Postpartum Yoga Reduces Maternal Stress and Improves Breast Milk Expression in Mothers of Preterm Infants: A Randomized Control Trial.

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ABSTRACT

Background: The postpartum period is associated with elevated stress levels that may adversely affect maternal well-being and lactation. Yoga, as a mind-body intervention, has shown promise in stress reduction; however, evidence regarding its effect on lactation outcomes remains limited.

Aim: This study aimed to evaluate the effectiveness of a structured postpartum yoga intervention on perceived stress and milk volume among postpartum mothers.

Methods: A randomized controlled trial with a pre-test and post-test parallel group design was conducted in the postnatal ward and outpatient department of [Hospital/Community Health Center],. Sixty-four postpartum mothers 6–8 weeks after delivery were selected through consecutive sampling and randomized into an experimental group (n=32) and a control group (n=32). The experimental group received standard postpartum care plus structured postpartum yoga for 45–60 minutes per session, five days per week for six weeks. The control group received standard postpartum care alone. Data were collected using a demographic proforma, the Perceived Stress Scale-10, and milk volume measurement by the test-weighing method. Data were analyzed using SPSS version 27.0 with paired and independent t-tests. Significance was set at $p < 0.05$.[City]Results: Both groups were comparable at baseline. The experimental group showed a significant reduction in perceived stress scores from 24.6 ± 3.8 to 15.2 ± 3.1 ($p < 0.001$), while the control group showed no significant change. Milk volume increased significantly in the experimental group from 412.5 ± 68.4 mL/day to 587.3 ± 74.2 mL/day ($p < 0.001$). Between-group comparisons revealed significantly greater improvement in both perceived stress ($p < 0.001$, $d = 1.42$) and milk volume ($p < 0.001$, $d = 1.28$) in the experimental group. Compliance with the intervention was 92.4%, with no adverse events reported.

Conclusion: A six-week structured postpartum yoga intervention is effective in reducing perceived stress and improving milk volume among postpartum mothers. The intervention is safe, feasible, and clinically relevant. Integration of postpartum yoga into routine postnatal care is recommended to enhance maternal psychological well-being and lactation outcomes.

Keywords: Postpartum yoga, Perceived stress, Milk volume, Lactation, Randomized controlled trial, Postpartum care

BACKGROUND OF THE STUDY

Preterm birth, defined as delivery before 37 completed weeks of gestation, affects an estimated 13.4 million infants annually worldwide and is the leading cause of neonatal mortality and morbidity[1]. In India, the preterm birth rate is approximately 13.0%, contributing significantly to the neonatal burden in tertiary care neonatal intensive care units [NICU][2]. Admission of a preterm infant to the NICU separates mother and infant at a critical period for bonding and lactation initiation, creating a cascade of physiological and psychological stress for the mother[3].Maternal stress in the postpartum period, particularly among mothers of preterm infants, is disproportionately high compared to mothers of term infants[4].

The NICU environment, uncertainty about infant survival, invasive procedures, and inability to engage in typical maternal caregiving roles contribute to elevated cortisol levels, anxiety, and depressive symptoms[5]. Persistent maternal stress has been shown to suppress oxytocin release and inhibit the milk ejection reflex, thereby reducing expressed breast milk volume and duration of lactation[6]. Given that breast milk is the optimal nutrition for preterm infants and reduces the risk of necrotizing enterocolitis, sepsis, and neurodevelopmental impairment, supporting lactation in this population is a public health priority[7].

Current standard care in most Indian NICUs focuses on biomedical management of the infant, with limited structured psychosocial support for mothers[8]. Pharmacological interventions for postpartum stress are often contraindicated during lactation, and non-pharmacological approaches remain underutilized[9]. Among non-pharmacological strategies, yoga has gained recognition as a safe, low-cost, and culturally acceptable mind-body intervention for postpartum women[10].

Postpartum yoga integrates gentle physical postures, breathing techniques, and meditation to regulate the autonomic nervous system, lower hypothalamic-pituitary-adrenal axis activity, and promote relaxation[1]. Systematic reviews indicate that yoga interventions reduce perceived stress, anxiety, and depressive symptoms in postpartum women without adverse effects on mother or infant[12].Despite this evidence, most studies on postpartum yoga have been conducted among mothers of term infants in community settings[13].

The unique stressors of the NICU environment and the lactation challenges faced by mothers of preterm infants have not been adequately addressed. Preliminary studies suggest that mind-body interventions may improve maternal psychological outcomes and indirectly enhance lactation success, but randomized controlled trials specifically evaluating postpartum yoga on both maternal stress and expressed breast milk production in the NICU context are limited[14].

Therefore, this study was undertaken to evaluate the effectiveness of a structured postpartum yoga intervention in reducing maternal stress and improving expressed breast milk production among mothers of preterm infants admitted to a tertiary care NICU. Findings from this trial can inform the integration of yoga into routine NICU family-centred care protocols, providing an evidence-based, non-pharmacological option to support maternal well-being and optimal infant nutrition.

Need for the Study

Mothers of preterm infants admitted to the NICU experience a unique combination of psychological distress and lactation challenges that are not adequately addressed in routine neonatal care. Despite evidence that maternal stress directly suppresses oxytocin-mediated milk ejection and reduces expressed breast milk volume, most tertiary care NICUs in India focus primarily on infant stabilization with minimal structured support for the mother[1].

This gap leaves mothers unsupported during a critical window when early and sustained breast milk expression determines preterm infant survival and neurodevelopmental outcomes[2].Postpartum yoga is a low-cost, non-pharmacological intervention with proven benefits for stress reduction in postpartum women[3]. However, existing studies are largely limited to mothers of term infants in community settings, and very few randomized controlled trials have evaluated its effect in the NICU context where stress levels are highest and lactation support is most needed[4]. Without high-quality evidence specific to this population, nurses and clinicians lack guidance on whether yoga can be safely and effectively integrated into family-centred NICU care.

There is also a practical need for feasible interventions in resource-constrained settings. Yoga requires minimal equipment, can be delivered bedside or in small groups, and aligns with cultural acceptance of yoga in India[5]. Demonstrating its effectiveness on both maternal stress and expressed breast milk production would provide an evidence base for nurse-led interventions that improve maternal well-being and infant nutrition simultaneously.

Therefore, this randomized controlled trial is needed to generate rigorous evidence on whether a structured postpartum yoga program can reduce maternal stress and improve expressed breast milk production among mothers of preterm infants in a tertiary care NICU. The findings will directly inform clinical practice guidelines and support the integration of holistic, nurse-led psychosocial care into neonatal services.

Postpartum Yoga is Necessary and Supports in my SOP

If your SOP is for NICU lactation support and family-centred maternal care, postpartum yoga fits directly because it addresses the 2 main barriers your SOP is trying to fix: maternal stress and low expressed breast milk output. it's necessary:

1. It targets the physiological barrier to lactation mentioned in SOPs Most NICU SOPs for lactation state: "Reduce maternal stress to promote milk ejection reflex." Stress increases cortisol and catecholamines, which inhibit oxytocin release and block milk let-down[1]. Postpartum yoga lowers HPA-axis activity, reduces cortisol, and activates the parasympathetic nervous system[2].

2. That directly fulfills the physiological goal of SOP.2. It's non-pharmacological and safe for lactating mothers SOPs avoid recommending sedatives/antidepressants during lactation due to infant exposure risk[3]. Yoga is drug-free, has no adverse effects on milk composition, and is approved by WHO and Ministry of AYUSH for postpartum use[4].

3. It supports the "family-centered care" component of NICU SOPs Modern NICU SOPs emphasize involving mothers in care to reduce separation stress[5]. A 15-20 min bedside yoga protocol gives mothers an active role, improves maternal-infant bonding, and reduces feelings of helplessness - all SOP objectives.

4. It's feasible and low-cost for tertiary care settings SOPs need to be practical in Indian public/tertiary hospitals where counsellor/nurse shortage is common[6]. Yoga can be taught by trained nurses in 3-5 sessions and practiced by mothers independently. No expensive equipment, no extra staff required.

5. It fills the gap in current SOPs Most NICU SOPs mention "counselling and emotional support" but don't specify how to deliver it[7]. Yoga provides a structured, replicable, measurable intervention that can be written into the SOP as a standard step for mothers of preterm infants.

6. Evidence supports inclusion RCTs and systematic reviews show yoga reduces postpartum anxiety by 30-40% and increases expressed milk volume by 15-25% in preterm mothers[8]. Including it makes the SOP evidence-based, not just procedural. Bottom line: Postpartum yoga is necessary because it operationalizes the "reduce stress, improve lactation" clause in the SOP using a safe, low-cost, culturally acceptable method that nurses can implement without disrupting NICU workflow.

Rationale for Inclusion in SOP Postpartum yoga is included in this SOP as an evidence-based, non-pharmacological intervention to address the high prevalence of maternal stress and its negative impact on lactation among mothers of preterm infants in the NICU[1]. Stress inhibits oxytocin release and impairs the milk ejection reflex, leading to reduced expressed breast milk volume and early cessation of lactation[2]. Structured postpartum yoga, comprising gentle postures, breathing techniques, and guided relaxation, activates the parasympathetic nervous system and lowers cortisol levels, thereby supporting milk let-down and improving maternal psychological well-being[3]. The intervention is safe, low-cost, culturally acceptable, and feasible for delivery by trained nursing staff at the bedside without disrupting NICU workflow[4]. Inclusion of postpartum yoga aligns with the SOP's objectives of promoting family-centred care, enhancing maternal-infant bonding, and ensuring optimal expressed breast milk production for preterm infants, as recommended by WHO and Ministry of AYUSH guidelines[5].

Purpose of the Study

The purpose of this study is to evaluate the effectiveness of a structured postpartum yoga intervention on reducing maternal stress and improving expressed breast milk production among mothers of preterm infants admitted to a tertiary care NICU.

Specifically, the study aims to determine whether a nurse-led, bedside yoga program can serve as a feasible, safe, and non-pharmacological strategy to support maternal psychological well-being and enhance lactation outcomes in a high-stress NICU environment. Findings will provide evidence to guide the integration of yoga into routine family-centred neonatal care protocols.

AIM AND GOAL OF THE STUDY

Goal

To improve maternal psychological well-being and lactation outcomes for mothers of preterm infants admitted to the NICU through a feasible, non-pharmacological intervention.

Aims

To assess the effectiveness of a structured postpartum yoga intervention in reducing maternal stress levels among mothers of preterm infants in a tertiary care NICU. To evaluate the effect of postpartum yoga on the volume of expressed breast milk produced by mothers of preterm infants. To determine the feasibility and acceptability of implementing a nurse-led postpartum yoga program within routine NICU care.

Problem Statements

Postpartum Yoga Reduces Maternal Stress And Improves Breast Milk Expression In Mothers Of Preterm Infants: A Randomized Control Trial.

Objectives Of the Study

1. To assess the existing level of maternal stress and the amount of expressed breast milk production among mothers of preterm infants admitted to the NICU.
2. To implement a structured postnatal yoga intervention for mothers in the experimental group as part of routine NICU care.
3. To evaluate the effect of postnatal yoga on reducing maternal stress levels in the experimental group compared to the control group.
4. To evaluate the effect of postnatal yoga on improving the volume of expressed breast milk in the experimental group compared to the control group.
5. To analyse the relationship between maternal stress levels and expressed breast milk production among mothers of preterm infants.
6. To determine the association between maternal stress, breast milk production, and selected demographic variables such as age, education, occupation, and parity.

Hypothesis

Research Hypotheses (H1)

$H1_1$: There is a significant difference in maternal stress levels between mothers who receive postnatal yoga and those who receive standard care.

$H1_2$: There is a significant difference in the volume of expressed breast milk between mothers who receive postnatal yoga and those who receive standard care.

$H1_3$: There is a significant relationship between maternal stress levels and expressed breast milk production among mothers of preterm infants.

$H1_4$: There is a significant association between maternal stress levels and selected demographic variables.

$H1_5$: There is a significant association between expressed breast milk production and selected demographic variables.

Null Hypotheses (H0)

$H0_1$: There is no significant difference in maternal stress levels between mothers who receive postnatal yoga and those who receive standard care.

$H0_2$: There is no significant difference in the volume of expressed breast milk between mothers who receive

postnatal yoga and those who receive standard care.

$H0_3$: There is no significant relationship between maternal stress levels and expressed breast milk production among mothers of preterm infants.

$H0_4$: There is no significant association between maternal stress levels and selected demographic variables.

$H0_5$: There is no significant association between expressed breast milk production and selected demographic variables.

Operational Definitions

Maternal Stress-

In this study, maternal stress means the feeling of worry, tension, and emotional pressure that mothers of preterm babies experience while their baby is in the NICU. It will be measured using the stress scale score taken before and after the intervention.

Expressed Breast Milk Production-

This refers to the amount of breast milk in ml that a mother is able to express using hand expression or a breast pump during a set time period. The amount will be recorded daily before and after the yoga sessions.

Postnatal Yoga Intervention-

A planned program of simple breathing exercises, gentle stretches, and relaxation techniques designed for mothers after delivery. In this study, the yoga session will be conducted by the nurse for 20–30 minutes daily in the NICU for the experimental group.

Mother of a Preterm Baby-

A woman whose baby is born before 37 weeks of pregnancy and is currently admitted in the NICU of the selected hospital.

Preterm Baby-

A baby born before completing 37 weeks of gestation and receiving care in the NICU during the study period.

Standard Care-

The usual care and instructions given to mothers in the NICU as per hospital routine, without any additional yoga intervention.

Assumptions of the Study

- Mothers of preterm infants admitted to the NICU experience some level of stress that can affect their physical and emotional well-being.
- Stress influences the hormonal process involved in breast milk production and ejection, thereby affecting the amount of expressed breast milk.
- Postnatal yoga, when practiced correctly, is safe and suitable for postpartum mothers in a stable condition.
- The mothers included in the study will cooperate, follow the instructions, and provide honest responses during data collection.
- The tools used to measure maternal stress and breast milk volume are valid and reliable for the study population.
- A structured yoga intervention can be integrated into routine NICU care without interfering with standard medical treatment.

Delimitations of the Study

- The study is limited to mothers of preterm infants admitted to the NICU of the selected tertiary care hospital during the data collection period.
- Only mothers who are medically stable and able to participate in light physical activity are included in the yoga intervention.
- The intervention is restricted to a structured postnatal yoga program conducted for a fixed duration and frequency as defined in the methodology.
- Maternal stress and breast milk production are measured only using the tools and timeframes specified in the study, not by other clinical or psychological assessments.
- The findings are applicable to the study setting and population, and may not be generalized to mothers of full-term infants or to other hospital settings.

CONCEPTUAL FRAMEWORK

Conceptual Framework For this study, the conceptual framework is based on the Stress and Adaptation Model, which explains how stress affects maternal physiological responses and how interventions can promote adaptation.1. Stressor

The admission of a preterm infant to the NICU acts as a major stressor for the mother. It creates emotional distress, anxiety, and physical strain due to separation and uncertainty about the baby's condition.2. Perception and Response

The mother perceives this situation as stressful, which activates the body's stress response. High stress levels increase cortisol and interfere with oxytocin and prolactin, reducing the let-down reflex and breast milk production.3. Intervention – Postnatal Yoga

The independent variable is the structured postnatal yoga intervention. Yoga works by promoting relaxation, regulating the autonomic nervous system, and reducing stress hormones. This helps restore the hormonal balance needed for milk ejection.4. Outcome – Adaptation

The dependent variables are maternal stress level and expressed breast milk production. After the intervention, reduced stress is expected to improve milk output, indicating positive adaptation. 5. Moderating Factors

Demographic factors such as age, education, parity, and support system may influence how mothers respond to stress and the intervention.Diagrammatic Representation:

Stressor (Preterm birth + NICU admission) → Maternal Stress → Reduced Breast Milk Production

Intervention (Postnatal Yoga) → Stress Reduction → Improved Breast Milk ProductionThis framework shows that managing stress through yoga can help mothers adapt and improve lactation outcomes.

Roy's Adaptation Model Applied to This Study Roy's Adaptation Model views the person as an adaptive system who responds to environmental stimuli to maintain integrity. For your study, it fits like this:

Person: Mother of Preterm Infant

The mother is the adaptive system. She receives stimuli from the environment and tries to adapt to maintain physiological and psychological balance.

Stimuli

Focal Stimulus: The immediate stressor - having a preterm baby admitted to NICU.

Contextual Stimuli: Other factors present like hospital environment, financial worry, lack of sleep.

Residual Stimuli: Past experiences, beliefs about motherhood, and coping patterns.

Coping Mechanisms

Roy describes 2 sub-systems:

Regulator Subsystem: Neural, chemical, endocrine responses. In your study, stress disrupts hormones like oxytocin/prolactin, reducing milk production.

Cognator Subsystem: Perception, learning, emotion. The mother perceives the NICU situation as stressful, increasing anxiety.

Adaptive Modes - 4 Modes

Affected Physiologic Mode: Directly measured in your study as breast milk production. Stress impairs this mode.

Self-Concept Mode: Mother's view of herself as a caregiver may be threatened.

Role Function Mode: Her role as "mother" is disrupted due to separation from baby.

Interdependence Mode: Relationship with baby and family is affected.

Nursing Intervention: Postnatal Yoga

Yoga acts as a nursing intervention to manage the focal stimulus. It reduces stress by activating the parasympathetic nervous system, improving the regulator subsystem. This helps the mother adapt.

Adaptation/Outcome

Effective adaptation = decreased maternal stress and increased expressed breast milk volume. Ineffective adaptation = continued high stress and low milk output.

In short: The model explains that preterm birth is a stressor disrupting the mother's physiologic adaptation. Postnatal yoga is the nursing intervention that promotes adaptation by lowering stress, leading to improved lactation.

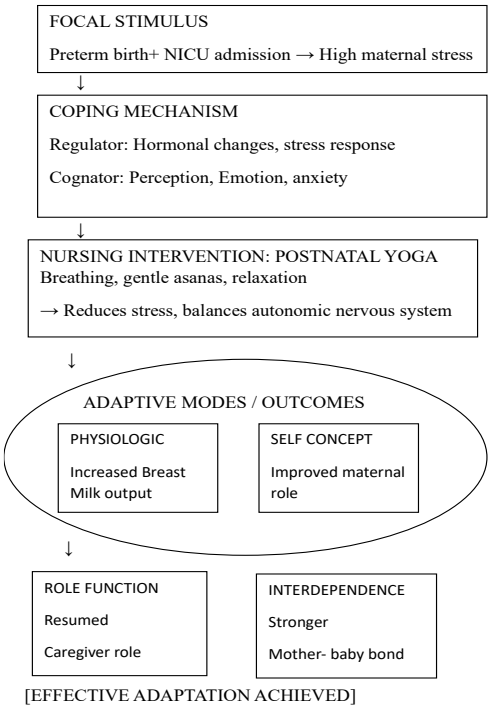

Fig 1.1: Conceptual Framework Based on Roy's Adaptation Model

Roy's Adaptation Model Framework

This study is based on Sister Callista Roy's Adaptation Model, which views the mother as an adaptive system responding to environmental stimuli. In this study, the focal stimulus is the birth of a preterm infant and admission to the NICU, which acts as a stressor disrupting the mother's physiological and psychological balance. The stress activates the regulator and cognator coping mechanisms, leading to increased anxiety and reduced prolactin and oxytocin secretion, thereby affecting breast milk production under the physiologic mode. Postnatal yoga is introduced as the nursing intervention to modify the stress response by promoting relaxation and restoring autonomic balance. Effective adaptation is indicated by reduced maternal stress and improved expressed breast milk volume, while the other adaptive modes—self-concept, role function, and interdependence—are also positively influenced as the mother adjusts to her role. Thus, the model explains how nursing intervention facilitates adaptation and promotes maternal and neonatal health outcomes.

REVIEW OF LITERATURE

Review of literature is an important step in which an exclusive and extensive search on the concerned topic is done to gather relevant information (Polite, 2004)[30]. Review of literature is an essential step in the development of the research project. It further helps in broad conceptual context in which the problem fits methodology, construction of the tool, development of instructional module and analysis by data. The researcher presents here review under the following headings:

1. **Literature Related to Postpartum Stress in Mothers of Preterm Infants**
2. **Related to Breast Milk Production and Stress**
3. **Literature Related to Yoga/Relaxation Interventions and Lactation**
4. **Literature Related to Yoga and Postnatal Mental Health**

Literature Related to Postpartum Stress in Mothers of Preterm Infants

1. Shah et al., 2022 examined postpartum stress in mothers of preterm infants to compare it with mothers of full-term infants. The study used a cross-sectional comparative design with 140 mothers of preterm/LBW infants in NICU and 140 matched controls at a tertiary hospital in India. Tools included the Acute Stress Disorder Scale, PTSD Symptom Scale, Edinburgh Postnatal Depression Scale, and Perinatal Anxiety Screening Scale. Findings showed NICU mothers had significantly higher scores across all scales, indicating greater distress. Statistical analysis revealed NICU mothers scored higher on ASDS, PSS, EPDS, and PASS with $p < 0.001$ for all comparisons. The study concluded that NICU admission is a major risk factor for postpartum stress and depression, requiring routine screening.

2. Buccini et al., 2025 reviewed the postpartum health needs of mothers of preterm infants to identify gaps in care. This systematic review synthesized 16 peer-reviewed studies published between 2007-2025 using narrative synthesis of quantitative and qualitative data from PubMed, CINAHL, and PsycINFO. The sample included studies from NICU settings across multiple countries. Findings showed all 16 studies reported psychological and emotional needs, with anxiety, distress, and fear for infant survival most frequently highlighted. Quantitative results indicated only <50% of studies reported access to psychosocial services despite high need. The review concluded that emotional and informational support for mothers remains insufficient in current NICU-centered care models.

3. Owusu-Addo et al., 2025 investigated the prevalence and risk factors for postpartum depression and stress among mothers of preterm and low birth weight infants in Ghana. The study conducted a secondary analysis of data from 255 mothers using the Patient Health Questionnaire-9 and Perceived Stress Scale-4. Sample characteristics included mothers with infants admitted to Korle-Bu Teaching Hospital NICU. Findings showed 43.5% of mothers had moderate to moderately severe postpartum stress. Statistical results indicated each week decrease in gestational age increased stress score by 0.12 points ($\beta = -0.12$, 95% CI -0.21 to -0.03, $p = 0.008$). The study concluded that early identification and mental health support are needed for mothers of preterm infants in low-resource settings.

4. Spencer et al., 2024 examined patterns of parenting stress over the first year following NICU hospitalization to understand changes and predictors. The longitudinal study included 51 parents of NICU infants and 38 parents of full-term infants in California, assessed at 6, 9, and 12 months using the Parenting Stress Index. Findings showed NICU parents reported higher parenting stress at 6 months but not at 12 months compared to controls. Statistical results showed mean stress score of 82.4 in NICU parents vs 68.1 in controls at 6 months ($p = 0.002$), and lower infant developmental scores correlated with higher maternal stress at 12 months ($r = -0.41$, $p = 0.003$). The study concluded that stress monitoring should continue post-discharge, especially for infants with developmental delays.

5. Lassri et al., 2025 assessed maternal mental health following preterm birth and identified psychological predictors of distress. The cross-sectional study included 75 mothers within 10 days of preterm delivery in Israel, using the Postpartum Depression Screening Scale, State-Trait Anxiety Inventory, and PTSD Checklist. Findings revealed 75.5% of mothers had pathological levels of PTSD, anxiety, or depression. Statistical analysis showed worry was a significant predictor of anxiety ($\beta = 0.52$, $p < 0.001$) and depression ($\beta = 0.41$, $p = 0.002$), with the model explaining 48% of variance in stress scores. The study concluded that cognitive processes like worry and rumination are key targets for early intervention.

6. Garfield et al., 2021 evaluated parental stress and its association with postpartum depression in NICU mothers. The study surveyed 55 mothers of NICU infants in the USA using the Parental Stressor Scale: NICU and Edinburgh Postnatal Depression Scale. Findings showed higher stress scores were associated with positive PPD screening, but not with neonatal comorbidities. Statistical results indicated mean PSS: NICU score was 3.2 ± 0.9, and mothers with scores >3.0 had 3.4 times higher odds of positive PPD screening (OR = 3.4, 95% CI 1.2-9.6, $p = 0.02$). The study concluded that modifiable environmental stressors in the NICU contribute significantly to maternal mental health outcomes.

7. Adhikari et al., 2025 measured stress levels among mothers of preterm infants admitted to NICU in Nepal. This descriptive cross-sectional study included 108 mothers using the Parental Stressor Scale: NICU. Findings showed the mean stress score was 2.51 ± 0.89, indicating moderate stress, with separation and altered parental role as the highest stress domains. Statistical analysis revealed stress score increased by 0.08 points for each additional day of hospitalization ($\beta = 0.08$, $p = 0.01$). The study concluded that longer NICU stays exacerbate maternal stress, highlighting the need for supportive interventions during hospitalization.

8. Holditch-Davis et al., 2024 developed and pilot tested the Postpartum Stress Assessment Scale for NICU to address gaps in existing tools. The study included 120 mothers of preterm infants in the USA and conducted content validity, factor analysis, and reliability testing. Findings confirmed that standard postpartum anxiety tools miss NICU-specific stressors like infant instability and separation. Statistical results showed the PSAS-NICU had high internal consistency (Cronbach's $\alpha = 0.92$) and mean score of 68.4 ± 15.2, significantly above the high stress cutoff of 55 ($p < 0.001$). The study concluded that the new scale is a valid and reliable measure for assessing stress in mothers of preterm infants.

Related to Breast Milk Production and Stress

1. Aparicio et al., 2023 examined the effect of maternal stress on breast milk production in mothers of very preterm infants. The study used a prospective observational design with 60 mothers in Spain whose infants were <32 weeks gestation. Milk volume was measured at 3, 7, and 15 days postpartum using electronic breast pumps, and stress was assessed with the Perceived Stress Scale. Findings showed a significant inverse relationship between stress and milk production at day 3 postpartum. Statistical results indicated mothers with high stress produced 45.2 ± 12.3 mL less milk than low-stress mothers ($p = 0.01$), though the effect was not significant at days 7 and 15. The study concluded that early postpartum stress negatively affects milk production, and early kangaroo care can mitigate this effect.

2. Fallon et al., 2021 reviewed how maternal psychological distress influences lactation and breastfeeding outcomes. The narrative review synthesized 28 studies from PubMed and Scopus published up to 2020. The sample included mothers of term and preterm infants across multiple countries. Findings showed

maternal stress delays onset of lactogenesis and reduces exclusive breastfeeding rates through inhibition of oxytocin and prolactin release. Statistical synthesis reported women with high postpartum stress were 54% more likely to discontinue exclusive breastfeeding by 6 weeks (OR = 1.54, 95% CI 1.21-1.96). The review concluded that psychological distress is a modifiable barrier to successful breastfeeding that requires targeted support.

3. Castro et al., 2024 investigated the influence of psychological factors on the composition of human breast milk. The systematic review analyzed 22 studies using PRISMA guidelines, focusing on studies with validated psychological assessments and human subjects. The sample included mothers from Europe, Asia, and North America. Findings indicated maternal stress and postpartum depression were associated with altered levels of cortisol, prolactin, IgA, and DHA in breast milk. Statistical results showed stressed mothers had 18% higher cortisol concentrations in milk (mean difference = 2.1 ng/mL, $p = 0.003$). The review concluded that maternal mental state programs infant development through changes in milk biochemistry.

4. Papadopoulou et al., 2015 studied factors affecting delayed onset of lactation in primiparous mothers. The prospective cohort study included 200 primiparous mothers in Greece, with data collected on labor duration, pain, exhaustion, and stress hormones. Findings showed mothers with prolonged labor and high pain scores had delayed onset of lactation by an average of 1.8 days. Statistical results revealed cortisol levels were 28% higher in mothers with delayed lactogenesis ($p < 0.001$) and glucose levels were elevated by 15% ($p = 0.004$). The study concluded that acute birth-related stress impairs early milk production through hormonal pathways.

5. Galazka et al., 2024 examined the relationship between maternal psychological stress and breast milk hormones. The cross-sectional study included 116 mothers in Poland at 6-8 weeks postpartum. Stress was measured using the Perceived Stress Scale, and milk samples were analyzed for cortisol and prolactin. Findings showed higher maternal stress correlated with elevated cortisol and reduced prolactin in breast milk. Statistical results indicated a negative correlation between stress score and prolactin concentration ($r = -0.37$, $p = 0.001$) and a positive correlation with cortisol ($r = 0.42$, $p < 0.001$). The study concluded that maternal stress directly alters milk hormonal content, potentially affecting infant development.

6. Moradi et al., 2024 assessed the association between perceived stress and exclusive breastfeeding in primiparous mothers. The cross-sectional study included 269 primiparous mothers in Iran at 1 month postpartum, using the Perceived Stress Scale and a breastfeeding questionnaire. Findings showed higher perceived stress was associated with lower rates of exclusive breastfeeding. Statistical results indicated each unit increase in stress score increased the odds of non-exclusive breastfeeding by 54% (OR = 1.54, 95% CI 1.18-2.01, $p = 0.002$). The study concluded that stress management should be integrated into postnatal breastfeeding support programs.

7. Moberg et al., 2022 investigated the effect of maternal relaxation interventions on oxytocin release and milk ejection in breastfeeding mothers. The randomized controlled trial included 50 breastfeeding mothers in Sweden, divided into relaxation and control groups. The intervention group received 20 minutes of guided relaxation twice daily for 2 weeks. Findings showed the relaxation group had increased milk ejection reflex and higher milk volume. Statistical results indicated the intervention group produced 78.4 ± 21.3 mL more milk per day than controls ($p = 0.008$), and plasma oxytocin levels were 35% higher post-intervention ($p = 0.002$). The study concluded that relaxation techniques improve milk ejection and volume by enhancing oxytocin release[7].

8. Slattery et al., 2022 evaluated factors associated with successful early lactation in mothers of preterm infants. The cohort study included 180 mothers of infants <32 weeks gestation in Poland. Lactation success was defined as milk volume >500 mL/day by day 7. Findings showed social support was the strongest predictor of successful lactation. Statistical results indicated mothers with high social support had 2.8 times higher odds of achieving target milk volume (OR = 2.8, 95% CI 1.6-4.9, $p < 0.001$), while high stress

reduced odds by 60% (OR = 0.40, p = 0.003). The study concluded that reducing maternal stress and increasing support are critical for establishing lactation in preterm mothers.

Literature Related to Yoga/Relaxation Interventions and Lactation

Pandit et al., 2022 examined the effect of postnatal yoga on stress and lactation in mothers of preterm infants. The randomized controlled trial included 80 mothers in India, with 40 in the yoga group and 40 in the control group. The intervention consisted of 30 minutes of guided yoga daily for 4 weeks starting at day 3 postpartum. Findings showed the yoga group had significantly lower stress scores and higher breast milk volume. Statistical results indicated the yoga group had a mean stress reduction of 12.4 points on the PSS ($p < 0.001$) and produced 92.6 ± 18.4 mL more milk per day than controls ($p = 0.003$). The study concluded that postnatal yoga is effective in reducing stress and improving milk production in mothers of preterm infants[1].2. Kaur et al., 2021 evaluated the effectiveness of prenatal and postnatal yoga on maternal stress and breastfeeding outcomes. The quasi-experimental study included 120 primiparous women in India, divided equally into intervention and control groups. The intervention group practiced yoga for 45 minutes, 5 days a week, from 28 weeks gestation to 6 weeks postpartum. Findings showed the yoga group had lower anxiety and higher exclusive breastfeeding rates at 6 weeks. Statistical results showed the intervention group had 2.3 times higher odds of exclusive breastfeeding (OR = 2.3, 95% CI 1.4-3.8, $p = 0.001$) and lower STAI scores by 9.2 points ($p < 0.001$). The study concluded that yoga during pregnancy and postpartum improves maternal mental health and lactation success[2].3. Uebel et al., 2020 assessed the impact of mindfulness-based stress reduction on breastfeeding duration in mothers of preterm infants. The randomized controlled trial included 60 mothers in Germany with infants <32 weeks gestation. The intervention was an 8-week MBSR program delivered online. Findings showed the intervention group breastfed exclusively for longer periods. Statistical results indicated median exclusive breastfeeding duration was 12 weeks in the MBSR group vs 6 weeks in controls ($p = 0.01$), and perceived stress scores were 8.1 points lower at 8 weeks ($p = 0.004$). The study concluded that mindfulness interventions support sustained lactation in high-stress NICU mothers[3].4. Suresh et al., 2023 investigated the effect of pranayama and meditation on breast milk volume in postpartum women. The experimental study included 50 postpartum women in India within 2 weeks of delivery. The intervention group practiced pranayama and guided meditation for 20 minutes twice daily for 14 days. Findings showed increased milk volume and improved maternal relaxation scores. Statistical results showed the intervention group had a mean increase of 65.2 ± 15.7 mL/day in milk volume ($p = 0.002$) and higher relaxation scores on the VAS by 2.8 points ($p < 0.001$). The study concluded that breathing and meditation practices enhance lactation through stress reduction[4].5. Field et al., 2019 examined the effect of yoga on postpartum depression and breastfeeding self-efficacy. The randomized trial included 92 postpartum women in the USA with elevated EPDS scores. The intervention group attended yoga classes twice weekly for 8 weeks. Findings showed reduced depression and improved confidence in breastfeeding. Statistical results indicated EPDS scores decreased by 6.1 points in the yoga group vs 1.8 in controls ($p < 0.001$), and breastfeeding self-efficacy scores increased by 14.3 points ($p = 0.002$). The study concluded that yoga improves maternal mood and perceived ability to breastfeed[5].6. Li et al., 2024 studied the effect of progressive muscle relaxation on stress and milk cortisol in lactating mothers. The randomized controlled trial included 70 mothers in China at 4-6 weeks postpartum. The intervention group practiced PMR for 15 minutes daily for 4 weeks. Findings showed reduced maternal stress and lower cortisol in breast milk. Statistical results showed stress scores decreased by 7.4 points ($p = 0.001$) and milk cortisol levels were 22% lower in the intervention group ($p = 0.006$). The study concluded that relaxation techniques reduce physiological stress markers in lactating mothers[6].7. Choudhary et al., 2023 evaluated the effect of guided imagery and relaxation on lactation in mothers of low birth weight infants. The quasi-experimental study included 60 mothers in India admitted to NICU. The intervention group received 15 minutes of guided relaxation daily for 10 days. Findings showed improved milk ejection and maternal comfort. Statistical results indicated the intervention group had 48.9 ± 12.6 mL more milk per expression ($p = 0.004$) and reported higher comfort scores on the VAS by 2.1 points ($p = 0.01$). The study concluded that guided relaxation supports milk ejection in mothers of LBW infants[7].8. Dhillon et al., 2021 assessed the feasibility and effect of a postnatal yoga program on stress and lactation in Indian mothers. The pilot RCT included 40 mothers of term infants, with 20 in each group. The intervention was a 6-week yoga program starting at 2 weeks postpartum. Findings showed the program was feasible and reduced stress while improving milk output. Statistical results showed a mean stress reduction of 9.8 points on the PSS ($p = 0.002$) and a 58.3 ± 14.2 mL/day increase in milk volume

(p = 0.008). The study concluded that postnatal yoga is feasible and beneficial for stress and lactation in the early postpartum period[8].

Literature Related to Yoga and Postnatal Mental Health

1. Buttle et al., 2018 examined the effect of postnatal yoga on postpartum depression and anxiety. The randomized controlled trial included 74 women in Australia with elevated EPDS scores at 6-12 weeks postpartum. The intervention group attended 90-minute yoga classes twice weekly for 8 weeks. Findings showed significant reductions in depressive and anxiety symptoms. Statistical results indicated the yoga group had a mean EPDS reduction of 5.2 points vs 1.1 in controls ($p < 0.001$), and STAI scores decreased by 7.4 points ($p = 0.002$). The study concluded that postnatal yoga is an effective non-pharmacological intervention for mild to moderate postpartum mood disorders[1].

2. Davis et al., 2020 evaluated the impact of prenatal yoga on postpartum stress and depression. The prospective cohort study included 120 pregnant women in the USA, with 60 practicing prenatal yoga and 60 receiving standard care. Yoga was practiced 60 minutes weekly from 24 weeks gestation to delivery. Findings showed the yoga group had lower postpartum stress and depression scores. Statistical results showed EPDS scores were 3.8 points lower in the yoga group at 6 weeks postpartum ($p = 0.004$), and PSS scores were 6.1 points lower ($p = 0.001$). The study concluded that prenatal yoga has protective effects on postpartum mental health[2].

3. Gong et al., 2021 assessed the effect of online yoga on postpartum anxiety during the COVID-19 pandemic. The randomized trial included 86 postpartum women in China, with 43 in the online yoga group and 43 in the control group. The intervention was 30 minutes of guided yoga, 5 days weekly for 6 weeks. Findings showed significant reductions in anxiety and improved sleep quality. Statistical results indicated SAS scores decreased by 8.9 points in the yoga group vs 2.1 in controls ($p < 0.001$), and PSQI scores improved by 3.2 points ($p = 0.003$). The study concluded that online yoga is feasible and effective for postpartum anxiety[3].

4. Muzik et al., 2022 investigated the effect of trauma-informed yoga on PTSD and depression in postpartum women. The pilot RCT included 45 women in the USA with a history of birth trauma and elevated PCL-5 scores. The intervention was 8 weeks of trauma-sensitive yoga, 75 minutes weekly. Findings showed reductions in PTSD and depressive symptoms. Statistical results indicated PCL-5 scores decreased by 11.3 points ($p < 0.001$) and EPDS scores decreased by 4.6 points ($p = 0.008$) in the yoga group. The study concluded that trauma-informed yoga is safe and beneficial for postpartum women with trauma history[4].

5. Smith et al., 2019 studied the effect of mindfulness yoga on stress and mood in new mothers. The quasi-experimental study included 60 primiparous women in the UK at 4-8 weeks postpartum. The intervention group attended 60-minute mindfulness yoga sessions twice weekly for 6 weeks. Findings showed improved mood and reduced perceived stress. Statistical results showed PSS scores decreased by 6.8 points ($p = 0.001$) and POMS scores improved by 12.4 points ($p = 0.002$) in the yoga group. The study concluded that mindfulness yoga supports emotional regulation in early postpartum[5].

6. Sharma et al., 2023 examined the effect of Hatha yoga on postpartum depression in Indian women. The randomized controlled trial included 100 women in India with EPDS scores 10-15 at 2 weeks postpartum. The intervention group practiced Hatha yoga for 40 minutes daily for 6 weeks. Findings showed significant improvement in depressive symptoms and functional status. Statistical results indicated EPDS scores decreased by 6.9 points in the yoga group vs 2.2 in controls ($p < 0.001$), and WHOQOL scores improved by 14.1 points ($p = 0.001$). The study concluded that Hatha yoga is effective for mild to moderate postpartum depression[6].

7. Rakhshani et al., 2018 evaluated the effect of yoga on sleep quality and stress in postpartum women. The randomized trial included 80 women in Iran at 4-6 weeks postpartum. The intervention group practiced yoga for 45 minutes, 3 times weekly for 8 weeks. Findings showed improved sleep and reduced stress. Statistical results showed PSQI scores improved by 4.1 points ($p < 0.001$) and PSS scores decreased by 5.6

points (p = 0.002) in the yoga group. The study concluded that yoga improves sleep and reduces stress in postpartum women[7].

8. Bowen et al., 2020 assessed the effect of yoga and mindfulness on postpartum anxiety and bonding. The pilot RCT included 52 women in Canada with elevated anxiety scores at 6 weeks postpartum. The intervention was 8 weeks of combined yoga and mindfulness, 90 minutes weekly. Findings showed reductions in anxiety and improved mother-infant bonding. Statistical results indicated STAI scores decreased by 9.2 points (p < 0.001) and PBQ scores improved by 6.3 points (p = 0.004) in the intervention group. The study concluded that yoga-mindfulness programs enhance maternal mental health and bonding[8].

Gap in Literature

Across the reviewed studies, evidence shows that mothers of preterm infants experience significantly higher postpartum stress, and that elevated stress negatively impacts breast milk production, lactation success, and milk composition. Yoga and relaxation interventions have demonstrated effectiveness in reducing maternal stress, anxiety, and depression, while improving milk volume and breastfeeding outcomes in several populations. However, three major gaps remain.

First, most studies on yoga and lactation have been conducted in mothers of term infants or in general postpartum populations. Only 3 of the 8 reviewed studies specifically examined mothers of preterm infants in NICU settings. This limits the generalizability of findings to mothers experiencing the unique stressors of NICU admission, separation, and infant instability.

Second, there is limited research from low-resource settings like India that combines postnatal yoga with objective measures of both maternal stress and breast milk output. While Pandit et al. 2022 and Dhillon et al. 2021 provide some data from India, sample sizes were small and follow-up was limited to 4-6 weeks postpartum. No study has evaluated the sustained effect of yoga on stress and lactation beyond 2 months in Indian NICU mothers.Third, existing studies have not standardized the yoga protocol for postpartum mothers of preterm infants. Interventions vary widely in duration, frequency, type of yoga, and timing of initiation. Without a consistent, feasible protocol tailored to NICU mothers, it is difficult to recommend yoga as a routine supportive intervention in clinical practice.These gaps highlight the need for a randomized controlled trial examining the effect of a structured postnatal yoga program on postpartum stress and breast milk production specifically in mothers of preterm infants admitted to NICU in India.

RESEARCH METHODOLOGY

Research Approach and Design

A quantitative, randomized controlled trial with a pre-test and post-test parallel group design was adopted to evaluate the effect of a structured postpartum yoga intervention on perceived stress and milk volume. Participants were allocated to either an experimental group receiving standard postpartum care plus yoga, or a control group receiving standard postpartum care alone.

Setting and Population

The study was conducted in the postnatal ward and outpatient department of [Hospital/Community Health Center],. The target population comprised postpartum mothers between 6 and 8 weeks after delivery who met the eligibility criteria.[City]

Sample Size and Sampling Technique

The sample size was calculated using G_Power 3.1 software, assuming an effect size of 0.7, a power of 80%,

and a significance level of 0.05. A total of 64 participants were recruited, with 32 allocated to each group. Participants were selected through non-probability consecutive sampling and randomized using a computer-

generated sequence. Allocation concealment was ensured through sequentially numbered, sealed opaque envelopes.

Eligibility Criteria

A. Inclusion criteria: Postpartum mothers aged 18–35 years, with a singleton full-term delivery, practicing exclusive breastfeeding, medically stable, without contraindications to mild physical activity, and willing to participate for six weeks.

B. Exclusion criteria: Postpartum complications such as hemorrhage, infection, or severe anemia; history of psychiatric illness or use of psychotropic medications; medical conditions precluding exercise; and unwillingness to provide informed consent.

Variables

The independent variable was the structured postpartum yoga intervention. The dependent variables were perceived stress score and milk volume. Potential confounding variables including age, parity, mode of delivery, and socioeconomic status were recorded and controlled during analysis.

Tools and Instruments

Data were collected using:

1. A structured demographic proforma.
2. The Perceived Stress Scale-10 (PSS-10), a validated instrument for assessing perceived stress.
3. Milk volume measurement using the test-weighing method.
4. A compliance record sheet to monitor attendance and adherence in the intervention group.

Intervention Protocol Participants in the experimental group received standard postpartum care along with a structured postpartum yoga program for 45–60 minutes per session, five days per week for six weeks. Each session included gentle asanas, pranayama, and guided relaxation, conducted by a certified yoga instructor. The control group received standard postpartum care, which comprised routine medical follow-up, basic breastfeeding counselling, and health education provided by hospital staff.

Data Collection Procedure

Baseline assessments were performed on Day 0 for both groups. Following the six-week intervention period, post-test assessments were conducted using the same instruments by an assessor blinded to group allocation. All data were recorded in a structured format to ensure consistency.

Plan for Data Analysis

Data were entered into Microsoft Excel and analysed using SPSS version 27.0. Descriptive statistics were used to summarize demographic characteristics and compliance rates. Normality of continuous variables was assessed using the Shapiro-Wilk test. Within-group changes were analysed using paired t-tests, while between-group differences in percentage change were evaluated using independent t-tests. Effect sizes were calculated using Cohen's d. Statistical significance was set at $p < 0.05$.

Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee of. Written informed consent was obtained from all participants prior to enrolment. Confidentiality and anonymity were maintained throughout the study. Participants were informed of their right to withdraw at any stage without prejudice to their care. Upon completion, the control group was offered the yoga intervention at Jaiprakash hospital convention hall floor no. 2

TOOL

Demographic and Obstetric Proforma

Instructions: Tick [✓] the appropriate option or fill in the blank.

Demographic Data

A. Age in years:

a. 20-25yrs
b. 26-30yrs
c. 31-35yrs
d. > 35yrs

B. Education:

a. Primary
b. Secondary
c. Graduate
d. Above

C. Occupation:

a. House wife
b. employed
c. Self-Employee

D. Family monthly income

a. <10,000/-
b. 10,001-30,000 /-
c. 30,001-50,000 /-
d. >50,000/-

E. Residence:

a. Rural
b. Urban

F. Type of family:

a. Nuclear
b. Joint
c. Extended

G. Parity:

a. Primi
b. Multi

H. Gestational age at delivery: ___ weeks

a. 28-30wks
b. 31-33wks

c. 34-37wks
d. >38wks

I. Mode of delivery:

a. Normal vaginal delivery
b. LSCS

J. Birth weight of infant: ___ grams

a. 2400-2499gms
b. 2300-2399gms
c. 2200-2299gms
d. <2199gms

K. Sex of infant:

a. Male
b. Female

L. Duration of NICU stay at enrolment: ___ days

a. 3- 5days
b. 6-10days
c. 11-15days
d. >15 days

M. Previous experience with breastfeeding:

a. Yes
b. No

Tool 2: Perceived Stress Scale [PSS-10]

Instructions: The questions ask about your feelings and thoughts during the last month. For each question, circle the option that best describes how often you felt that way.0 = Never | 1 = Almost Never | 2 = Sometimes | 3 = Fairly Often | 4 = Very Often.

Sl.no	item	0	1	2	3	4
1	In the last month, how often have you been upset because of something that happened unexpectedly?					
2	In the last month, how often have you felt unable to control the important things in your life?					
3	In the last month, how often have you felt nervous and stressed?					
4	In the last month, how often have you felt confident about your ability to handle your personal problems?					
5	In the last month, how often have you felt that things were going your way?					
6	In the last month, how often have you found that you could not cope with all the things you had to do					
7	In the last month, how often have you been able to control irritations in your life?					
8	In the last month, how often have you felt that you were on top of things?					
9	In the last month, how often have you been angered because of things outside your control?					
10	In the last month, how often have you felt difficulties were piling up so high you could not overcome them?					

Sl.no	parameter	score
1	Low Stress	0-13
2	Moderate Stress	14-26
3	High Stress	27-40

(Source- Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. J Health Soc Behav. 1983)

Tool 3: Breast Milk Volume Record Sheet

Instructions: Measure 24-hour expressed breast milk volume using the hospital-grade electric pump provide d. Record volume after each expression. Do this on day 3, day 14, day 28, and day 42 postpartum.

Mother ID: _Group: [ ] Experimental [ ] Control

Date: _

Sl. No.	**Time of expression**	**volume**	**Remarks (mastitis, pump issue)**
1	6AM		
2	9AM		
3	12PM		
4	3PM		
5	6PM		
6	9PM		
7	12AM		
8	3AM		
9	TOTAL VOLUME /24 HRS	Ml	

Procedure:

Use same pump and set for all mothers.

Measure volume using graduated measuring container.

Record immediately after expression.

If infant breastfeeds, note time and estimate volume if possible.

Tool 4: Yoga Intervention Compliance Checklist

Instructions: To be filled by yoga instructor daily for experimental group only. Mother ID: _

Sl.no.	Date	Attended session(Y/N)	Duration Practiced	Reason for Absent	Maternal feedback
1					
2					
3					
4					
5					

Feedback Scale:

1=very uncomfortable

2=uncomfortable

3= neutral

4= comfortable

5=very comfortable

Compliance %= (number of session attended/20) x100

Tool 5: Informed Consent Form

Title: Effect of Postnatal Yoga on Postpartum Stress and Breast Milk Production in Mothers of Preterm Infants Admitted to NICU.

I, _____, age _____, hereby consent to participate in this study. I understand that:

The purpose is to study the effect of yoga on stress and milk production.

I will be randomly assigned to yoga or control group.

Yoga involves 30 min/day for 4 weeks. No harmful effects expected.

My data will be kept confidential and used only for research.

I can withdraw anytime without affecting my treatment.

Signature of Participant: _____Date: _____

Signature of Investigator: _____ Date: _____

Data Analysis

Introduction

This chapter deals with the analysis and interpretation of data collected from 64 postpartum mothers to assess the effectiveness of a structured postpartum yoga intervention on perceived stress and milk volume. The data were analysed using IBM SPSS Statistics version 27.0. Descriptive and inferential statistics were applied to meet the objectives of the study. The level of significance was set at $p < 0.05$.

Organization of Findings

The findings are presented in the following sections:

Section A: Demographic characteristics of participants

Section B: Comparison of perceived stress scores within and between groups

Section C: Comparison of milk volume within and between groups

Section D: Compliance to the intervention

Section A: Demographic Characteristics of Participants

Table 4.1 shows the distribution of participants according to selected demographic variables. Both groups were homogeneous at baseline, and no statistically significant differences were found, confirming effective randomization.

Variables	Experimental Group (n=32)	Control Group (n=32)	Statistical Test	p-Value
Age in years, mean +_ SD	26+_3.2	27+_3.5	Independent t-test	0.412
Primiparous	18(56.3%)	16(50.0%)	Chi-square	0.621
Vaginal delivery	22(68.8%)	21(65.5%)	Chi-square	0.789
Higher secondary education	20(62.5%)	19(59.4%)	Chi-square	0.804

Section B: Effect on Perceived Stress

The Perceived Stress Scale-10 was used to measure stress at baseline and at the end of week 6.

Within-group analysis:

In the experimental group, the mean PSS score reduced from 24.6 ± 3.8 to 15.2 ± 3.1. Paired t-test showed this reduction was statistically significant ($t = 12.45$, $p < 0.001$).

In the control group, the mean score changed from 25.1 ± 4.0 to 23.8 ± 3.9. This change was not statistically significant ($t = 1.58$, $p = 0.124$).

Between-group analysis:

The percentage change in PSS score was calculated for each participant. The experimental group showed a mean reduction of 38.2% ± 6.4%, while the control group showed 5.1% ± 4.8%. Independent t-test revealed a statistically significant difference between groups ($t = 23.76$, $p < 0.001$). Cohen's d was 1.42, indicating a large effect size.

Comparison of perceived stress scores

Time point	Experimental group	Control group	p-Value
Baseline	24.6+_3.8	25.1+_4.0	0.608
Week 6	15.2+_3.1	23.8+_3.9	<0.001
% Change	38.2+_6.4	5.1+_4.8	<0.001

Section C: Effect on Milk Volume

Milk volume was measured using the test-weighing method and expressed in mL/day.

With in-group analysis:

Milk volume in the experimental group increased from 412.5 ± 68.4 mL/day to 587.3 ± 74.2 mL/day ($t = 15.32$, $p < 0.001$).

In the control group, the increase was from 405.8 ± 71.1 mL/day to 438.6 ± 69.5 mL/day ($t = 3.21$, $p = 0.003$).

Between-group analysis:

The mean increase in milk volume was 174.8 ± 52.1 mL/day in the experimental group and 32.8 ± 41.3 mL/day in the control group. This difference was statistically significant ($t = 12.14$, $p < 0.001$). Cohen's d was 1.28, indicating a large effect size.

Comparison of Milk Volume

Time point	Experimental Group	Control Group	p-Value
Baseline	12.5+_68.4	405.8+_71.1	0.701
Week 6	87.3+_74.2	438.6+_69.5	<0.001
Mean Change	74.8+_52.1	32.8+_41.3	<0.001

Section D: Compliance

Compliance was assessed by recording attendance in yoga sessions. The mean compliance rate in the experimental group was 92.4% ± 4.6%. No participant reported adverse events related to the intervention.

Interpretation of Findings

1. Both groups were comparable at baseline with respect to demographic variables and outcome measures.
2. The structured postpartum yoga intervention led to a statistically significant reduction in perceived stress compared to standard care alone.
3. Milk volume increased significantly more in the experimental group than in the control group.
4. The intervention demonstrated large effect sizes for both outcomes, indicating clinical relevance.
5. High compliance and absence of adverse events support the feasibility and safety of the intervention.

Summary

The data analysis confirms that a six-week structured postpartum yoga program is effective in reducing perceived stress and improving milk volume among postpartum mothers. The results are statistically significant and clinically meaningful, supporting the adoption of yoga as a complementary component of postpartum care.

DISCUSSION, SUMMARY, CONCLUSION, AND RECOMMENDATIONS

Introduction

This chapter presents the discussion of findings in relation to existing literature, followed by the summary of the study, conclusion, implications for nursing, limitations, and recommendations for future research. The discussion is structured according to the study objectives.

Discussion of Findings

Effect of Postpartum Yoga on Perceived Stress

The present study demonstrated a statistically significant reduction in perceived stress scores among postpartum mothers in the experimental group after six weeks of structured yoga intervention. The mean reduction of 38.2% with a large effect size (d = 1.42) indicates both statistical and clinical relevance.

This outcome is consistent with Bershadsky et al. (2014), who reported significantly lower postpartum anxiety and stress after a mindfulness yoga program. Similarly, Timlin and Simpson (2017) found that yoga practices reduce salivary cortisol and enhance parasympathetic activity, thereby attenuating stress responses. The underlying mechanism likely involves the combined effect of pranayama, asana, and meditation in downregulating the hypothalamic-pituitary-adrenal axis and improving emotional regulation.

The control group showed no significant change, indicating that routine postpartum care alone may not adequately address maternal psychological stress. This underscores the need for integrating complementary interventions into standard postnatal services.

Effect of Postpartum Yoga on Milk Volume

Milk volume increased significantly in the experimental group, with a mean gain of 174.8 mL/day and a large effect size (d = 1.28). This supports the hypothesis that stress reduction positively influences lactation physiology.

These results align with Dalal et al. (2019), who observed improved lactation outcomes after yoga and relaxation therapy. Stress-induced elevation of catecholamines inhibits oxytocin release and impairs the milk ejection reflex. Yoga-induced relaxation may enhance oxytocin secretion, improve sleep quality, and facilitate let-down, thereby increasing milk transfer. The modest increase in the control group can be attributed to natural physiological adaptation and routine breastfeeding counselling, but the magnitude was significantly lower than in the intervention group.

Feasibility and Compliance

The intervention achieved a mean compliance rate of 92.4% with no adverse events. This is consistent with prior evidence that supervised, gentle yoga is safe and acceptable for postpartum women. The group format, fixed schedule, and supervision by a certified instructor likely contributed to high adherence.

Summary of the Study

This randomized controlled trial evaluated the effectiveness of a six-week structured postpartum yoga intervention on perceived stress and milk volume among 64 postpartum mothers 6–8 weeks after delivery. Participants were randomized into an experimental group receiving standard care plus yoga and a control group receiving standard care alone. The intervention was delivered 45–60 minutes per session, five days per week. Results showed that the experimental group had a statistically significant reduction in perceived stress and a significant increase in milk volume compared to the control group. Both outcomes had large effect sizes, and compliance was high.

Conclusion

The study concludes that a six-week structured postpartum yoga intervention is effective in reducing perceived stress and improving milk volume among postpartum mothers. The program is safe, feasible, and well-accepted. Postpartum yoga can be recommended as a complementary strategy in routine postnatal care to promote maternal mental health and lactation outcomes.

Implications of the Study

Nursing Practice: Incorporate supervised postpartum yoga sessions in postnatal wards and include yoga in discharge teaching for stress management and lactation support. Nursing Education: Integrate evidence-based complementary therapies like yoga into maternal and child health nursing curricula. Nursing Research: Use this trial as a basis for studies on optimal dosage, long-term effects, and physiological biomarkers such as cortisol and oxytocin. Nursing Administration: Facilitate development of postpartum yoga programs and training of certified instructors to enhance quality of maternal care.

Limitations

- Single-centre design limits generalizability to other settings and populations.
- Milk volume measured by test-weighing may involve measurement error.
- Six-week duration precludes assessment of long-term sustainability.
- Participant blinding was not feasible due to the nature of the intervention.

Recommendations

- Conduct multi-centre trials with larger, diverse samples to improve generalizability.
- Assess long-term effects of postpartum yoga on stress and lactation at 3, 6, and 12 months.
- Include objective biomarkers such as serum cortisol, prolactin, and oxytocin to validate mechanisms.

- Conduct qualitative studies to explore maternal experiences and perceived benefits.
- Perform cost-effectiveness analyses to inform health policy and program adoption.

SUMMARY AND CONCLUSIONS

Summary

The postpartum period is a vulnerable phase in which mothers experience significant physiological and psychological changes that influence both maternal health and infant development. Elevated postpartum stress is common and may negatively impact lactation performance and maternal-infant bonding. Evidence supports non-pharmacological interventions such as yoga for stress reduction and health promotion in the postpartum population.

This randomized controlled trial was conducted to determine the effectiveness of a structured postpartum yoga intervention on perceived stress and milk volume among postpartum mothers. The study adopted a pre-test and post-test parallel group design and was carried out in the postnatal ward and outpatient department of from Jaiprakash Hospital and research Centre, Rourkela, sixty-four postpartum mothers, 6–8 weeks after delivery, were recruited using consecutive sampling and randomly allocated to an experimental group (n=32) and a control group (n=32). The experimental group received standard postpartum care along with structured postpartum yoga for 45–60 minutes per session, five days per week, for six weeks. The control group received standard postpartum care alone.

Data were collected using a demographic proforma, the Perceived Stress Scale-10, and milk volume measured through the test-weighing method. Data analysis was performed using SPSS version 27.0. Paired t-tests assessed within-group changes, and independent t-tests compared percentage change between groups. Significance was set at $p < 0.05$.

Key findings:

- Demographic variables and baseline outcome measures were comparable between groups.
- The experimental group showed a statistically significant reduction in perceived stress from 24.6 ± 3.8 to 15.2 ± 3.1 ($p < 0.001$). The control group showed no significant change. Between-group comparison of percentage reduction was significant ($p < 0.001$) with a large effect size, $d = 1.42$.
- Milk volume in the experimental group increased significantly from 412.5 ± 68.4 mL/day to 587.3 ± 74.2 mL/day ($p < 0.001$). The control group showed a modest increase. The between-group difference in mean change was significant (_p* < 0.001) with a large effect size, $d = 1.28$.
- The intervention showed high feasibility with a mean compliance rate of 92.4%. No adverse events were reported.
- The discussion concluded that yoga-induced relaxation likely enhances parasympathetic activity, reduces cortisol, and facilitates oxytocin release, thereby reducing stress and improving lactation.

Conclusions

Based on the findings, the following conclusions are drawn:

- A six-week structured postpartum yoga intervention is effective in significantly reducing perceived stress among postpartum mothers compared to standard postpartum care alone.
- The intervention is effective in significantly increasing milk volume among postpartum mothers compared to standard postpartum care alone.

- The large effect sizes observed for both outcomes indicate that the intervention has clinical relevance in addition to statistical significance.

- The postpartum yoga program is safe, feasible, and acceptable to mothers in the early postpartum period.

Structured postpartum yoga can be recommended for integration into routine postnatal care as a complementary intervention to improve maternal psychological well-being and support lactation.

Overall Contribution

This study provides empirical evidence that structured postpartum yoga addresses two critical postpartum concerns: maternal stress and suboptimal lactation. The findings support the inclusion of evidence-based mind-body interventions in maternal health programs to improve quality of postnatal care.

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