

A quality improvement initiative to improve the quantity of expressed breast milk among mothers whose neonates were admitted in the neonatal intensive care unit

*Revathi Krishnakumar¹, Kanimozhi Thandapani², Singaravelu Manikavasagam³

Sri Lanka Journal of Child Health, 2022; **51**(3): 397-403
DOI: <http://dx.doi.org/10.4038/sljch.v51i3.10239>

Abstract

Introduction: The importance of breast milk (BM) is unquestionable for any neonate. Our neonatal intensive care unit (NICU) does not have a human milk bank and depends entirely on the availability of mothers' own milk. Hence this quality improvement (QI) initiative was designed to improve expressed breast milk (EBM) usage.

Objective: To increase the quantity of EBM in postnatal mothers, whose neonates were admitted in NICU on day-3 of life, from the baseline of 15ml per day to 60ml per day over an 8-week-period.

Method: In our neonatal unit, we found many challenges faced by mothers in initiation and maintenance of breast feeding. This study involved systematic implementation utilizing QI strategies; baseline data were collected in the initial weeks and the important causes for less usage of BM were found using a fish bone analysis. Plan-do-study-act cycles were conducted to test change of ideas like counselling sessions and methods of milk expression with help of pamphlets, charts and videos. This series of changes led to increase in BM expression.

Results: There were 48 deliveries during the study period of which 26 were included in study. Baseline data collection revealed that the average quantity of expressed mothers' milk intake per day was 15 ml, and use of other mothers' milk and formula feeds was 50%. Within the 8-week-period of implementation, average quantity of EBM improved

from 15ml to 60ml and use of formula feeds was 0%.

Conclusions: The quantity of EBM in postnatal mothers, whose neonates were admitted in NICU on day-3 of life, was increased from 15ml to 60ml per day during an 8-week-period by systematic approach using QI strategies.

(Key words: Expressed breast milk, Counselling, PDSA cycle, Quality improvement, Breastfeeding)

Introduction

Quality in healthcare is defined as being safe, effective, patient-centred, timely, efficient, and equitable¹. The goal in healthcare quality improvement (QI) is to make changes in how the delivered care leads to improvement. The Point of Care Quality Improvement (POCQI) module developed by the World Health Organisation (WHO) uses a four-step approach: (1) identification of the problem; (2) analysis of the cause and collection of data to measure performance; (3) identification, testing and analysis of ideas for change using Plan-Do-Study-Act (PDSA) cycle; (4) sustaining improvement². Human milk has innumerable benefits for neonates. Exclusively breastfed neonates have better short-term and long-term health and developmental outcome, and obtain maximum immunological benefits³⁻⁵. QI programmes can improve usage of human milk⁶.

Our newborn intensive care unit (NICU) has no human milk bank and feeding of admitted newborns depends entirely on the availability of mothers' own milk. If mothers' own milk is not available, other mothers' milk or formula feeds are used. We retrospectively analysed our data and identified that delay in and inadequate frequency of milk expression resulted in reduced quantity of expressed milk available for admitted newborns. Main reasons for this were lack of knowledge among postnatal mothers about the importance of human milk and manual expression of breast milk (BM), stress and anxiety among mothers whose neonates were admitted in NICU, and perception of not enough milk by the mother. Thus, we designed a QI initiative to increase exclusive breastfeeding rates in neonates admitted in NICU. The aim of this study was to increase the quantity and frequency of expressing mothers' milk in neonates admitted in

¹Assistant Professor, ²Associate Professor, ³Professor, Department of Paediatrics, Sri Manakula Vinayagar Medical College and Hospital, Pondicherry, India

*Correspondence:

revathikrishnakumar.1990@gmail.com



<https://orcid.org/0000-0002-8316-0696>

(Received on 16 January 2022; Accepted after revision on 18 February 2022)

The authors declare that there are no conflicts of interest

Personal funding was used for the project.

Open Access Article published under the Creative

Commons Attribution CC-BY  License

NICU and to improve quality of care in our institute within the given infrastructure without any additional resources.

Objectives

To increase the quantity of expressed breast milk (EBM) in postnatal mothers, whose neonates were admitted in NICU on Day 3 of life, from a baseline of 15ml to 60ml per day over an 8-week period.

Method

Setting: A prospective study was conducted in the Department of Paediatrics, Sri Manakula Vinayagar Medical College and Hospital, Pondicherry, India.

Sampling method: Continuous sampling method.

Study participants: All postnatal mothers whose neonates were admitted in NICU on 3rd day of life in November and December 2019.

Sample size: Total number of postnatal mothers whose neonates were admitted in NICU during the study period. This was 48.

Inclusion criteria: All in-born newborn babies shifted to NICU on day 3 of life with a gestational age of >34 weeks.

Exclusion criteria: Extramural birth, gestational age 34 weeks or less and babies with surgical conditions and congenital malformations.

QI team: Paediatrician, resident medical officers of NICU, staff nurses of NICU, social worker and postnatal mothers (monitoring – paediatrician; recording - staff nurses; counselling - staff nurses and social worker)

Tools: Sessions with videos, charts and pamphlets.

Procedure: This project involved the systematic implementation of evidence-based practices utilizing QI strategies. The nature of intervention was chalked out by the QI team. This team underwent extensive training sessions on QI and conducted a root cause analysis of less usage of EBM in NICU. Baseline data were collected for initial week and included the amount and frequency of EBM, use of other types of milk (formula / other mothers' milk) and important causes for less usage of BM. These causes were listed and categorized using a fish bone analysis (Figure 1).

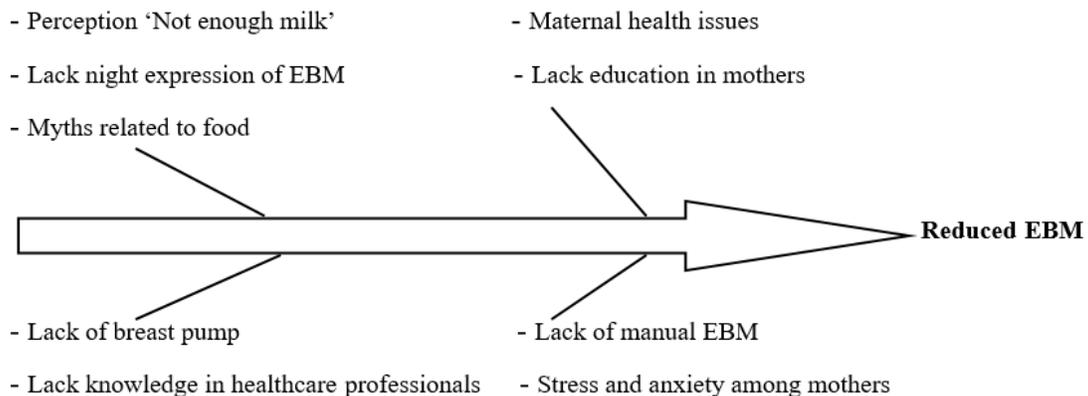


Figure 1: Fish bone analysis

EBM: expressed breast milk

As change in practice, counselling sessions were given by staff nurse and social worker to the postnatal mothers with pamphlets and charts showing the importance of breastfeeding and videos explaining benefits of BM and method of milk expression both manually and with help of breast pumps. The team also counselled other family members and husband to help them provide better support to mother to initiate breastfeeding.

These change ideas were tested twice weekly by Plan-Do-Study-Act (PDSA) cycle. In the first phase of PDSA cycle 1 (Figure 2), we implemented postnatal counselling session by QI team related to myths and importance of breast feeding.

Second phase of PDSA cycle 2 (Figure 3) was to identify barriers related to human milk expression. We intervened for identified breast feeding problems through a videos session and charts showing the position and signs of good attachment, conducted by staff nurse and social worker.

Last phase of PDSA cycle 3 (Figure 4) was to increase the night-time expression of milk. For this, night-time expression was encouraged among mothers and ward attendants would bring EBM to NICU. We also encouraged use of breast pumps for expression. This series of changes in our unit led to increase in milk expression, which was continuously measured and posted on a time series chart.

ACT - Apply on intramural mothers	PLAN - Comprehensive: Counselling package - Baseline: Data collection
STUDY -Study effect of counselling on amount of breast milk intake in NICU neonate	DO - Counselling - Videos, charts, pamphlets (Involving NICU nurses, social worker)

Figure 2: Plan-Do-Study-Act (PDSA) cycle 1

NICU: neonatal intensive care unit

ACT - Apply on intramural mothers	PLAN - Comprehensive: postnatal counselling - Identify barriers related to expression of breast milk.
STUDY Effect of manual expression breast milk to increase amount of breast milk intake by day 3	DO - Manual expression of breast milk - Videos and relaxation

Figure 3: Plan-Do-Study-Act (PDSA) cycle 2

ACT - Apply on intramural mothers	PLAN - To increase night-time expression. - Use breast pump to express breast milk. - Counselling.
STUDY Effect of night-time expression of milk to increase amount of breast milk.	DO - EBM brought to NICU during night by ward attendants. - Charts, videos related to usage of breast pump.

Figure 4: Plan-Do-Study-Act (PDSA) cycle 3

EBM: expressed breast mil

Ethical issues: The study was approved by the Institutional Ethics Committee of Sri Manakula Vinayagar Medical College and Hospital, Pondicherry, India (Approval No. E/C/26/2020). Written informed consent was obtained from all postnatal mothers included in the study.

Results

There was a total of 48 deliveries during the study period of which 26 fulfilled the inclusion criteria.

Of the 22 deliveries which were excluded from the analysis, 9 had a period of gestation ≤ 34 weeks, 6 mothers required ICU care due to postnatal complications, 4 were discharged against medical advice and 3 had surgical conditions.

Baseline data collection revealed that the average day 3 milk intake was 15-20ml and that 50% used other mothers' milk and formula feeds.

The root causes of the problems were identified and with changes of ideas after 1st PDSA cycle the mothers' milk intake improved to 30-35 ml; 50% of our target was achieved after the initial 3 weeks of change and by repeated PDSA cycles, our QI team found out that the key drivers of intervention were postnatal lactation counselling, identified barriers related to expression of mothers' milk and manual expression of mothers' milk from day 3 of life. At around 6 weeks of intervention, we were able to improve to around 45-50ml, 90% of our target and use of mothers' milk increased over formula / other mothers' milk (Figure 5).

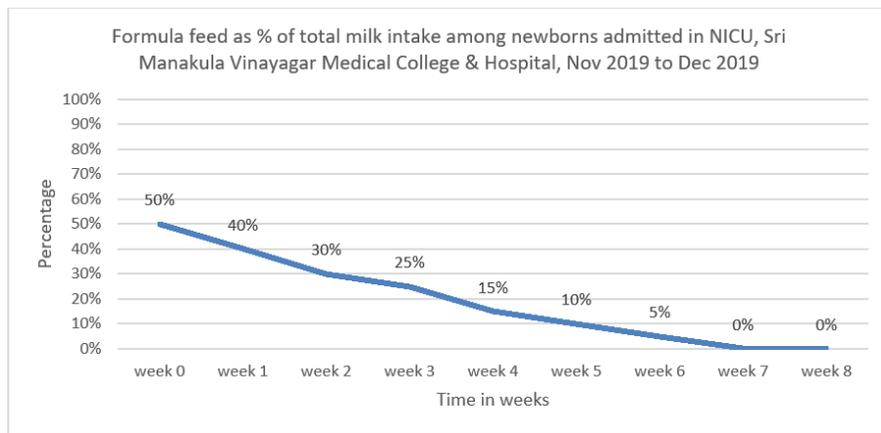


Figure 5: Formula feed as percentage of total milk intake among newborns over 8 weeks

At around 8 weeks we were able to achieve the target of 60ml of EBM at 3rd day of NICU babies (Figure 6).

We were also able to increase intake of mothers' milk and the average daily frequency of milk expression among postnatal mothers whose

neonates were admitted in NICU also increased 10 times (Figure 7).

As quality improvement project implemented changes improved over time and was sustained with above intervention.

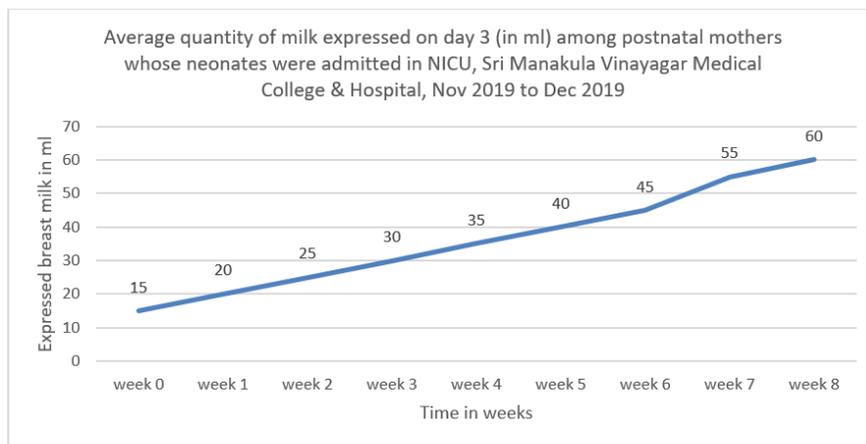


Figure 6: Average quantity of milk expressed on day 3 (in ml) over 8 weeks

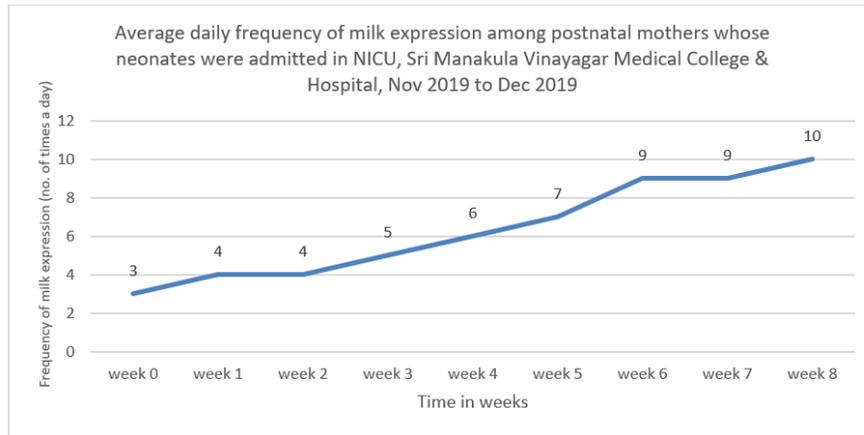


Figure 7: Average frequency of milk expression over 8 weeks

Discussion

This QI initiative resulted in an increase in the proportion of term neonates receiving EBM at the target amount of 60ml at day 3 of life and increased the frequency of usage of EBM and less usage of formula or other mothers' milk in neonates admitted in NICU over a period of 8 weeks. Our results are consistent with other studies using similar interventions for achieving increased consumption of EBM in neonates⁸⁻¹². In our study we initially analysed the problems in our unit and planned intervention accordingly. In the initial observation phase, mothers of NICU newborns were not familiar with the NICU environment and depended on healthcare professionals for guidance and support. Both healthcare professionals and peer support for mothers contribute to the success of breastfeeding in neonates^{13,14}. In our study we formed the QI team which was especially for supporting and encouraging the mothers whose neonates were admitted in the NICU in expressing milk. Sisk PM, *et al*⁸ found that lactation counselling of mothers of very low birth weight (VLBW) infants increases the incidence of lactation initiation and BM feeding without increasing maternal stress and anxiety. In our study we also counselled mothers on stress and anxiety aspects.

A study by Sethi A, *et al*⁷ showed that the proportion of newborns receiving mothers' own milk at postnatal day 7 increased from the current rate of 12.5% to 30% over a period of 6 weeks⁷. In our project, neonates receiving mothers' own milk increased from 20% to 80% at the 3rd day of life which is very important for our institute which does not have a breast milk bank. Thakur A, *et al*¹⁵, in a study of 156 VLBW babies found that the mean proportion of EBM reached 100ml/kg/day from 61.3% to 82.3% within 6 months of implementation of a QI programme. Bagga N, *et al*¹⁶ in a QI study of 30 babies found that the proportion of babies receiving EBM on the 1st day improved from 24% to 80% and at the end of 7 days it increased to 73%

from 46%. In our study, by extensive sessions of repeated PDSA cycles we were able to achieve the target of 60 ml per day at 8 weeks by making changes like educating mothers on breast feeding advantages and myths of food, boons of formula / pre-lacteal feed; video sessions were taken regarding benefits of human milk and expressing milk by social worker, technique of expressing milk manually and by using breast pump were demonstrated to mothers, group interaction with pamphlets, charts, during night also mothers were advised to express 3 hours once and ward attendants were used to bring EBM to NICU, so that the night-time expression increase amount of milk production and were able to achieve our goal with above changes.

The team met once a week, to have discussions regarding problems and try to make changes to support team members and tokens of appreciation were given to counseling group to encourage them in journey to achieve our goal and for maintaining our sustainability. The strength of this QI project is that it represents one of the few published reports from India to demonstrate the effectiveness of systematic implementation to improve usage of human milk in late preterm and term neonates admitted in NICU at day 3 of life and was implemented in small groups to achieve target with baseline data collection available; the outcome of our study depended on the constant supervision and repeated changes by PDSA were sustained after this phase and also took place in NICU; so counselling and implementation of change of ideas were much easier to achieve the goal. In addition, there was no additional manpower employed for QI project nor was it funded, so that aim of this QI project totally depended on the dedicated QI team that took up additional responsibility without compromising other aspects of clinical care. Further study can use these findings and focus on different setting and also benefits and impact of expressed mothers' milk in outcomes of neonate.

Conclusions

The quantity of EBM in postnatal mothers, whose neonates were admitted in NICU on day-3 of life, was increased from 15ml to 60ml per day during an 8-week-period by systematic approach using QI strategies.

Acknowledgements

We acknowledge the QI team for their support

References

1. Institute of Medicine Committee on Quality of Healthcare in America. Crossing the quality chasm: A new health system for the 21st century. Washington, DC: National Academies Press (US); 2001.
2. Point of Care Continuous Quality Improvement. Developed by WHO - SEARO, WHO Collaborating Center for Newborns (AIIMS) and ASSIST, supported by UNICEF, UNFPA, USAID and WHO CC SEA.
3. Henerson G, Anthony MY, Meguire W. Formula milk versus maternal breast milk for feeding preterm or low birth weight infants. *Cochrane Database of Systematic Reviews* 2007; **4**: CD002972. <https://doi.org/10.1002/14651858.CD00272.pub2> PMID: 17943777
4. Meir PP, Johnson TJ, Patel AZ, Rossman B. Evidence based methods that promote human milk feeding of preterm infants. *Clinical Perinatology* 2017; **44**: 1-22. <https://doi.org/10.1016/j.clp.2016.11.005> PMID: 28159199 PMCID: PMC5328421
5. Murphy L, Warner DD, Parks J, Whitt J, Peter-Wohl S. A quality improvement project to improve the rate of early breast milk expression in mothers of preterm infant. *Journal of Human Lactation* 2014; **30**: 398-401. <https://doi.org/10.1177/0890334414544124> PMID: 25063572
6. Battersby C, Santhakumaran S, Upton M, Radbone L, Birch J, Modi N. The impact of a regional care bundle on maternal breast milk use in preterm infants: Outcomes of the East of England quality improvement programme. *Archives of Disease in Childhood Fetal and Neonatal Edition* 2014; **99**: 395-401. <https://doi.org/10.1136/archdischild-2013-305475> PMID: 24876197
7. Sethi A, Joshi M, Thukral A, Dalal JS, Deorari AK. A quality improvement initiative: Improving exclusive breastfeeding rates of preterm neonates. *Indian Journal of Pediatrics* 2017; **84**: 322-5. <https://doi.org/10.1007/s12098-017-2306-4> PMID: 28233253
8. Sisk PM, Lovelady CA, Dillard RG, Gruber KJ. Lactation counselling for mothers of very low birth weight infants: effect on maternal anxiety and infant intake of human milk. *Pediatrics* 2006; **117**: e67-75. <https://doi.org/10.1542/peds.2005-0267> PMID: 16396850
9. Pineda RG, Foss J, Richards L, Pane CA. Breastfeeding changes for VLBW infants in the NICU following staff education. *Neonatal Network* 2009; **28**: 311-9. <https://doi.org/10.1891/07300832.28.5.311> PMID: 19720595
10. Ward L, Auer C, Smith C, Schoettker PJ, Pruett R, Shah NY, *et al*. The human milk project: a quality improvement initiative to increase human milk consumption in very low birth weight infants. *Breastfeeding Medicine* 2012; **7**: 234-40. <https://doi.org/10.1089/bfm.2012.0002> PMID: 22612658
11. Meier PP, Engstrom JL, Mingoelli SS, Miracle DJ, Kiesling S. The Rush Mothers' Milk Club: breastfeeding interventions for mothers with very-low-birth-weight infants. *Journal of Obstetric, Gynecologic and Neonatal Nursing* 2004; **33**: 164-74. <https://doi.org/10.1177/0884217504263280> PMID: 15095795
12. Verma A, Maria A, Pandey RM, Hans C, Verma M, Sherwani F. Family-centred care of sick newborns. A randomized controlled trial. *Indian Pediatrics* 2017; **54**: 453-9. <https://doi.org/10.1007/s13312-017-1047-9> PMID: 28667715

13. Renfrew MJ, Dyson L, Wallace LM, D'Souza L, McCormick F, Spiby H. Breastfeeding for longer: What works? *Journal of the Royal Society for the Promotion of Health* 2005; **125**: 62e3.
<https://doi.org/10.1177/146642400512500208>
PMid: 15819179
14. Dyson L, McCormick F, Renfrew MJ. Interventions for promoting the initiation of breastfeeding. *Cochrane Database of Systematic Reviews* 2005; **2**: CD001688.
<https://doi.org/10.1002/14651858.CD001688.pub2>
15. Thakur A, Kler N, Garg P, Singh A, Gandhi P. Impact of quality improvement program on expressed breast milk usage in very low birth weight infants. *Indian Pediatrics* 2018; **55**: 739-43.
<https://doi.org/10.1007/s13312-018-1371-8>
PMid: 30345975
16. Bagga N, Nadipineni R, Mohamed A, Poddutoor P, Chirla D.K. A quality initiative to improve exclusive breast milk feeding in preterm neonates. *Internal Journal of Pediatrics and Adolescent Medicine* 2018; **5**(4): 131-4.
<https://doi.org/10.1016/j.ijpam.2018.12.003>
PMid: 30805548 PMCID: PMC6363261