapy or a combination of both (De Crescenzo et al., 2014). In Indonesia, additional modalities such as music therapy, aromatherapy, and the role of midwives contribute significantly to the success of PPD management programs (Widiasih et al., 2021). Furthermore, telemedicine or mobile health-based interventions have shown meaningful benefits in reducing PPD symptoms, as measured by EPDS, according to a meta-analysis of 11 studies from six countries (Xiong et al., 2020). Effects of psychological interventions have also been documented in primary healthcare settings (Stephens et al., 2016). The importance of postnatal counseling—whether conducted face-to-face or through technology—its coverage in Indonesia remains uneven. While the national counseling coverage reaches 70.94%, it is concentrated in central regions, leaving eastern areas underserved (Cahyono et al., 2021). Expanding counseling services is crucial to ensure equitable access across all regions. Both psychiatrists and trained general practitioners are crucial in delivering postnatal counseling to prevent and mitigate the progression of PPD symptoms. Addressing this disparity is essential to ensure that the benefits of postnatal counseling are widely and equitably distributed

CONCLUSION

Postnatal counseling has been proven effective in reducing postpartum depression (PPD) symptoms. The initial average EPDS scores in the counseling group were higher than in the non-counseling group but showed a significant decrease after the intervention. The reduction in EPDS scores was greater in the counseling group compared to the non-counseling group, highlighting the significant role of counseling in alleviating postpartum depressive symptoms in patients. Similarly, salivary cortisol measurements showed a significant decrease in the counseling group, while no meaningful change was observed in the non-counseling group. Although there was no statistically significant difference between the initial and final cortisol levels between the two groups, the magnitude of cortisol reduction was greater in the counseling group. This study confirms that postnatal counseling is effective in lowering both EPDS scores and salivary cortisol levels, offering positive benefits for patients with postpartum depression.

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