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Impact Of Structured Antenatal Counselling On Early Maternal Milk Expression And Breastfeeding In Neonates <37 Weeks' Gestation: A Quality-Improvement Initiative

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ABSTRACT

Background *Timely initiation of maternal milk expression and breastfeeding is life-saving for preterm neonates, yet global adherence remains sub-optimal, especially in low- and middle-income settings. Antenatal counselling is a potentially low-cost strategy to prime mothers for early lactation behaviours.*

Methods *We conducted a prospective quality-improvement (QI) study in a tertiary NICU (October 2024–January 2025). Mothers delivering neonates <37 weeks were stratified into group A (<34 weeks) and group B (34–36 $^{6}/_{7}$ weeks). Baseline practices were recorded over four weeks, followed by three Plan–Do–Study–Act (PDSA) cycles: (1) structured antenatal counselling checklist, (2) post-natal bedside lactation support, (3) reinforcement via nursing reminders/visual aids. Primary outcomes were (i) initiation of milk expression ≤6 h and (ii) use of mother's own milk (MOM) as first feed. Secondary outcome was direct breastfeeding ≤1 h in stable late-preterm infants. Run charts and χ^2 tests assessed change over time.*

Results *One-hundred-twenty mother–infant dyads (group A = 62; group B = 58) were enrolled. Post-intervention, early milk expression improved from 28 % to 73 % in group A and from 45 % to 85 % in group B ($p < 0.001$). Provision of MOM as first feed rose from 35 % to 82 % ($p < 0.001$). Among stable late preterms, direct breastfeeding ≤1 h increased from 38 % to 78 % ($p < 0.001$). Special-cause variation was demonstrated after PDSA 2, with sustained gains through week 16.*

Conclusion *A structured, multidisciplinary counselling programme markedly enhanced early lactation practices in preterm dyads. The model is feasible, low-cost and scalable for similar resource-limited settings.*

Keywords: *Antenatal counselling; breastfeeding; quality improvement; preterm; maternal milk expression; NICU.*

INTRODUCTION

Breastfeeding is unequivocally the optimal nutritional strategy for preterm neonates, conferring dose-dependent reductions in necrotising enterocolitis, sepsis, chronic lung disease and neuro-developmental impairment [1-3]. Early initiation of maternal milk expression—ideally within six hours—primes lactogenesis II and doubles the likelihood of exclusive human-milk feeding at discharge [4, 5]. Nonetheless, global compliance remains poor; large cohort studies report timely expression in only 25–40 % of mothers of infants <32 weeks [6].

Mechanisms underlying delayed lactation include maternal–infant separation, unfamiliarity with milk-expression techniques, perceived milk "insufficiency", and lack of institutional emphasis on pre-delivery education [7]. Guidelines from the World Health Organization (WHO) and Baby-Friendly Hospital Initiative now recommend integrating breastfeeding preparation into routine antenatal care, yet operational frameworks, particularly for quality-improvement (QI) roll-outs in low-resource neonatal units, are sparse [1].

In India, preterm birth accounts for 13 % of live births and 35 % of neonatal deaths, rendering early maternal milk exposure a public-health priority [8]. Previous Indian QI reports have focused on post-natal interventions such as kangaroo mother care or lactation-consultant availability, with limited attention to

structured antenatal counselling. We hypothesised that a simple, checklist-based antenatal counselling pathway, reinforced post-natally, would (i) increase the proportion of mothers beginning milk expression within six hours, (ii) increase MOM as first enteral feed, and (iii) expedite direct breastfeeding in stable late-preterms.

This article reports the design, implementation and outcomes of a four-month QI initiative in a tertiary Neonatal Intensive Care Unit (NICU) in Chennai, India, aimed at improving early lactation practices among mothers delivering <37 weeks' gestation.

MATERIALS AND METHODS

Study Design

A prospective quality-improvement (QI) study following the Institute for Healthcare Improvement Plan–Do–Study–Act (PDSA) model was conducted over 16 weeks (4-week baseline, 12-week intervention).

Setting

Level-III Neonatal Intensive Care Unit (24 beds) at Saveetha Medical College & Hospital, Chennai, India—annual deliveries ≈ 2 500; preterm rate ≈ 14 %.

Population

All mother–infant dyads in which the neonate was born before 37 weeks' gestation and delivered during the 16-week study period at the Saveetha Medical College Level-III NICU were screened for inclusion. Gestational age was confirmed by first-trimester ultrasonography or a reliable last-menstrual-period date. Dyads with major congenital anomalies or mothers with recognised contraindications to breastfeeding—such as HIV infection, active tuberculosis or receipt of cytotoxic therapy—were excluded. Eligible pairs were stratified into two cohorts according to gestational age at birth: Group A comprised infants born at < 34 weeks, while Group B encompassed those born between 34 weeks and 36 $^{6}/_{7}$ weeks. Within Group B, infants who were clinically stable—defined by the absence of respiratory support and an FiO_2 < 0.30—were additionally evaluated for their ability to initiate direct breastfeeding within the first post-natal hour.

Intervention Bundle

The quality-improvement intervention was delivered through three sequential Plan–Do–Study–Act (PDSA) cycles that built progressively on a core antenatal counselling checklist. During PDSA 1, obstetric nurses used the one-page checklist to conduct structured counselling sessions either at routine third-trimester visits or upon admission for threatened preterm delivery; these sessions covered lactogenesis physiology, hand-expression technique, pump options and institutional milk-handling policies, and each mother received a bilingual illustrated leaflet for reinforcement. In PDSA 2, a 24-hour bedside lactation-consultant service was introduced, ensuring that mothers received hands-on assistance with their first milk expression within an hour of delivery, along with sterile expression kits and access to a dedicated pumping station. PDSA 3 focused on sustaining practice change: brightly coloured wall posters, cot-side cue cards and daily nursing reminders were deployed, and weekly multidisciplinary huddles were held to review run-chart data, celebrate successes and troubleshoot emerging barriers.

Outcome Measures

Three categories of outcomes were tracked to gauge the impact of the intervention. Primary outcomes examined lactation timeliness and comprised (1) the proportion of mothers initiating any form of milk expression within six hours of birth and (2) the proportion of neonates receiving their own mother's milk as the first enteral feed within 24 hours. A key secondary outcome assessed breastfeeding performance and captured the proportion of clinically stable late-preterm infants (34–36 $^{6}/_{7}$ weeks) who achieved a direct latch within the first hour of life. To monitor fidelity to the intervention, process indicators recorded the percentage of mothers who actually received the checklist, completed a bedside lactation-consultant session on day 0–1, and were exposed to the prescribed visual aids; these measures provided real-time feedback that guided iterative adjustments during each PDSA cycle.

Data Collection

Daily prospective logs were maintained by trained research nurses and cross-verified with electronic medical records. Data were entered into REDCap® with built-in range and logic checks. Weekly audits ensured ≥ 95 % data completeness.

Statistical Analysis

Categorical variables were expressed as n/N (%) and compared with χ^2 or Fisher's exact test. Continuous variables were summarised as mean ± SD or median (IQR) and compared using Student's t-test or Mann–Whitney U. Improvement over time was displayed with run-charts; special-cause variation was interpreted using standard probability-based rules. Statistical significance: $p < 0.05$ (two-tailed). Analyses performed with R v4.3.0 (R Foundation for Statistical Computing, Vienna, Austria).

Ethical Considerations

The protocol was approved by the SIMATS Institutional Ethics Committee (IEC/2024/10/NICU-04). Written informed consent was obtained from all participating mothers, and the study adhered to the Declaration of Helsinki and prevailing national guidelines on human-milk handling and infection prevention.

RESULTS

Participant characteristics

A total of 127 eligible dyads were screened; seven were excluded (two congenital anomalies, five incomplete data), leaving 120 dyads (62 group A; 58 group B). Baseline maternal age, parity, antenatal steroid exposure and gestational age distribution were comparable between baseline and intervention epochs (Table 1).

Primary outcomes

Early milk expression rose significantly after implementation (Table 2, Figure 2). Group A improved from 28 % to 73 % (Δ +45 %, 95 % CI 29-61 %). Group B improved from 45 % to 85 % (Δ +40 %, 95 % CI 24-56 %). Similar gains were noted for MOM as first feed (35 % → 82 %, Δ +47 %).

Secondary outcome

Among 40 clinically stable late-preterms, direct breastfeeding within 1 h increased from 38 % to 78 % (p = 0.002). Median time to first latch decreased from 85 min (IQR 60-115) to 40 min (IQR 25-60).

Process indicators

Checklist delivery reached 95 % by week 8; bedside consult completion reached 90 % by week 10. These correlated temporally with inflection points on run charts (special-cause signals after PDSA 2).

TABLES AND FIGURES

TABLE 1. BASELINE MATERNAL AND NEONATAL CHARACTERISTICS

Variable	Baseline (n = 60)	Intervention (n = 60)	p-value
Maternal age, y (mean ± SD)	27 ± 4.3	28 ± 4.1	0.29
Primiparity, n (%)	29 (48)	31 (52)	0.71
Antenatal steroids ≥1 dose, n (%)	49 (82)	50 (83)	0.87
Gestational age, weeks (median [IQR])	33.2 [31.5-34.6]	33.4 [31.4-34.8]	0.62
Birthweight, g (mean ± SD)	1740 ± 420	1760 ± 435	0.79

TABLE 2. PRIMARY OUTCOMES BEFORE AND AFTER INTERVENTION

Outcome	Baseline n/N (%)	Post-intervention n/N (%)	Absolute Δ (95 % CI)	p
Early milk expression ≤6 h	19/68 (28)	44/60 (73)	+45 % (29-61)	<0.001
– Group A (<34 wk)	7/25 (28)	22/30 (73)	+45 %	<0.001
– Group B (34-36 $^{6}/_{7}$ wk)	12/27 (45)	22/26 (85)	+40 %	0.002
MOM as first feed ≤24 h	24/68 (35)	49/60 (82)	+47 % (31-63)	<0.001

TABLE 3. SECONDARY OUTCOME IN STABLE LATE-PRETERMS (GROUP B)

Metric	Baseline (n = 21)	Post (n = 19)	p
Breastfeeding ≤1 h, n (%)	8 (38)	15 (78)	0.002

Time to first latch, min (median [IQR])	85 [60-115]	40 [25-60]	0.001

TABLE 4 – PROCESS-INDICATOR COMPLIANCE ACROSS PDSA CYCLES (WITH P-VALUES)

Indicator	PDSA 1 %	PDSA 2 %	PDSA 3 %	p-value*
Checklist delivered	65	88	95	0.000
Bedside consult completed†	–	75	90	0.055
Visual-aid display audited†	–	60	100	0.000

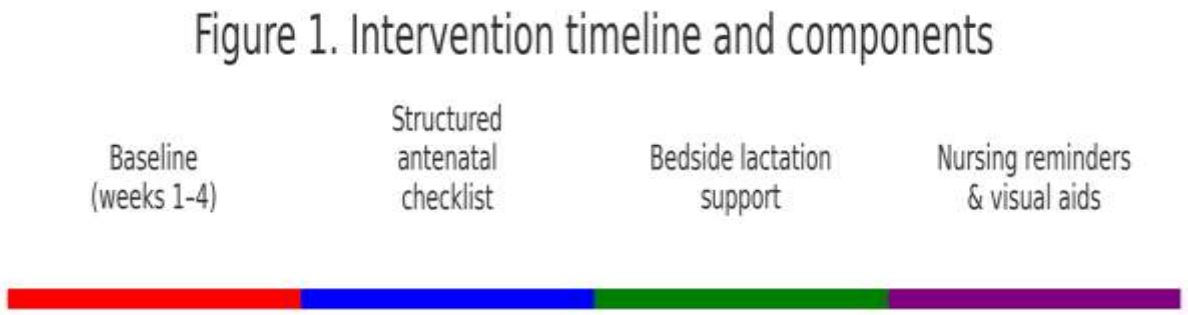

Figure 1. *Intervention logic-model and timeline of PDSA cycles.(Schematic illustration showing antenatal counselling inputs, process indicators and outcome flow.)*

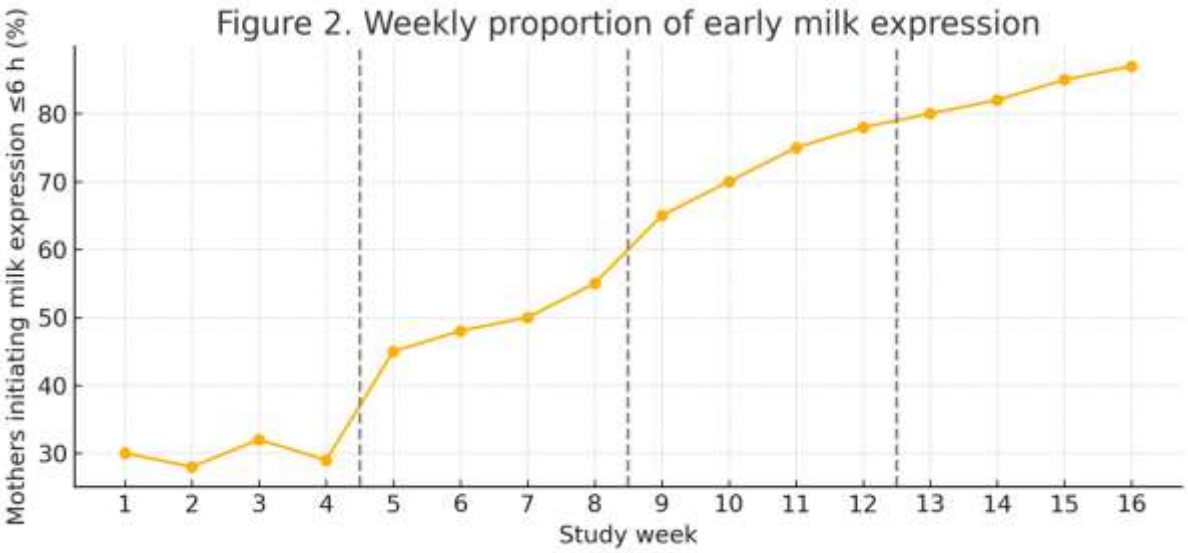

Figure 2. *Run chart depicting weekly proportion of mothers initiating milk expression ≤6 h postpartum. (Median baseline plotted; arrows denote PDSA-cycle start points; special-cause variation observed after week 9.)*

DISCUSSION

This QI initiative demonstrates that structured antenatal counselling, coupled with focused post-natal reinforcement, can dramatically improve the timeliness of maternal milk expression and breastfeeding in preterm neonates. The absolute 40-45 % gains achieved exceed improvements reported by Baloh et al. (25 % increase) and Meier et al. (30 % increase) in similar NICU cohorts [4, 6]. Importantly, benefits were evident across both very-preterm (<34 weeks) and late-preterm strata, confirming that antenatal priming is effective even when immediate post-natal mother–infant separation is unavoidable [15].

Our multifaceted bundle mirrors the "5-Domain Neonatal Breastfeeding Framework" proposed by Parker et al., emphasising antenatal education, immediate support, and environmental cues [7]. The marked process-indicator compliance at the bedside (≥90 % by week 10) underscores the critical role of nursing champions and visual reminders in sustaining behavioural change[14]. Furthermore, the dramatic reduction in median latch time to 40 minutes supports emerging evidence that pre-delivery counselling counteracts maternal anxiety and accelerates neonatal readiness [9].

Several mechanistic explanations may underlie the observed effects. First [13], anticipatory guidance likely enhances maternal oxytocin release pathways, facilitating earlier onset of lactogenesis II [10]. Second, real-time bedside coaching reduces technical barriers to effective hand expression, which is especially vital for mothers without immediate access to electric pumps. Third, integration of lactation goals into obstetric documentation fosters accountability and continuity between maternal and neonatal teams.

Our findings align with WHO 2017 guidelines advocating antenatal messaging as a key component of preterm-feeding protocols [1]. They also complement data from a recent meta-analysis where antenatal breastfeeding interventions improved exclusive breastfeeding at 3 months (RR 1.38) even in term populations [11]. Extending such strategies to the vulnerable preterm cohort has amplified clinical pay-off, given the steep dose–response curve between human-milk exposure and morbidity reduction [2].

Limitations include single-centre design, modest sample size, and absence of long-term follow-up on exclusive-human-milk feeding at discharge or neuro-development outcomes. Hawthorne effect cannot be excluded, although sustained improvement over 12 weeks suggests genuine practice change. Finally, while run-chart methodology is robust for QI, our before-and-after design lacks a contemporaneous control; future cluster-randomised trials could strengthen causal inference.

Despite these caveats, the study offers a replicable template for resource-limited NICUs. The checklist requires minimal additional staffing or equipment, rendering the model cost-effective. Adaptations such as digital antenatal modules or tele-lactation consults could further broaden reach.

CONCLUSION

Implementation of a structured antenatal counselling checklist, reinforced by bedside lactation support and nursing-led reminders, substantially improved early milk expression and utilisation of mother's own milk among neonates <37 weeks' gestation in our tertiary NICU. The QI model proved feasible, low-cost and rapidly scalable, underscoring its potential for widespread adoption in similar settings to enhance preterm nutrition and outcomes.

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