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The effect of combined postnatal education and postpartum yoga on serum prolactin levels and breastfeeding confidence among postpartum women at risk of depression

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Abstract

To determine the effect of combined postpartum yoga and postpartum classes on blood prolactin levels and breastfeeding success beliefs in postpartum women at risk of depression. We used a quasi-experimental pretest-posttest control group design on postpartum mothers in the Wagir Health Center area, Wagir District, Malang Regency. Subjects were divided into three intervention groups: (1) postpartum yoga combined with a postpartum class, (2) postpartum class only, and (3) control group with no intervention. We measured prolactin by ELISA, assessed breastfeeding confidence with the BSES-SF, and evaluated depression risk with the EPDS. Wilcoxon, Kruskal-Wallis, Mann-Whitney, and paired t-test were used to analyzed the data. The combination group showed a significant increase in prolactin (from 2045.75 to 3195.19 µIU/mL; p 0.018) and breastfeeding confidence (44.50 to 49.50; p 0.002) as measured by Wilcoxon test. The postpartum only group improved. The control group showed no significant changes. Combining postpartum yoga and classes effectively increases prolactin and breastfeeding confidence in mothers at risk of depression. This effect occurs through relaxation, hormonal balance, education, and psychosocial support.

Keywords: Postpartum yoga, Postpartum classes, Prolactin, BSES-SF, Postpartum women.

Introduction

The postpartum period is an important stage that demands major adjustments in the physical and psychological aspects of the mother [1]. One of the key factors that determines the well-being of both mother and baby is successful breastfeeding [2]. This process is highly dependent on hormonal balance, especially prolactin, which plays a role in breast milk production. Hormonal imbalances due to stress or the risk of postpartum depression can reduce milk production as well as the mother's confidence in her ability to breastfeed, thus impacting the quality of the mother-infant relationship [3].

Globally, it is recommended to exclusively breastfeed infants for the first 6 months of life. Exclusive breastfeeding benefits the infant's immune system and growth [4]. However, exclusive breastfeeding coverage in Indonesia is still lacking. According to data from the Ministry of Health of the Republic of Indonesia in 2023 [5], the national exclusive breastfeeding rate was 63.9%. There is significant variation between provinces. West Nusa Tenggara had the highest rate (81.1%), while West Papua had the lowest (10.9%). In East Java, coverage increased from 67% in 2022 to 74.8% in 2023. Malang District reached only 68%. This suggests that mothers' knowledge and beliefs about breastfeeding are still issues that need attention. These gaps need to be addressed through education-based interventions and emotional support. Postpartum depression is one of the most common psychological problems experienced by mothers, with a prevalence of around 13% worldwide and reaching 26-85% in Asia [6-7]. In Indonesia, its prevalence is reported to be between 50-70%, especially in big cities [8-9]. Excessive stress can physiologically increase cortisol levels, inhibit the let-down reflex, and decrease prolactin secretion. By contrast, balanced prolactin levels ensure smooth lactation and help mothers remain emotionally stable. Approaches that can balance hormones and emotions at the same time are necessary.

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Nonpharmacological approaches such as postpartum yoga and postpartum classes can be effective solutions. Postpartum yoga has been shown to reduce stress and balance hormones. It also improves mood through a combination of physical exercise, breathing, and meditation [10]. Postpartum classes provide education and social support. They also increase the mother's confidence in breastfeeding [11]. Combining both approaches is expected to have a synergistic effect. This may improve hormonal balance while strengthening the mother's psychological confidence.

However, there is limited scientific evidence assessing the effect of combining postpartum yoga and postpartum classes on prolactin levels and breastfeeding success confidence. Therefore, this study aims to analyze the effectiveness of this combination in increasing blood prolactin levels and maternal confidence in breastfeeding success. The focus is on mothers at risk of postpartum depression.

Methods

This study is a quasi-experimental study with a pretest-posttest control group design, which was conducted in July-September 2025 in the working area of the Wagir Health Center, Malang Regency. Ethical approval was obtained from the Health Research Ethics Committee of the Faculty of Medicine, Universitas Airlangga (No. 178/EC/KEPK/FKUA/2025) and all procedures followed the Council for International Organizations of Medical Sciences (CIOMS) International Ethical Guidelines for Health-related Research Involving Humans, 2016.

Study subjects were breastfeeding mothers with Edinburgh Postnatal Depression Scale (EPDS) scores in the range of 5-13, indicating a mild risk of depression. Inclusion criteria included mothers who were partially breastfeeding, had no pregnancy complications, delivered a live baby, and were willing to sign informed consent. Exclusion criteria included hypothyroidism, consumption of hormone-affecting drugs, medically diagnosed psychological disorders, or EPDS score >13. Sampling was conducted using non-probability voluntary sampling method.

The first step in the implementation of this study was the recruitment of 38 respondents, then conducted a pretest of breastfeeding success beliefs by filling out the Breastfeeding Self-Efficacy Scale-Short Form questionnaire and also conducted a pretest examination of prolactin hormone levels and then divided into groups, into 3 groups: a combination of postpartum yoga and postpartum classes (n = 12), postpartum classes only (n = 14), and control without intervention (n = 12). In the combined yoga and postpartum class group, there were 2 respondents who the researcher dropped out because 1 respondent withdrew because she was busy at work, and 1 respondent withdrew because she did not attend the study and lost contact with the researcher. The sample calculation considers the 95% confidence level, 80% power, and Z value = 1.96. The intervention was conducted for 4 weeks, with each intervention group attending a 60-minute session each week. Yoga classes were guided by certified instructors, while postpartum classes were given by midwives and researchers. After the intervention, the researcher gave a posttest back to the respondents to find out the changes that occurred in the respondents in participating in the activities both before and after the intervention. The posttest of breastfeeding success beliefs was again used by researchers using the Breastfeeding Self-Efficacy Scale-Short Form questionnaire and the posttest of checking prolactin hormone levels. After the pretest and posttest had been conducted, the results obtained were then analyzed. This diagram can be seen in Figure 1.

Blood prolactin levels were measured using the Enzyme-Linked Immunosorbent Assay (ELISA) method with the DBC kit at the Biomedical Laboratory of Brawijaya University. Breastfeeding success beliefs were assessed using the Breastfeeding Self-Efficacy Scale-Short Form questionnaire (BSES-SF, 14 items; Cronbach's α=0.72-0.97), and postpartum depression risk using the 10-item EPDS (specificity 92.1%).

Data were analyzed using the Shapiro-Wilk test for normality. The paired t-test was used for normally distributed data and Wilcoxon test for non-normal data. Comparison between groups used Kruskal-Wallis, while between two groups used Mann-Whitney with a significance level of $p<0.05$. All respondents gave written consent to participate in the study.

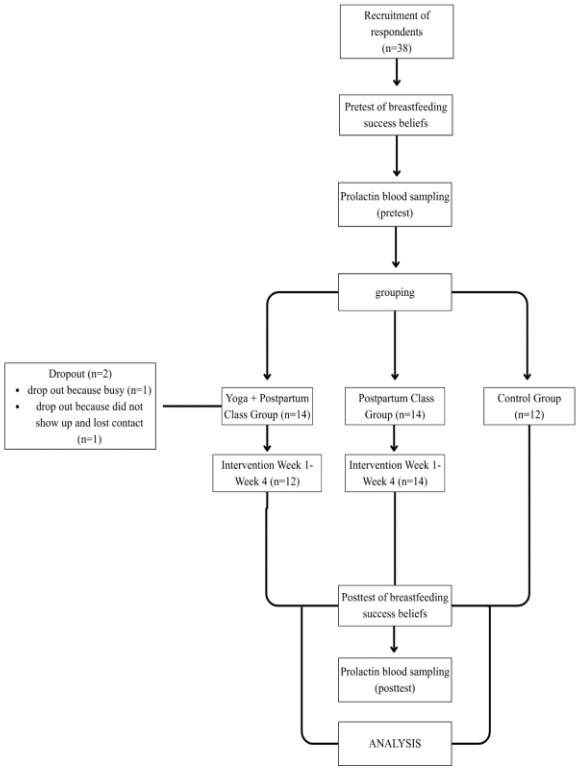

Figure 1. Flowchart of the study group

Intervention

Each study participant underwent two stages of measurement: before the intervention (pretest) and after the intervention (posttest). Data were collected by measuring blood prolactin levels. Structured interviews and questionnaires measured breastfeeding confidence and risk of postpartum depression.

The intervention lasted 4 weeks with weekly 60-minute sessions. The combination group received both postpartum yoga and classes. Yoga sessions, led by a certified instructor, included breathing exercises, relaxation, and simple movements for hormone balance and stress management. Interactive postpartum classes, delivered by midwives and researchers, covered self-care, breastfeeding techniques and positions, breast management, and emotional stability.

The postpartum class group attended educational sessions using identical materials and schedules as the intervention group, but without yoga. The control group received no intervention, but completed pre- and post-test measurements at the same times as the postpartum class group. Researchers observed attendance, participation, and breastfeeding practices throughout the study. After each session, postpartum class participants debriefed, reinforcing material and offering psychological support.

Statistical analysis

All data were analyzed using IBM SPSS Statistics version 25.0. Descriptive analysis described respondent characteristics-including occupation, parity, economic status, place of residence, baby's birth weight, and birth attendant-that were presented as frequency, percentage, and mean. Statistical tests were then selected based on data type and distribution.

Occupation, parity, residential status, and birth attendant were analyzed using the Chi-square test, as these variables are categorical with expected counts >5, which fit the Chi-square test's assumptions. Economic status and birth weight were analyzed using Fisher's Exact test because some cells had expected counts <5, making Fisher's test more appropriate. The relationship between pretest prolactin level and Breastfeeding Self-Efficacy Scale-Short Form (BSES-SF) score was assessed with the Spearman correlation test, since both are numeric variables with non-parametric distributions, which matches the test's requirements. For other numeric data, normality was assessed using the Shapiro-Wilk test; normally distributed data were analyzed using parametric tests (t-test or ANOVA), while non-normal data were analyzed using non-parametric tests (Mann-Whitney or Kruskal-Wallis), based on distribution. The significance threshold was set at $p < 0.05$.

Results

Most variables, including occupation, parity, infant birth weight, delivery attendant, and pre-intervention BSES-SF score, were not significantly different between groups ($p>0.05$). The results of baseline characteristics analysis using Chi-Squarea, Fisher's Exactb, Spearmanc. However, there were significant differences in pre-intervention prolactin levels between the variables of economic status (p 0.010) and residential status (p 0.029) in table 1. This suggests that social and economic factors as well as living environment may play a role in differences in

baseline prolactin levels in postpartum women.

However, after the intervention, there was a significant increase in the combination group of Postpartum Yoga and Postpartum Class, from an average of 2045.75 ± 1100.78 µIU/mL to 3195.19 µIU/mL in table 2, while the postpartum class group alone decreased from 1492.84 µIU/mL to 1147µIU/mL, and the control group was not significant in table 3. This increase indicates that yoga practice combined with postpartum education has the potential to stimulate an increase in the letdown reflex and milk production through hormonal balance.

On the breastfeeding success belief variable (BSES-SF pre), the p value between groups was 0.224[c], indicating no significant initial difference in table 1. However, after the intervention, the combination group showed a significant increase in the BSES-SF score from 44.50 to 49.50 with a p value of 0.002, while the postpartum class group increased from 50 to 57.50 with a p value of 0.005 (Significant), and the control group experienced a slight decrease and was not significant in table 4. This difference indicates that the dual intervention of physical (yoga) and educational (postpartum class) has a positive effect on increasing mothers' self-efficacy in breastfeeding.

Table 1. Distribution of respondent characteristics by intervention group

Variable	Yoga + Postpartum Class (n=12)	Postpartum Class (n=14)	Control (n=12)	P-value (Pre BSES-SF)	P-value (Pre Prolactin)
Work Worker Not Working	 5 (41,67%) 7 (58,33%)	 3 (21,43%) 11 (78,57%)	 6 (50%) 6 (50%)	0,088[b]	0,299[a]
Parity Primiparous Multiparous	 5 (41,67%) 7 (58,33%)	 5 (35,71%) 9 (64,29%)	 1 (8,33%) 11 (91,67%)	0,309[b]	0,880[a]
Economy <UMR UMR/>UMR	 5 (41,67%) 7 (58,33%)	 8 (57,14%) 6 (42,86%)	 4 (33,33%) 8 (66,67%)	0,730[b]	0,010[a]
Status of residence Private Contract Living with relatives	 5 (41,67%) 1 (8,33%) 6 (50%)	 4 (28,57%) 6 (42,86%) 4 (28,57%)	 5 (41,67%) 3 (25%) 4 (33,33%)	0,169[b]	0,029[a]
Birth weight Birth weight low Not low birth weight Mean Sd	 5 (41,67%) 7 (58,33%) 2531,67 592,94	 8 (57,14%) 6 (42,86%) 2728,31 369,36	 4 (33,33%) 8 (66,67%) 2905 428,02	0,819[c]	0,151[c]
Helper Midwife	 5 (41,67%)	 7 (50%)	 4	0,591[b]	0,782[a]

Doctor	7 (58,33%)	7 (50%)	(33,33%) 8 (66,67%)		
Prolactin uIU/mL (pre)					
Mean	2045,75	1498,66	2267,69		
Sd	1100,78	1276,24	1442,34		0,224[c]
Minimum	98,67	135,33	102		
Median	2130,33	1492,83	2180,33		
Maximum	3807	3818,67	5115,33		
BSES-SF (pre)					
Mean	43,67	50,43	50,08		
Sd	8,86	3,93	7,58		
Minimum	20	45	34	0,224[c]	
Median	44,50	50	51,50		
Maximum	55	60	58		

a = Chi-Square Test; b = Fisher's Exact Test; c = Spearman Correlation Test.

The results of the analysis showed that most of the data were not normally distributed, so non-parametric tests were used in data processing, except for the combination of yoga and postpartum classes that met the assumption of normality.

In the prolactin level variable, the group that received the combination of postpartum yoga and postpartum classes showed a significant increase from the pretest mean value of 2045.75 ± 1100.78 µIU/mL to 3195.19 µIU/mL (p 0.018) based on the results of the Paired t-test based on table 2. Based on table 3, the postpartum class group had a median prolactin level of 1492.84 µIU/mL to 1147 µIU/mL (p 0.048) based on the results of the Wilcoxon test but still within the range of significant differences. While the control group did not show statistically significant changes, with median prolactin levels decreasing from 2180.34 µIU/mL to 1193.67 µIU/mL (p 0.239).

Table 2. Changes in pretest and posttest prolactin levels in yoga and postpartum groups

Variable	Pretest Mean-sd)	Posttest Median (min-max)	p-Values
Prolactin levels	2045,75 (1100,78)	3195,19 (1051,40)	0,018
Paired t-test Yoga group + postpartum class (pre and post)			

Paired t-test. Bolded values indicate statistical significance at the $p < 0.05$ level.

Table 3. Changes in pre and post prolactin levels

Variable	Pretest Median (min-max)	Posttest Median (min-max)	p-Values
Prolactin levels (postpartum class)	1492,84 (135,33-3818,67)	1147 (-24,67-4528,67)	0,048
Prolactin levels (Control group)	2180,34 (102-5115,33)	1193,67 (88,67-5112)	0,239
Wilcoxon test Postpartum class group and control group (pre and post			

Non-parametric dependent group test (Wilcoxon Test). Bolded values indicate statistical significance at the $p < 0.05$ level

In the Breastfeeding Self-Efficacy Scale-Short Form (BSES-SF) score variable, the group that received a combination of postpartum yoga and postpartum classes showed a significant increase from a median of 44.50 (20-55) to 49.50 (37-60) with a p value of

0.002. A significant increase also occurred in the postpartum class group, from a median of 50 (45-60) to 57.50 (42-60) with a p value of 0.005. Meanwhile, the control group did not show statistically significant changes, with the median value decreasing from 51.50 (34-58) to 48 (31-60) (p value 0.075) based on table 4. These results suggest that the combined intervention of postpartum yoga and postpartum classes is effective in increasing

breastfeeding success confidence in postpartum women compared to the control group.

Table 4. Change in pretest and posttest breastfeeding success belief score

Variable	Pretest Median (min-max)	Posttest Median (min-max)	p-Values
BSES-SF score (Yoga and postpartum class)	44,50 (20-55)	49,50 (37-60)	0,002
BSES-SF score (postpartum class)	50 (45-60)	57,50 (42-60)	0,005
BSES-SF score (control group)	51,50 (34-58)	48 (31-60)	0,075
Wilcoxon test (pretest and posttest)			

Non-parametric dependent group test (Wilcoxon Test). Bolded values indicate statistical significance at the $p < 0.05$ level

The intergroup test of prolactin levels using the Kruskal-Wallis test showed a significant difference after the intervention with a value (p value 0.016) listed in table 5. Table 6 also shows the results of the intergroup test of breastfeeding success confidence score using Kruskall wallis, which showed a change after the intervention, and a change in the delta value of breastfeeding success confidence. Further analysis was conducted to determine the comparison of the two groups using the Mann-Whitney test. In this test, significant results were obtained for the groups (combination of yoga and postpartum classes) and (postpartum classes) with a p value of 0.001. In the group (combination of yoga and postpartum classes) and (control group) also obtained significant results with a p value of 0.028. While in the group (postpartum class) and (control group) get a p value of 0.280 which means it is not significant. The mann whitney test was also conducted on the breastfeeding success confidence score to compare the same thing. In this test, the same p value result was obtained, namely p 0.000 in the group (combination of yoga and postpartum classes) and (postpartum classes) as well as in the group (combination of yoga and postpartum classes) and (control group) where these results stated that the results were significant. In the group (postpartum class) and (control group) also obtained significant results with a p value of 0.005 based on table 7. This confirms that the combination of yoga and postpartum classes provides the highest increase in prolactin levels and breastfeeding success confidence compared to the postpartum class alone and control groups.

Table 5. Comparison of prolactin levels between groups at pretest and posttest

Description	Yoga+ postpartum class	Postpartum class	Control group	P-values
Pre test	2130,33 (98,67-3807)	1492,84 (135,33-3818,67)	2180,34 (102-5115,33)	0,390
Post test	3193,67 (100,33-5497)	1147 (-24,67-4528,67)	1193,67 (88,67-5112)	0, 016
Kruskal wallis test between groups				

Table 6. Comparison of breastfeeding success confidence scores between groups at pre and post test

Description	Yoga+ Postpartum class	Postpartum class	Control	P-values
Pre test	44,50 (20-55)	50 (45-60)	51,50 (34-58)	0,031
Post test	49,50 (37-60)	57,50 (42-60)	48 (31-60)	0, 046
Delta Median (min-max)	-41,50 (-52-(-17)	5 (-5-12)	-3 (-8-5)	0,000
Kruskal wallis test between groups				

Non-parametric between-group test (Kruskal-Wallis). Bolded values indicate statistical significance at the $p < 0.05$ level

Table 7. Results of analysis of differences in changes using Mann Whitney test on variables of prolactin levels and delta of breastfeeding success beliefs

	Yoga + postpartum class	Postpartum class	Control group
Yoga + postpartum class	-	0,001	0,028
Postpartum class	0,001	-	0,280
Control group	0,028	0,280	-
Mann Whitney Test of Prolactin Level Variable			
Yoga + postpartum class	-	0,000	0,000
Postpartum class	0,000	-	0,005
Control group	0,000	0,005	-
Mann Whitney Delta test Confidence in breastfeeding success			

Discussion

The results showed that the combination of postpartum yoga and postpartum classes was most effective in increasing blood prolactin levels and breastfeeding success beliefs in postpartum mothers at risk of depression. This intervention proved to be superior compared to the provision of postpartum classes alone or the control group that did not receive the intervention.

The results of this study indicate that the combined intervention of postpartum yoga and postpartum classes has the highest effectiveness in increasing serum prolactin levels and mothers' confidence in breastfeeding success compared to the postpartum class only group and the control group. Initial analysis of prolactin levels showed no significant difference between groups. After the intervention, the combination group had a significant increase, while the postpartum class group showed a decrease, and the control group had no significant change. This finding reinforces the notion that stimulation through yoga practice accompanied by postpartum education can support hormonal balance, especially in increasing the let-down reflex and milk secretion.

On the Breastfeeding Self-Efficacy Scale-Short Form (BSES-SF) variable, no significant differences were found between groups before treatment. However, after the intervention, there was a significant increase in BSES-SF scores in the combination group with a value of (p 0.002) and in the postpartum class group (p 0.005), while the control group showed a decrease in scores without significant differences. This suggests that a physical and education-based approach can strengthen mothers' self-efficacy in breastfeeding through a more optimal psychoneuroendocrine mechanism.

This finding is in line with research Muthiatulsalimah et al (2022) that stimulating relaxation through postpartum yoga can reduce stress hormone levels (cortisol) and increase prolactin secretion, while postpartum classes provide educational and emotional support that strengthens the mother's confidence in her breastfeeding ability [13].

This study supports the results reported by Rodriguez Gallego et al (2024), that postpartum breastfeeding education can increase mothers' confidence and motivation in providing exclusive breastfeeding. In addition, Boybay Koyuncu & Yayan (2022) also found that postpartum yoga practice helps stabilize emotions, improve blood circulation, and accelerate the physical recovery of mothers after childbirth.

Thus, the combination of Postpartum Yoga and Postpartum Classes provides a synergistic effect that complements each other between the physical and psychological aspects of postpartum women. Postpartum classes play a role in strengthening cognitive and emotional aspects by providing education, increasing knowledge, and social support that helps mothers feel more confident in the breastfeeding process. Meanwhile, postpartum yoga contributes to the improvement of physiological and hormonal functions through breathing exercises, relaxation, and stretching that can reduce stress levels and stimulate the secretion of the hormone prolactin. The synergy between these two interventions makes the combined approach of Postpartum Yoga and Postpartum Classes an effective, comprehensive intervention strategy to improve breastfeeding success, especially in mothers at risk of postpartum depression.

Conclusions

The results showed that combining postpartum yoga and classes for women at risk of depression improved their breastfeeding success beliefs and increased prolactin hormone levels, contributing to better breastfeeding outcomes. Based on these findings, it is essential to implement this intervention routinely and continuously to maximize results. Health services, especially posyandu, must prioritize developing postpartum class implementation and actively involve all midwives to enhance mothers' breastfeeding self-efficacy. Future research should extend intervention duration and include more diverse and relevant respondents to strengthen the evidence base.

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