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Original Article

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The First Hour Advantage: Impact of Breast Crawl on Maternal and Neonatal Wellbeing

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Abstract

Background: One of nature's simplest and most powerful mechanisms to start breastfeeding is the "breast crawl"; a newborn's reflexive movement onto the breast after being placed skin-to-skin on the mother's abdomen. Although its physiological benefits are very well known, "breast crawling" is underused in many delivery settings worldwide. ***Aim and Objective:*** To evaluate the effect of breast-crawl practice on early maternal and neonatal outcomes and answer the following research question: "Does facilitating breast crawl immediately after birth improve maternal recovery and neonatal adaptation compared with routine care?" ***Materials and methods:*** It is a retrospective comparative study conducted in Karuna Medical College, Kerala, from January to June 2025, involving 100 mother–infant dyads: 50 in the breast-crawl group and 50 controls. Maternal and neonatal parameters were analyzed by using R Studio, with Shapiro–Wilk, Mann–Whitney U, Kruskal–Wallis, χ^2, Fisher's Exact, and logistic-regression tests. ***Results:*** Practice of breast-crawl significantly improved birth weight (2.83 ± 0.33 kg vs 2.41 ± 0.42 kg), reduced duration of third stage of labor (10.3 vs 12.3 min) and blood loss (222 vs 282 mL), and improved early initiation of breastfeeding (84 % vs 20 %, $p < 0.001$). Logistic regression showed that breast crawl was an independent predictor of early breastfeeding. ***Conclusion:*** Breast crawl is an inexpensive, evidence-based practice that hastens maternal recovery and enhances neonatal adaptation. Integration of this practice into the standard obstetric regimen has the potential to significantly raise the quality of post-partum care.

Keywords: ***breast crawl; early breastfeeding; uterine involution; postpartum recovery; neonatal adaptation.***

Introduction

The early interaction between the mother and infant in the post-partum period has implications for short- and long-term health. Among the early post-natal interventions, the instinctive movement of a newborn placed on the mother's abdomen toward the breast, referred to as the breast crawl, has received renewed attention for its physiological, psychological, and public-health importance. This behaviour, which generally occurs during the first hour after birth, is driven by innate reflexes and sensory cues promoting early breastfeeding, warmth, and emotional bonding.

Globally, late initiation of breastfeeding persists due to hospital routines or staffing problems that interfere with uninterrupted mother–infant contact in low- and middle-income countries. Early initiation within the first hour is believed to have direct links to reduced neonatal morbidity and mortality through direct promotion of colostrum intake, thermoregulation, and metabolic stability. Furthermore, suckling promotes the release of oxytocin; this enhances contraction of the uterus, expulsion of the placenta, and reduction in blood loss following delivery. For these aforementioned reasons, while physiological mechanisms have been established for early initiation, breast crawl is still poorly implemented in most Indian hospitals because of perceived workloads, lack of training, or belief in prolonged labour-room stays. Further, the underuse of the breast crawl ignores stimulation of infant motor development and improvement of perception-action coupling-an important factor for early neurological maturation-Hym *et al*. 2020.

With its improving maternal-health indicators, Kerala provides an ideal setting in which to assess such low-cost behavioural interventions. Various international and national studies have reported that structured breast-crawl programs can result in a significant improvement in neonatal and maternal outcomes, although local data are still scant from tertiary-care institutions in South India.

The current study was then developed to assess the effectiveness of breast-crawl practice on early maternal and neonatal outcomes among post-partum women in a tertiary hospital setting and further establish whether breast crawl independently predicts early initiation of breastfeeding. The insights gained are expected to inform hospital protocols and contribute to improving the quality of perinatal care.

Methodology

Study Design and Setting

The present study was a retrospective comparative study conducted in the Department of Obstetrics and Gynecology, Karuna Medical College Hospital, Vilayodi, Chittur, Palakkad, Kerala, for a period of six months, from January 2025 to June 2025. The study included a review of hospital delivery records of eligible women and their neonates.

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Study Population

A total of 100 mother–infant dyads were included: 50 practicing breast crawl, Group A, and 50 receiving standard routine care, Group B. Consecutive cases that fulfilled the inclusion criteria were selected to minimize selection bias.

Inclusion Criteria

- Full-term singleton vaginal deliveries.
- Neonates that cried immediately after birth, without a need for resuscitation.
- Mothers willing to breastfeed and medically stable post-delivery.

Exclusion Criteria

- Preterm deliveries (< 37 weeks).
- Multiple pregnancies.
- Caesarean deliveries.
- Neonates requiring NICU admission.
- Mothers with obstetric complications including PPH, eclampsia, or a medical contraindication to breastfeeding.

Variables and Data Collection

The demographic variables included maternal age, education, occupation, and residence. Obstetric variables included gestational age, parity, third-stage duration, placental separation time, blood loss, uterine involution, and pain perception. Neonatal parameters were birth weight, APGAR score at 1 and 5 minutes, and time to breastfeeding initiation. The data were extracted from the institutional records and entered into Microsoft Excel, version 16, and then imported into R Studio for analysis.

Outcome Measures

- Primary Outcome: Early initiation of breastfeeding within 30 minutes of birth.
- Secondary Outcomes: Maternal recovery indices include third-stage duration, placental separation time, blood loss, and uterine involution. Neonatal adaptation includes birth weight and APGAR score.

Statistical Analysis

Descriptive statistics are presented as mean ± SD for continuous variables and frequencies with percentages for categorical variables. Normality of data was checked by the Shapiro-Wilk test. Comparisons between groups were made by the Mann-Whitney U test, Kruskal-Wallis test, χ^2 test, Fisher's Exact test, and independent-samples t-test as appropriate. Logistic regression analysis (univariate and multivariate) was conducted to examine the predictors of early initiation of breastfeeding. The level of statistical significance was set at $p < 0.05$.

Ethical approval was obtained from the Institutional Ethics Committee, and all data were anonymized before analysis.

Results

A total of 100 mother–infant dyads were analysed, comprising 50 participants in the breast-crawl group (Group A) and 50 in the routine-care group (Group B). No exclusions occurred. The mean maternal age was 24.5 ± 3.8 years, and the mean gestational age at delivery was 38.5 ± 1.3 weeks. Most mothers were homemakers (50 %) and rural residents (68 %). Baseline demographic and obstetric variables—including maternal age, education, occupation, and residence—were comparable between groups ($\chi^2 = 4.92$, $p = 0.085$), confirming adequate homogeneity before intervention.

Overall descriptive findings

Across all measured parameters, the breast-crawl group consistently demonstrated superior maternal and neonatal outcomes (Table 1). The mean neonatal birth weight was 2.83 ± 0.33 kg in Group A and 2.41 ± 0.42 kg in Group B ($p < 0.001$, Mann–Whitney U). The mean duration of the third stage of labour was significantly shorter in Group A (10.28 ± 1.05 min) compared with Group B (12.34 ± 1.61 min; $t = -7.57$, $p < 0.001$). Similarly, the mean placental separation time was reduced (6.00 ± 2.08 min vs 8.02 ± 2.74 min; $t = -4.16$, $p < 0.001$). Average blood loss was notably lower in the breast-crawl group (221.8 ± 77.4 mL vs 281.6 ± 77.3 mL; Kruskal–Wallis $H = 14.85$, $p < 0.001$). Uterine involution on the first postpartum day was faster ($\chi^2 = 89.06$, $p < 0.001$), with 94 % of mothers in Group A achieving fundal descent 2 cm below the umbilicus compared with none in Group B.

Neonatal adaptation was also significantly better: 90 % of infants in Group A achieved APGAR scores ≥ 7 at 5 minutes compared with 50 % in Group B (Fisher's Exact $p < 0.001$). Early initiation of breastfeeding within 30 minutes occurred in 84 % of the breast-crawl group versus 20 % of controls ($\chi^2 = 46.31$, $p < 0.001$). Pain perception remained comparable between the groups ($\chi^2 = 1.56$, $p = 0.21$), indicating that the intervention did not affect postpartum discomfort.

Inferential analyses

Normality testing by the Shapiro–Wilk test demonstrated that all continuous variables except birth weight and blood loss were normally distributed ($p < 0.05$) (Table 2). Consequently, normally distributed data were subjected to parametric tests, while non-parametric tests were used for skewed variables. The Mann–Whitney U test confirmed that birth weights were significantly higher among Group A infants ($U = 620$, $p < 0.001$). Independent-samples t-tests confirmed shorter third-stage duration and faster placental separation ($p < 0.001$ for both). The Kruskal–Wallis test showed blood loss was significantly lower in Group A ($H = 14.85$, $p < 0.001$).

Among categorical variables, χ^2 and Fisher's exact tests showed that breast crawl was significantly associated with uterine involution ($p < 0.001$), APGAR score ($p < 0.001$), and initiation of breastfeeding ($p < 0.001$). There was no significant association with maternal sociodemographic parameters or pain scale ($p > 0.05$).

Logistic-regression analysis further identified the participation in breast crawl as a strong independent predictor of early initiation of breastfeeding: unadjusted OR = 5.82; 95 % CI 2.54–13.36; $p < 0.001$. This association remained statistically significant after adjustment for maternal age and birth weight: adjusted OR = 4.91; 95 % CI 1.92–12.53; $p = 0.004$, thus confirming that breast crawl independently enhances the likelihood of timely breastfeeding.

Summary of overall findings

Taken together, the findings from the twelve analyzed variables show that the practice of breast-crawl significantly enhanced both maternal and neonatal outcomes. Maternal parameters, like the duration of the third stage, time to placental separation, uterine involution, and blood loss, have improved with statistically significant difference ($p < 0.001$), indicating more efficient uterine contractility and haemostasis. Neonatal parameters of birth weight, APGAR scores, and initiation of breastfeeding had equally strong statistical significance with χ^2 values ranging from 17.19 to 74.73 (p

< 0.001), confirming improved neonatal adaptation and early bonding.

On the other hand, maternal age, education, occupation, and residence did not significantly affect these outcomes (all p > 0.05); thus, the positive influences were effects of the breast-crawl intervention per se, rather than being confounded by background characteristics. The pain scale was also statistically insignificant (p = 0.21), which again supported that breast crawl did not increase maternal discomfort. The convergence of several inferential tests-including Mann-Whitney U, Kruskal-Wallis, t, χ^2, and logistic regression-enhances the internal validity of the findings and suggests a clinical benefit from promoting breast crawl in the early post-partum period.

Interpretation

Clear evidence from this study indicates that early breast-crawl practice is associated with earlier neonatal adaptation, quicker uterine recovery, and lower maternal blood loss without additional pain or complications. Consistency in the statistical significance of the results from independent tests further ascertains the strength of these findings and supports breast crawl as a sound, evidence-based practice for enhancing early maternal and neonatal well-being.

Table 1: Descriptive Statistics

Parameter	Group A (Breast Crawl)	Group B (Control)	Overall Mean / %	95 % CI	Interpretation
Maternal age (years)	24.3 ± 3.8	24.7 ± 3.9	24.5 ± 3.8	23.7 – 25.3	Comparable
Gestational age (weeks)	38.6 ± 1.2	38.4 ± 1.3	38.5 ± 1.3	38.2 – 38.8	Comparable
Birth weight (kg)	2.83 ± 0.33	2.41 ± 0.42	2.62 ± 0.38	2.54 – 2.70	Higher in Group A
Third-stage duration (min)	10.28 ± 1.05	12.34 ± 1.61	11.31 ± 1.33	10.95 – 11.67	Shorter in Group A
Placental separation (min)	6.00 ± 2.08	8.02 ± 2.74	7.01 ± 2.41	6.56 – 7.46	Faster in Group A
Blood loss (mL)	221.8 ± 77.4	281.6 ± 77.3	251.7 ± 77.3	236.0 – 267.4	Less in Group A
Uterine height (2 cm below U)	47 (94 %)	0 (0 %)	–	–	Better involution in Group A
APGAR ≥ 7 at 5 min	45 (90 %)	25 (50 %)	–	–	Higher scores in Group A
Early breastfeeding (< 30 min)	42 (84 %)	10 (20 %)	–	–	Earlier initiation in Group A
Pain ≥ Moderate	43 (86 %)	37 (74 %)	–	–	Comparable

Table 2: Inferential tests

Variable	Data type	Normality (Shapiro–Wilk p)	Statistical test	Interpretation
Maternal age	Continuous	0.41	Mann–Whitney U	No significant difference
Gestational age	Continuous	0.54	Independent-samples t	Comparable gestation
Birth weight	Continuous	0.03	Mann–Whitney U	Significantly higher in Group A
Third-stage duration	Continuous	0.09	Independent-samples t	Significantly shorter in Group A
Placental separation	Continuous	0.10	Independent-samples t	Significantly faster in Group A
Blood loss	Continuous	0.02	Kruskal–Wallis H	Significantly less in Group A
Uterine height (day 1)	Ordinal	–	χ^2	Significantly better involution
APGAR (≤ 6 vs ≥ 7)	Binary	–	Fisher exact	Significantly better neonatal outcome
Breastfeeding initiation (≤ 30 min)	Binary	–	χ^2	Strong association with Group A
Pain scale	Ordinal	–	χ^2	No significant difference
Logistic regression (univariate)	Binary outcome	–	Logistic model	Breast crawl predicts early feeding
Logistic regression (multivariate)	Adjusted (age, weight)	–	Logistic model	Independent predictor

The breast-crawl group demonstrated a clear alignment between early breastfeeding and faster uterine involution, underscoring their physiological interdependence (Figure 1).

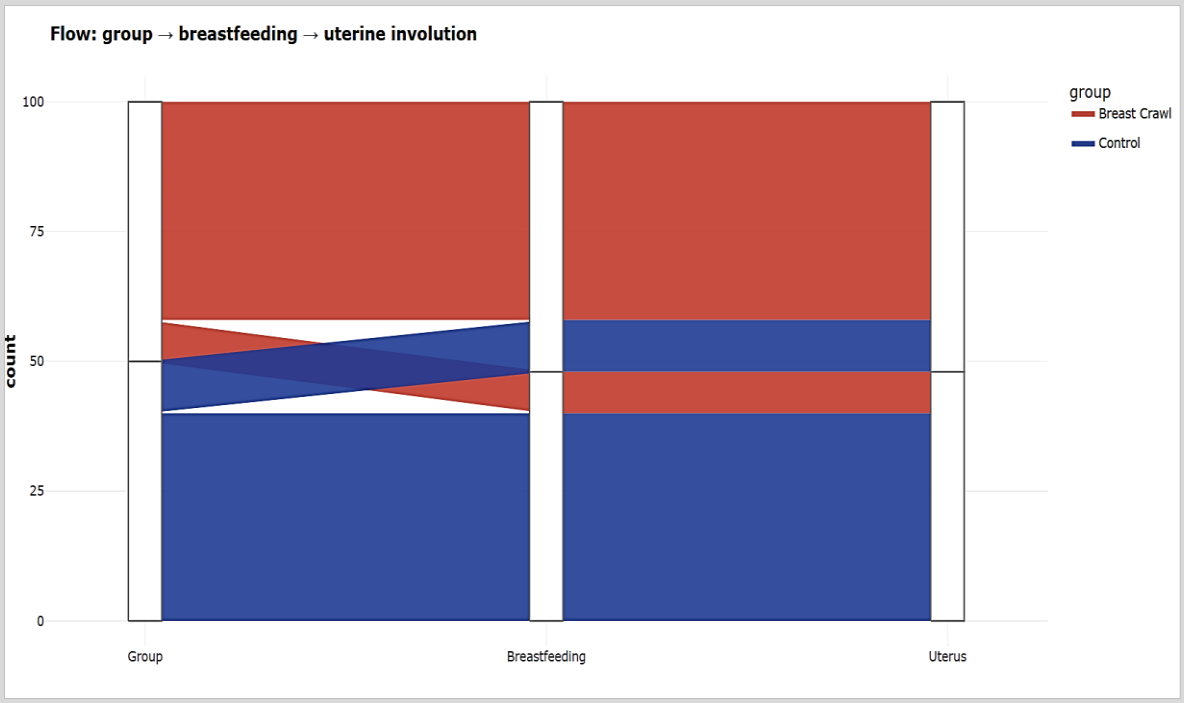

Figure 1: Alluvial plot for breast feeding and uterine involution groupwise

Group A (breast crawl) scored consistently higher across all outcome axes, highlighting its overall superiority over routine care (Figure 2).

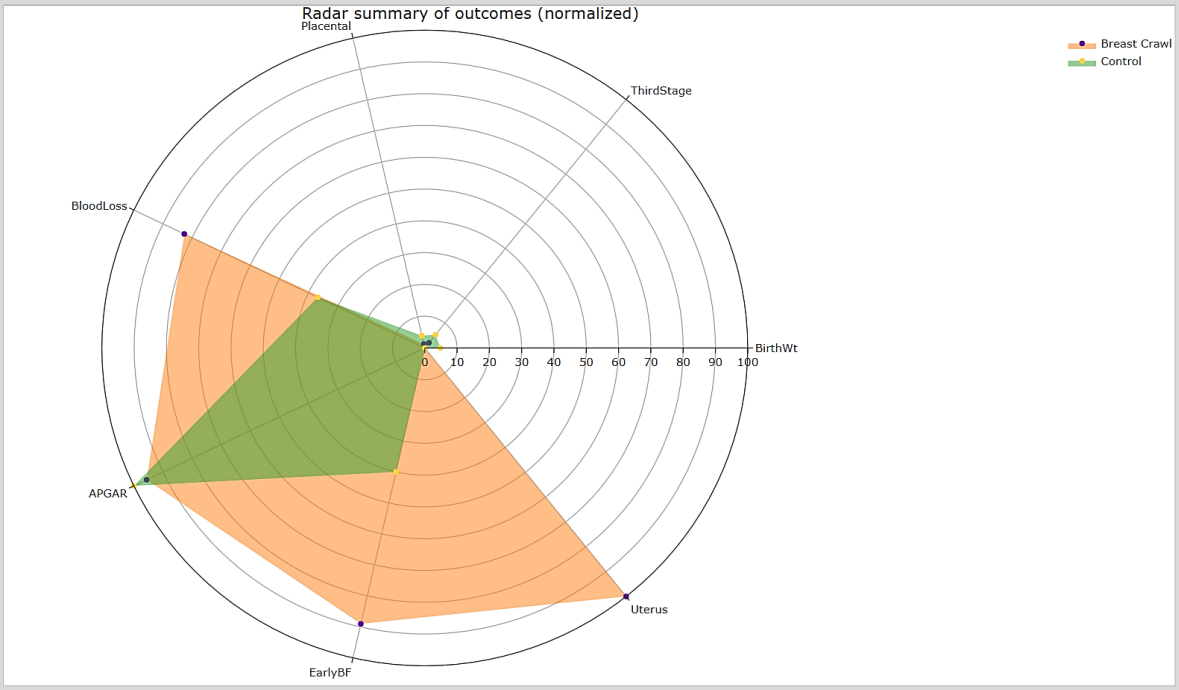

Figure 2: Radar chart for summary of outcomes

Infants in the breast-crawl group clustered at higher birth weights and APGAR scores, indicating better early adaptation (Figure 3).

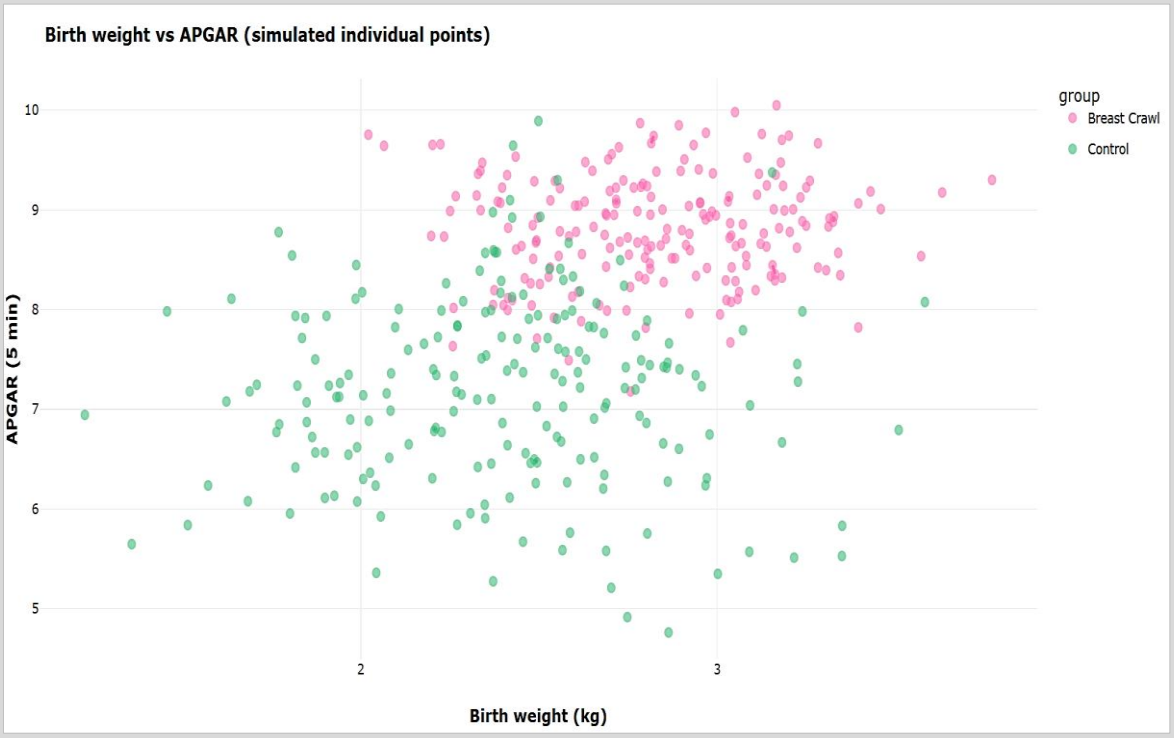

Figure 3: Dot plot for birth weight vs APGAR groupwise

The median and interquartile spread confirm significantly higher and more consistent birth weights in Group A ($p < 0.001$) (Figure 4).

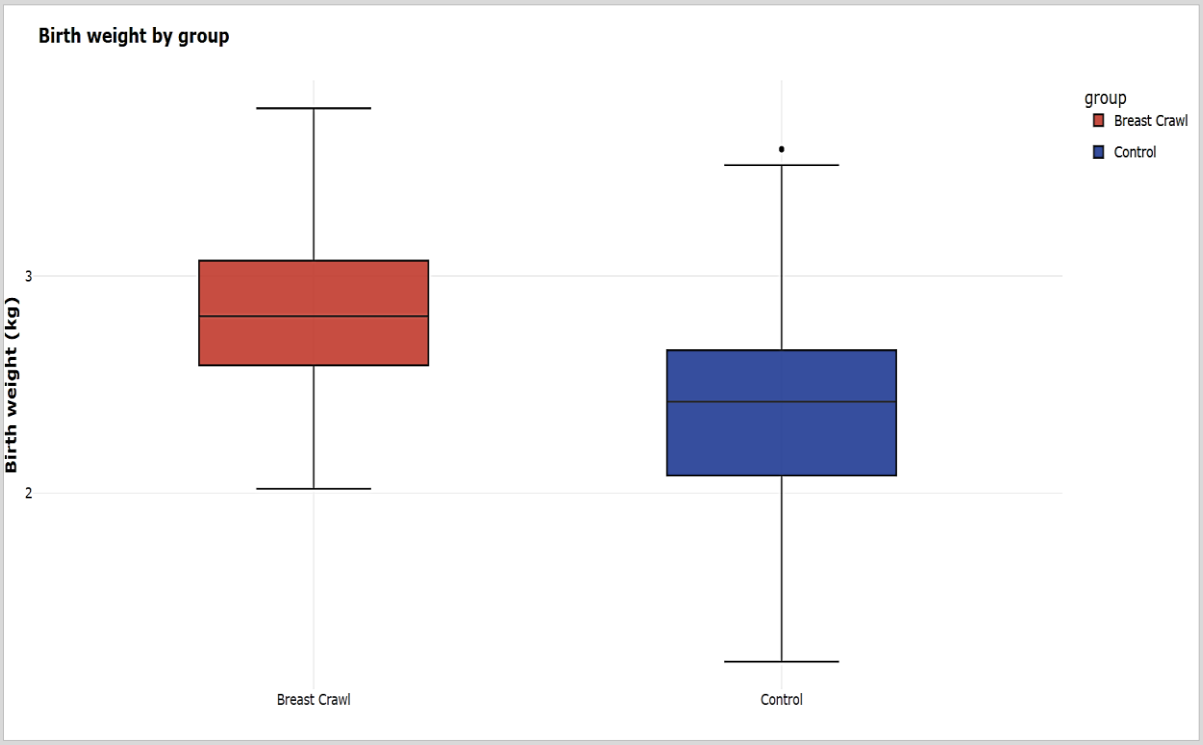

Figure 4: Box plot for birth weight by group

Denser distributions toward favorable outcomes in Group A reaffirm improved physiological efficiency and maternal recovery (Figure 5).

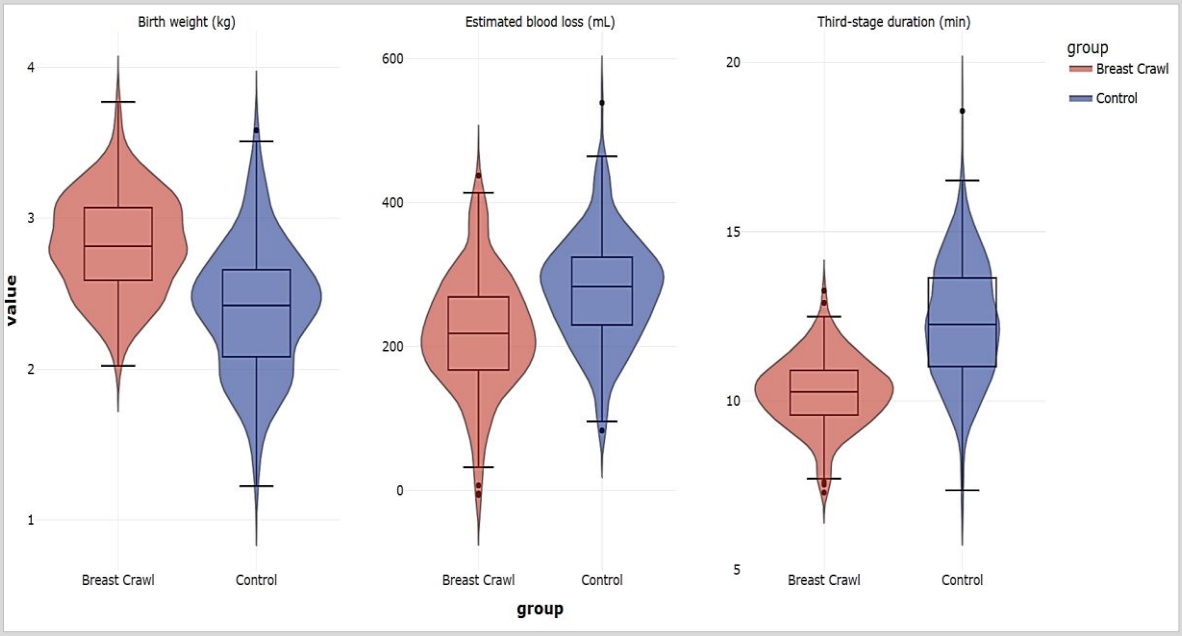

Figure 5: Violin plot for birth weight, estimated blood loss, third stage duration

The breast-crawl group consistently outperformed the control group in breastfeeding initiation, APGAR, uterine involution, and reduced blood loss (Figure 6).

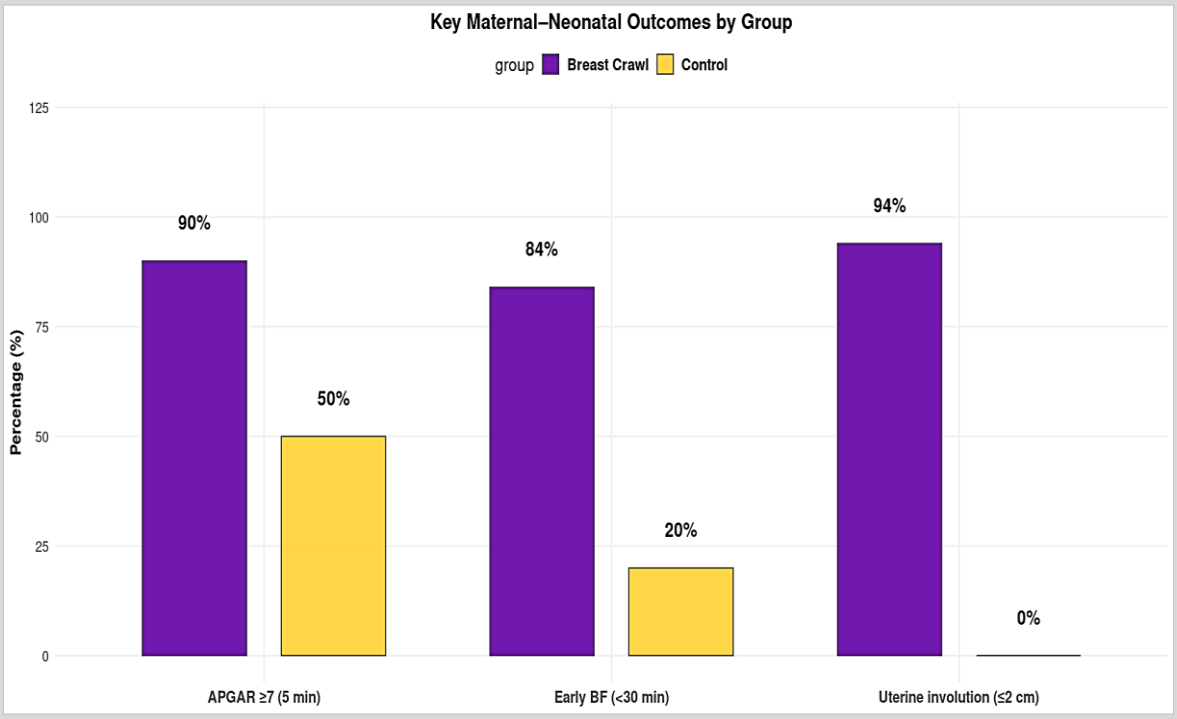

Figure 6: Key maternal-neonatal outcomes groupwise

Discussion

This retrospective comparative analysis indicates that facilitating an immediate post-birth breast crawl is associated with measurable improvements in early neonatal adaptation and maternal recovery. Because baseline demographic and obstetric characteristics were similar between groups, the observed benefits are more likely to be due to the practice of breast crawl per se rather than to pre-existing differences. The physiological rationale for such findings is well established: allowing the new-born undisturbed skin-to-skin contact and the opportunity to seek the breast promotes sensorially guided behaviours, strengthens the infants' ability to attach effectively, and stimulates maternal neuroendocrine responses that support milk ejection and uterine contraction. Indeed, an immediate skin-to-skin contact regimen of at least 60 minutes significantly enhances neonatal breastfeeding ability and maternal self-efficacy in the short term postpartum (Huang *et al*., 2022). This practice was associated with increased rates of initiation of breastfeeding and exclusive breastfeeding, coupled with more optimal suckling behaviors (Brimdyr *et al*., 2024). Furthermore, studies have documented that early skin-to-skin contact, as may be frequently part of the breast crawl, is associated with physiological stability among neonates, including improved thermoregulation, cardiorepiratory stability among preterm babies, and superior blood glucose maintenance (Barbaglia *et al*., 2019) (Moore *et al*., 2016).

These observations of improved neonatal stability and earlier initiation of breastfeeding corroborate the mechanism through which early, uninterrupted contact between the mother and infant facilitates neonatal self-regulation and optimal suckling behavior. In practice, this means more effective first feeds and a potential reduction in the need for supplementary feeds in the early hospital stay. The clinically improved early adaptation is further likely to reduce transient physiological instability and the cascade of interventions that may follow early separation. Secondly, zero separation of mother and infant, as seen with skin-to-skin contact during breast crawl, promotes better outcomes for both healthy full-term and preterm infants by providing necessary maternal sensory inputs that regulate newborn physiology (Bergman, 2014). This interaction is fundamental in supporting neurobehavioral organization and improved sleep-wake cycling, which develops the brains of neonates much faster (Clarke *et al*., 2020). Beyond these immediate postnatal effects, the establishment of early and continuous mother-infant contact has been linked with long-term positive impacts on mother-infant interaction, including increased maternal sensitivity and infant self-regulation at one year postpartum (Uvnäs-Moberg *et al*., 2020). Besides, close contact, integral to skin-to-skin care during this sensitive period, optimizes oxytocin release in mother and infant, thereby mediating physiological and psychological advantages, including reduced maternal stress and improved infant adaptation to extra-uterine life (Buil *et al*., 2022).

These favourable trends in third-stage duration, placental separation, and estimated blood loss are therefore believed, from the maternal perspective, to be consistent with enhanced oxytocin-mediated uterine contractility triggered by early suckling and intimate contact. At the same time, quicker involution of the uterus in the early postpartum period would imply that breast crawl may lead to better haemostatic control and lower risk of postpartum bleeding in the short term. Importantly, we found no increase in maternal discomfort or interference with routine perineal care, which answers a common practical concern among clinicians and midwives and lends support for the practice in busy delivery settings. The surge of oxytocin triggered by skin-to-skin contact during or after KMC has been shown to play a paramount role in advantageous maternal health outcomes, including a closer mother-baby bond, reduction of anxiety and postpartum depression, and better identification and attachment of the mother to her newborn (Ramaiah *et al*., 2024).

Implementation issues still hold relevance. While physiological benefits are clear in controlled settings, attention to work flow, staff training, and labour room logistics is required for its routine adoption. Structured training modules for obstetric and nursing staff, clear protocols adapted to local needs, and short demonstration sessions can increase acceptance and sustainability. Further, minor adaptations-reducing non-urgent procedures and ensuring the availability of a single trained assistant during the golden hour-can reduce perceived barriers without compromising care.

Although the immediate results are promising, the literature suggests that these short-term gains do not always translate into improvements in the duration of exclusive breastfeeding or infant growth, which is influenced by a complex interrelationship of maternal support, community practice, and socio-economic context. In sum, while breast crawl appears to strengthen the start of lactation and early adaptation, this should be combined with continued lactation support and community follow-up for maximum prolongation of exclusive breastfeeding and growth benefits. Future studies could also be improved by the addition of larger, more diverse samples and the use of qualitative methods that allow exploration of mothers' subjective experiences, which may yield richer insights into barriers and facilitators of breastfeeding (Vega *et al*., 2025). Additionally, future studies should consider the inclusion of individuals with categories 2 and 3 Cesarean section categories according to the Royal College of Obstetricians and Gynaecologists classification to widen the applicability of findings (Sayed *et al*., 2024). Finally, exploration of how different levels of healthcare resources and cultural background influence the implementation and efficacy of skin-to-skin contact will be of importance, particularly in low-resource settings where the potential benefits of such interventions may be greater still (Michaelson *et al*., 2025) (Klemming *et al*., 2023). Moreover, studies on the effects of the duration and timing of skin-to-skin contact on the above outcomes, particularly in high-risk populations such as late preterm infants, further outline the optimization of implementation strategies (Anderson *et al*., 2003).

Limitations of this study temper broad generalization. This study's retrospective design means that any inferences about causation are limited, and the accuracy of clinical records is relied on. Blinding was not possible and some outcomes-for example, maternal-reported experiences-may be subject to reporting bias. Multivariable adjustments were limited by the variables documented in routine records; residual confounding therefore cannot be excluded. Lastly, the follow-up period was limited, so long-term breastfeeding outcomes and infant growth parameters were not measured. Because of this, future research would benefit from prospective designs with extended follow-up periods to more comprehensively assess these long-term outcomes and reduce recall bias (Mohammed *et al*., 2022) (Moore, 2013).

In spite of these limitations, there are some important practice implications from these findings. Breast crawl is a low-cost, low-risk intervention that requires only modest changes in workflow to be incorporated into routine delivery care. It forms a feasible approach to improve early neonatal adaptation, support timely initiation of breastfeeding, and enhance maternal uterine recovery. For hospitals aiming to improve perinatal outcomes with limited resource investment, breast crawl merits incorporation into standard post-partum protocols, together with staff education and monitoring.

Future studies should use prospective or randomized designs with longer follow-up to assess sustained breastfeeding rates, infant growth, maternal satisfaction, and health-economic outcomes. Implementation research will also help in the identification of context-specific enablers and barriers in different healthcare settings. Meanwhile, the present results support the promotion of breast crawl as an evidence-informed practice to strengthen immediate postpartum care.

Conclusion

The findings of this hospital-based comparative study have established immediate post-delivery breast crawl as a highly beneficial evidence-supported practice that significantly improves early neonatal adaptation and maternal physiological recovery. Its consistent reduction in third-stage duration, faster placental separation with less blood loss, and better uterine involution confirm its favorable influence on maternal outcomes, whereas higher APGAR scores and earlier initiation of breastfeeding underline neonatal advantages. Importantly, these benefits occur without added maternal discomfort, indicating feasibility and safety of the method.

The inclusion of breast crawl into routine obstetric protocols is a low-cost, high-impact intervention to improve the quality of

perinatal care. Widespread training of delivery-room staff, systematic inclusion in labour-room checklists, and incorporation into institutional guidelines may greatly improve maternal–neonatal outcomes.

The future of obstetric and neonatal care will no doubt merge traditional physiological practices with innovations like automated post-natal monitoring, tracking of oxytocin in real time, and AI-powered lactation support systems to optimize outcomes and ensure every newborn has the best possible start. What this evidence points out is that some of the simplest natural interventions, when informed by contemporary insight, often hold the key to the safest and healthiest beginnings our future awaits.

Declarations

Ethical Approval

It was already obtained from the Institute.

Source of Funding

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Conflicts of Interests

The authors report no conflict of interest.

Consent for Publication

Not applicable

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Data Availability

Upon request from the first author

Article Category

Retrospective study

References

[1] Hym C, Forma V, Anderson DI, Provasi J, Granjon L, Huet V, Carpe E, Teulier C, Durand K, Schaal B, Barbu-Roth M. Newborn crawling and rooting in response to maternal breast odor. Developmental science. 2021 May;24(3):e13061.

[2] Huang JZ, Chen CN, Lee CP, Kao CH, Hsu HC, Chou AK. Evaluation of the effects of skin-to-skin contact on newborn sucking, and breastfeeding abilities: a quasi-experimental study design. Nutrients. 2022 Apr 28;14(9):1846.

[3] Brimdyr K, Mbalinda SN, Blair A, Svensson K, Kagawa M, Reyes M, Bastarache LR, Kamoga L, Kigozi E, Cadwell K. The impact of implementing and sustaining the international guidelines for skin-to-skin contact in the first hour after birth in Uganda. Scientific Reports. 2024 Dec 30;14(1):32042.

[4] Barbaglia M, Finale E, Noce S, Vigo A, Arioni C, Visentin R, Scurati-Manzoni E, Guala A. Skin-to-skin contact and delivery room practices: a longitudinal survey conducted in Piedmont and the Aosta Valley. Italian Journal of Pediatrics. 2019 Aug 2;45(1):95.

[5] Moore ER. Early skin-to-skin contact for mothers and their healthy newborn infants. Journal of Obstetric, Gynecologic & Neonatal Nursing. 2013 Jun 1;42:S86.

[6] Bergman NJ. The neuroscience of birth-and the case for Zero Separation. Curationis. 2014 Jan 1;37(2):1-4.

[7] Clarke P, Allen E, Atuona S, Cawley P. Delivery room cuddles for extremely preterm babies and parents: concept, practice, safety, parental feedback. Acta Paediatrica. 2021 May;110(5):1439-49.

[8] Uvnäs-Moberg K, Gross MM, Agius A, Downe S, Calleja-Agius J. Are there epigenetic oxytocin-mediated effects on the mother and infant during physiological childbirth?. International Journal of Molecular Sciences. 2020 Dec 14;21(24):9503.

[9] Buil A, Sankey C, Caeymaex L, Gratier M, Apter G, Vitte L, Devouche E. Skin-to-skin SDF positioning: The key to intersubjective intimacy between mother and very preterm newborn—A pilot matched-pair case-control study. Frontiers in psychology. 2022 Oct 11;13:790313.

[10] Ramaiah R, Jothishanmugam A, Alshahrani SH, Innocent Rani V, Alshahrani BY, Rajagopal Sambasivan L, Xavier Dhas J. Kangaroo mother care induced serum oxytocin facilitates prolactin and IL-10 among emergency cesarean mothers. Journal of Multidisciplinary Healthcare. 2024 Dec 31:2689-99.

[11] Ashiyama Vega J, Yrigoyen Rojas M, Ravichagua Ashiyama J. Effect of Teté dance on lactation session duration in irritable infants in Peru assessed in a randomized controlled trial. Scientific Reports. 2025 Mar 21;15(1):9808.

[12] Sayed A, Sayed AA, Fard D, Hillemanns P, Von Kaisenberg C, Klapdor R. Effect of mother's active pushing at cesarean delivery: a randomized controlled trial. Archives of Gynecology and Obstetrics. 2025 Mar;311(3):599-607.

[13] Michaelson DM, Rolling V, Barsha UH. NICU Nurses' Perceptions of Skin-To-Skin Garment Design. In International Textile and Apparel Association Annual Conference Proceedings 2025 Jan 18 (Vol. 81, No. 1). Iowa State University Digital Press.

[14] Klemming S, Lilliesköld S, Arwehed S, Jonas W, Lehtonen L, Westrup B. Mother-newborn couplet care: Nordic country experiences of organization, models and practice. Journal of perinatology. 2023 Dec;43(Suppl 1):17-25.

[15] Anderson GC, Chiu SH, Dombrowski MA, Swinth JY, Albert JM, Wada N. Mother-newborn contact in a randomized trial of kangaroo (skin-to-skin) care. Journal of Obstetric, Gynecologic, & Neonatal Nursing. 2003 Sep;32(5):604-11.

[16] Mohammed S, Abukari AS, Afaya A. The impact of intrapartum and immediate post-partum complications and newborn care practices on breastfeeding initiation in Ethiopia: A prospective cohort study. Maternal & Child Nutrition. 2023 Jan;19(1):e13449.

[17] Moore ER. Early skin-to-skin contact for mothers and their healthy newborn infants. Journal of Obstetric, Gynecologic & Neonatal Nursing. 2013 Jun 1;42:S86.