

Quality improvement (QI) initiative to increase the usage of mother's milk (EBM) for neonates admitted in special new-born care unit in South India

¹Dr. Vasanth Kumar D. L, ²Dr. Hyalyad Sunita C Parasuramappa, ³Dr. Bheemaraya Shivasharana, ⁴Dr. Venugopal S, ⁵Dr. Manoj GM, ⁶Dr. Ravindra B Patil

^{1,2,3}Assistant Professor, Department of Paediatrics, SIMS, Shivamogga, Karnataka, India

⁴Associate Professor, Department of Paediatrics, SIMS, Shivamogga. Karnataka, India

⁵Senior Resident, Department of Paediatrics, SIMS, Shivamogga, Karnataka, India

⁶Professor & Head, Department of Paediatrics, SIMS, Shivamogga, Karnataka, India

Corresponding Author: Dr. Bheemaraya Shivasharana (bs43ghawanalli@gmail.com)

Abstract

Breast milk is the best milk for premature, sick new-born admitted in NICU, as it has got innumerable benefits for the growth and wellbeing of the baby. However provision of EBM to the new-born in resource limited NICU is challenging. We aimed at increasing the proportion of EBM given to babies admitted in NICU from base line of 20% to 50% of the total feed on PND5 over a period of 10 weeks. We planned a QI project, analysed the root cause associated with lesser EBM provision and various change ideas were introduced to overcome the problems and were tested by 4 PDSA cycles viz. post natal counselling of mothers, augmenting knowledge and skills of staff nurses in regards to manual expression of breast milk and introduction of dedicated lactation counsellor to post natal wards. EBM provision gradually improved from 20% to 72% and sustained above 70% over 10 months. Thus by doing a simple QI project, EBM provision can be improved and well sustained in a resource limited NICU.

Keywords: Expressed breast milk, quality improvement, PDSA cycle, sustainability, post natal counselling

Introduction

Mother's milk is the best form of nutrition for babies^[1]. Data on breast feeding rates in neonatal intensive care units (NICUs) is limited and similarly the national data. Factors influencing breast feeding are many such as attitude of parents, collective knowledge and practical issues such as prematurity and ill baby^[2]. Preterm infants, however, are at increased risk for nutritional compromise. These infants are born with limited nutrient accretion and reserves due to their premature delivery, immature metabolic pathways and increased nutrient demand^[2]. The fact that 'the breast milk is the best milk' is well known and universally accepted^[1, 12]. Preterm and critically ill infants are too immature or fragile to breastfeed directly^[3]. In those babies who are unable to breast feed directly nutrition is provided enterally by feeding expressed breast milk via a nasogastric (NG) feeding or by Katori spoon feeding^[4,5]. But many a times enteral feed eligible babies remain nil orally due to various reasons, common being non availability of EBM. Expressed breast milk feeding in neonatal intensive care unit (NICU) is a well-established clinical best practice^[14]. However, ensuring its implementation in a resource constrained SNCU (Special New born Care Unit) remains challenging. Although the rates of "any" EBM (Expressed Breast Milk) use in NICU have improved during the last decade, efforts to help mothers in expressing and maintaining mother's own milk (MOM) through discharge remains a concern^[2]. The experience of having a sick baby admitted to a NICU means, parents are thrust into an unfamiliar environment and

reliant on healthcare professionals for support and guidance^[5].

The use of human milk offers many nutritional and non-nutritional advantages to the premature infant. Such as improved feed tolerance, decreased incidence of sepsis and NEC^[6,12,17]. Earlier discharge is facilitated by better feeding tolerance and less illness^[1]. Breast milk is the best gift that a mother can give to her baby. It contains all the nutrients for normal growth and development of a baby from the time of birth to the first 6 months, by far the most effective intervention that is known to reduce new born and child deaths^[2]. Aside from improved health outcomes, the additional healthcare costs associated with NEC and poor neuro-cognitive outcome are considerable^[7,11,12,13]. In addition to the health benefits of EBM, maternal satisfaction regarding own milk provision on the NICU is well documented^[6,7]. However, for various reasons, mothers of premature infants face multiple challenges in establishing and maintaining an adequate supply of milk. These include delayed lactogenesis, insufficient milk volume, and difficulties in milk expression due to stress or inadequate support^[8]. Whilst many units are able to use donor expressed breast milk (DEBM), it is not universally available.

Quality improvement (QI) programmes, by altering clinical behaviour and by doing consistent good practice can improve use of EBM and therefore improve health outcomes of new-born babies^[2,10,14]. In our hospital SNCU, we observed that proportion of EBM available out of total feed required on day 5 in hemodynamically stable new born was only 20.92%. We planned a QI project with the support from Neonatology division of AIIMS New Delhi with the motive to identify challenges faced by the health workers and the mothers in initiation and maintenance of EBM and to solve the remediable factors, so as to use expressed breast milk for feeding the neonates. The specific aim is to increase the proportion of Expresses breast milk of total feed received by neonates admitted to SNCU on Post natal day-5 (PND-5) from base line of 20% to 50% by implementing a package of best practices, over a period of 10 weeks.

Methodology

The QI project was carried out in a tertiary care SNCU (level 2 NICU) of Shivamogga medical college, from May 2019 to June 2020 over a period of 14 months. Study was approved for ethical clearance from the Institute. All neonates who were admitted in SNCU and eligible for enteral feeds were enrolled in this study. Neonates who are on DBF, not on enteral feeds in initial 4 PND, hemodynamically unstable, major congenital malformation and neonates who are admitted after PND-5 were excluded (Fig 1).

We run a 20 bedded SNCU with twenty four nurses, three junior residents and twelve paediatricians working round the clock on a shift basis. The SNCU handles around 150 admissions per month, catering to both inborn as well as out born neonates. Being a referral hospital, about 30-40 percent of admissions are out born. The unit doesn't have human milk bank. The enteral feeding solely dependent on availability of expressed breast milk (MOM), if not formula milk.

Study intervention: The 14-month study period was divided into three phases (Fig.2), baseline (one month), intervention (Three months) and sustenance phases (Ten months).

During the baseline phase, the knowledge and skills of health care providers (HCPs) in best practices for preterm infants and knowledge scores in QI methods were assessed. Two days brainstorming workshop was conducted with the help of Neonatology team from AIIMS, New Delhi, on quality improvement initiative for all the health workers in SNCU at Shimoga Institute of Medical Sciences. Use of expressed breast milk (EBM) for feeding neonates on post natal day 5 (PND5) was chosen as a priority as the unit didn't have the standard feeding policy and the babies admitted in SNCU hardly received any EBM in initial days of ICU stay. At the beginning of the study, baseline data was collected for one month and analysed. Data on

demographic variables including birth weight, gestation, antenatal care, mode of delivery, delivery room care and variables indicating routine practices in the SNCU like proportion of expressed breast milk intake on day 5. On PND5 the proportion of EBM out of total feed received by a new-born was just 20.92%. Root cause of decrease in EBM on PND5 was identified through fish bone analysis (Fig. 3). Our study adhered to the standards for QI reporting excellence 2 (SQUIRE 2.0), guideline available in the equator network and the method was adopted from point of care QI (POCQI) learner guide. Based on this we developed the care bundles and modified them for local implementation.

After analysing the problems with EBM provision, the change ideas were tested using multiple Plan-do-study-act (PDSA) cycles from June to August 2019 to achieve the aim (Fig.2). Weekly QI meetings were conducted and the team was mentored through a web call by the AIIMS team. Data on the amount of EBM expressed by the mother every day was entered in the case record by the attending staff nurse in each shift. The change ideas were adapted or adopted based on the results (Fig. 2).

In the first PDSA cycle, the change idea was counselling post natal mothers by a consultant and a resident in charge of postnatal wards whose babies were admitted at SNCU, regarding provision of breast milk to their babies by manual expression. All the mothers were counselled about EBM and the way to express it and were told of giving formula feeding to neonates till adequate EBM is expressed (Fig.4). The outcome was analysed and the change idea was modified in the 2nd cycle by developing a standard post natal counseling format explaining the mothers about advantages of breast milk and formula feeding is inferior to breast milk and the complications associated with formula feed. Benefits of mother's milk such as immunity booster, improvement in neuro cognition, safe and hypo allergic properties were stressed. In the 3rd PDSA ramp we conducted a 2 day workshop for all the nurses of SNCU with the help of St John's hospital, Bengaluru, neonatologist's team which focussed on knowledge and skill augmentation in best practices of preterm infants, the proper way of expressing breast milk in the mothers (Table.2). Activities consisted of small group discussions, skill practice and simulated clinical scenarios. The training material was also made available to HCPs in physical format and available online at www.pretermcare-eliminatingrop.com for on-going reference. In the 4th PDSA, we appointed a lactation counsellor who was well trained in maternal counselling and manual expression of EBM. She was assigned to demonstrate EBM expression on mama's breast in post-natal wards and counsel the mothers regarding benefits of EBM using a standard format and promotion of early milk expression and ongoing support for lactation and stress management (Fig. 8). The PDSA ramp is shown in fig. 3. The on-going activities during the intervention phase included post-training supportive supervision and internal and external QI mentoring. During the fortnightly QI meetings team members assembled for approximately 30 minutes, reviewed the data, discussed potential change ideas, screened relevant skill video on their smartphones and reviewed case files. Weekly data updated in excel spread sheet.

Sustenance phase: After the 4 PDSA ramps, the routine counselling of post natal mothers and provision of EBM to babies in SNCU got stream lined and during this phase (Sept 2019-June 2020), we continued with monthly audits of compliance to the activities and the monthly data was updated in excel spreadsheet.

Process and Outcome measures: The process measures studied fortnightly was proportion of mothers counselled by lactation counselor postnatally for expression of breast milk. The outcomes measure was the proportion of EBM received by the neonate out of total feed on PND5 (Table 3).

Statistical analysis

The data were captured in case record form and entered in excel spread sheet. The outcomes were monitored for data quality, completeness and accuracy. Data were expressed as proportions, mean and SDs or median and IQR where relevant. The analysis was two sided and by intention to treat. Data was analyzed using Stata V.14.0 (StataCorp, USA).

Results

Results were divided into baseline data and intervention phase and sustenance phase. In the baseline data, the average Proportion of EBM given for neonates on Postnatal day-5, Mean =20.92, Median = 12.9, Inter quartile range 28.38. Demographic characteristics of study population were as shown in table 1.

Total of 14,600 neonates were born during the study period, 1661 required NICU admission. Of these, 785 neonates were excluded from the study who didn't meet the inclusion criteria. A total of 876 neonates were enrolled, 64 in the baseline phase, 185 in the intervention phase and 627 in the sustenance phase (Fig. 1).

The mean gestational age of neonates was 36.2, 37 and 36.5 weeks respectively at baseline, intervention and sustenance phase. The mean birth weight was 2100, 2300 and 2050 grams respectively at baseline, intervention and sustenance phase. Total of 523 primipara mothers were in the study of which 127 were less than 20 years of age. 785 Neonates were excluded from the study, of which 197 were either on mechanical ventilation or in shock. 54 had congenital anomalies, 185 were on direct breast feeding, 193 were excluded due to maternal unavailability or maternal illness such as PIH/Eclampsia, PPH, ARDS etc. There were 25 extreme premies and 75 small for date babies. 30% of babies received KMC during the course of study.

Table 1: Maternal and Infant demographic profile of baseline, intervention & sustenance phase

Demographic profile	Baseline (n=64)	Intervention (n=185)	Sustenance phase (n=627)	p-value
Maternal characteristics				
Booked	57 (96.2)	162 (87.2)	601 (95.7)	0.66
Gravida				
• Primigravida	39 (60%)	94(50.8)	319 (50.8)	0.73
Type of delivery				
• SVD	18 (28.7)	101 (54.5)	271 (43.2)	0.03
• Assisted vaginal	7(11.2)	3 (1.4)	27 (4.2)	0.10
• Em LSCS	26 (40)	20 (10.7)	117 (18.6)	<0.001
• El LSCS	13(20)	61 (33.1)	212 (33.8)	0.054
Maternal Morbidity				
• PIH	4 (5)	17 (9)	53 (8.4)	0.02
• Preeclampsia/Eclampsia	7 (11.2)	5 (2.4)	16 (2.5)	0.72
• Abruption	4 (5)	12 (6.1)	21 (3.3)	0.72
• Placenta Previa	4 (5)	10 (5.3)	21 (3.3)	0.57
Infant characteristics				
In-born	67%	60%	62%	
Gestational age	36.2 (28-42)	37 (26-42)	36.5 (2-41)	
Birth weight	2170 (200)	2010 (651)	1950 (225)	
Sex: Male	44 (67.5)	97 (53.3)	345 (55)	0.082

Gestation (Corr. weeks)				
• ≤28	0 (0)	1 (0.54)	5 (0.79)	-
• 28-32	8 (12.50)	6 (03.24)	32 (5.10)	0.0032

• 33-34	8 (12.50)	50 (27.03)	157 (25.04)	0.012
• 35-36	39 (60.93)	85 (45.94)	276 (44.02)	0.054
• 37-41	9 (14.06)	43 (23.24)	101 (16.1)	<0.0002
Weight for gest. age				
• AGA	55 (86.2)	143 (77.5)	552 (88.1)	0.67
• SGA	7 (11.2)	37 (19.9)	68 (10.8)	0.048
• LGA	2 (2.5)	5 (2.5)	7 (1.1)	0.013
VLBW	7 (10.9)	9 (4.9)	31 (4.94)	0.19
LBW	20 (31.2)	81 (43.9)	149 (23.7)	0.20
Apgar score at 1 min	8 (1-9)	8 (1-9)	8 (1-9)	
Apgar score at 5 min	10 (2-10)	10 (3-10)	10 (3-10)	
Sepsis (on any antibiotics)	54 (85)	78 (42.1)	143 (22.8)	<0.001
Deaths	7 (10)	17 (9)	31 (5)	
Referrals	6 (8.7)	5(2.6)	17(2.5)	
SVD: Spontaneous vaginal delivery, Em. LSCS: Emergency lower segment caesarean section, El LSCS: Elective lower segment caesarean section, PIH: Pregnancy induced hypertension, AGA, SGA and LGA: appropriate, small and large for gestational age respectively, VLBW: very low birth weight, LBW: low birth weight Data depicted as mean (SD); median (Range) and n (%) wherever applicable *1 infant with ambiguous genitalia				

In PDSA one, 44 mothers received counselling by the consultant and a senior resident about early initiation of feed and providing breast milk to their babies admitted in NICU. Among them 29 of them had delivered vaginally and 15 through LSCS. But the proportion of EBM received by the babies at NICU was less than the base line i.e. 18.2%. PDSA two where the counselling method was changed to more uniform and specific facts, 56 mothers were counselled, which showed significant improvement in the proportion of EBM received by the babies at NICU to 27.6% by 1 week and 37% by 2 weeks. 3rd PDSA was of knowledge and skill augmentation workshop for nursing staff on best practices for milk expression by the team of neonatologists from AIIMS New Delhi, after which the proportion of EBM received by babies at NICU increased over 50% to 56% by 4 weeks. The knowledge and skill scores of staff nurses before and after the work shop are shown in table 2. After introduction of lactation counsellor in 4th PDSA for counselling mothers at post natal wards using mama breast to show manual expression of breast milk(Fig.8), the proportion of EBM drastically improved beyond 60% to 72% by 4 weeks. The improvement of proportion of EBM beyond 70% sustained throughout sustenance phase. There was a dip to 60% in the month of October and November due to more number of out born babies whose mothers were not available to provide EBM. One more dip was seen in the month of March 2020 to 58% due to Covid pandemic which resulted in isolating mothers to prevent the spread. The run chart is shown in Fig 6. During the study period the average KMC duration improved from 2 hours to 6 hours, percentage of enteral feeds improved from 18 to 60 and were sustained throughout sustenance phase. The minimum, maximum, median, 1st and 3rd quartiles, IQ range of proportion of EBM provided throughout the study is given in table 4. For easy understanding Figure 7 explains the same through box and whisker plot. As the study progressed the IQ range remained narrow and median was above 80.

Table 2: PDSA 3. QI workshop training staff nurses (Effectiveness of Preterm baby package and Quality improvement package)

	Pre-test score Mean ± SD	Post-test score Mean ± SD	Mean difference (95% CI)	p-value
Nursing officers (n=22)				
QI workshop	3.1 ± 1.2	16.2 ± 2.3	13.1 (12.1 to 14.5)	0.003

Knowledge score (Best practices for preterm care)*	3.4 ± 1.2	16.2 ± 1.4	12.8 (11.9 to 13.6)	0.001
Skill score (Best practices for preterm care)#	4.5 ± 1.1	17.2 ± 1.3	12.7 (11.8 to 13.6)	0.002

*Questionnaire 20 question; Max score 20; # 4 Skill stations; each skill graded out of max score of 5.

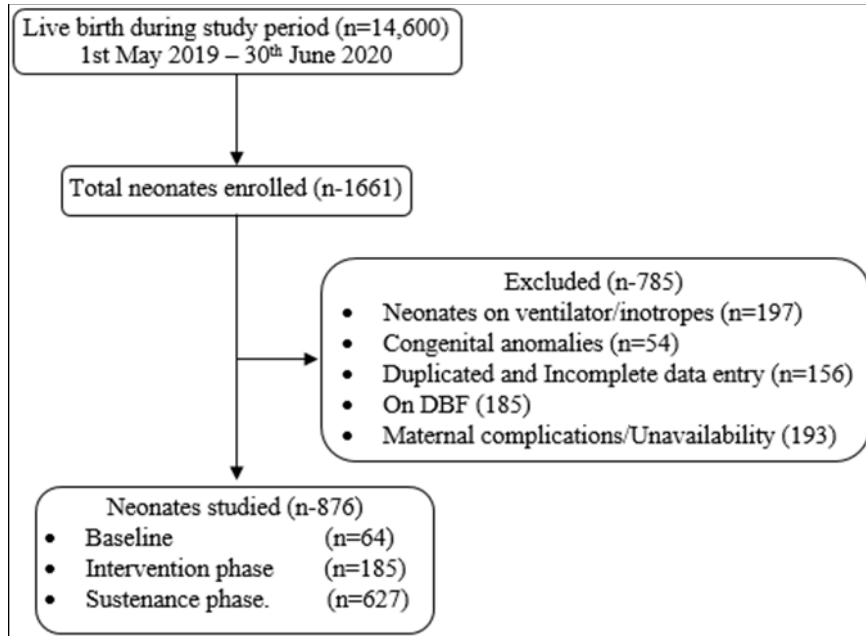


Fig 1: Study enrolment

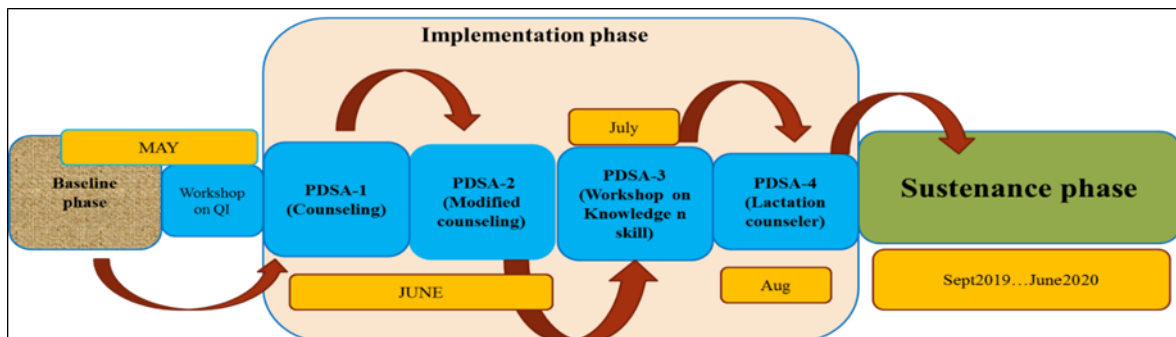


Fig 2: Study flow

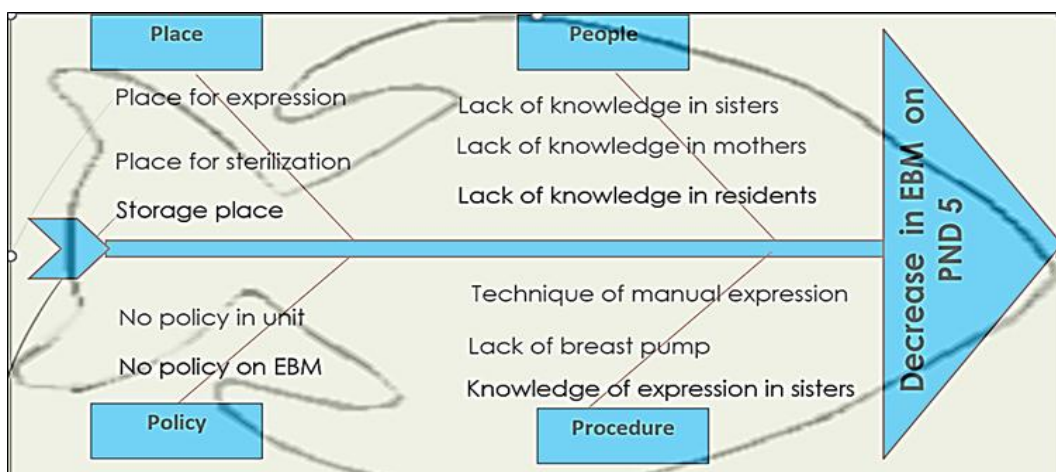



Fig 3: Fish bone analysis of the Problem

	Work sheet PDSA -1	Date of test 1/6/19	Test completion date 15/6/19
	Overall project Aim : counselling for all the mothers and teaching how to express EBM manually for more than 8 times per day		
	What is the objective of the test: To improve the EBM on PND 5		

<p>PLAN Briefly describe the test: counselling all the mothers about breast milk and its importance How will you know the change is the improvement ? Increase in EBM on PND 5 What drive does the change impact ? Decrease in usage of fluids and formula feeds What do you predict will happen? Gradual increase in EBM of mothers on PND5</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width: 25%;">List the task necessary to complete the test</th> <th style="width: 25%;">Person responsible</th> <th style="width: 25%;">when</th> <th style="width: 25%;">where</th> </tr> </thead> <tbody> <tr> <td>Counselling</td> <td>Dr Manoj</td> <td>1/6/19</td> <td>Counselling room</td> </tr> <tr> <td>To be conveyed to all the faculty</td> <td>Dr Vasanth</td> <td>1/6/19</td> <td>In meeting</td> </tr> </tbody> </table> <p>Plan for collection of data: The PI shall observe the compliance with faculty Sister will collect the data from the case sheet</p>	List the task necessary to complete the test	Person responsible	when	where	Counselling	Dr Manoj	1/6/19	Counselling room	To be conveyed to all the faculty	Dr Vasanth	1/6/19	In meeting	<p>DO :Test the change Was the cycle carried out as planned? YES</p> <p>What did you observe that was not part of our plan? There was fall in EBM ON PND5</p> <p>Study Did the results match prediction ? NO</p> <p>What did you learn? There was adverse effect as we have mentioned that in counselling that we are giving formula feeding till the EBM was produced that made the mother relaxed</p> <p>ACT :Decide to Adopt, Adapt, Abandon</p> <p>ADAPT: changed the way of counselling that only mother milk is the best for the baby</p>
List the task necessary to complete the test	Person responsible	when	where										
Counselling	Dr Manoj	1/6/19	Counselling room										
To be conveyed to all the faculty	Dr Vasanth	1/6/19	In meeting										

Fig 4: Work sheet: PDSA 1

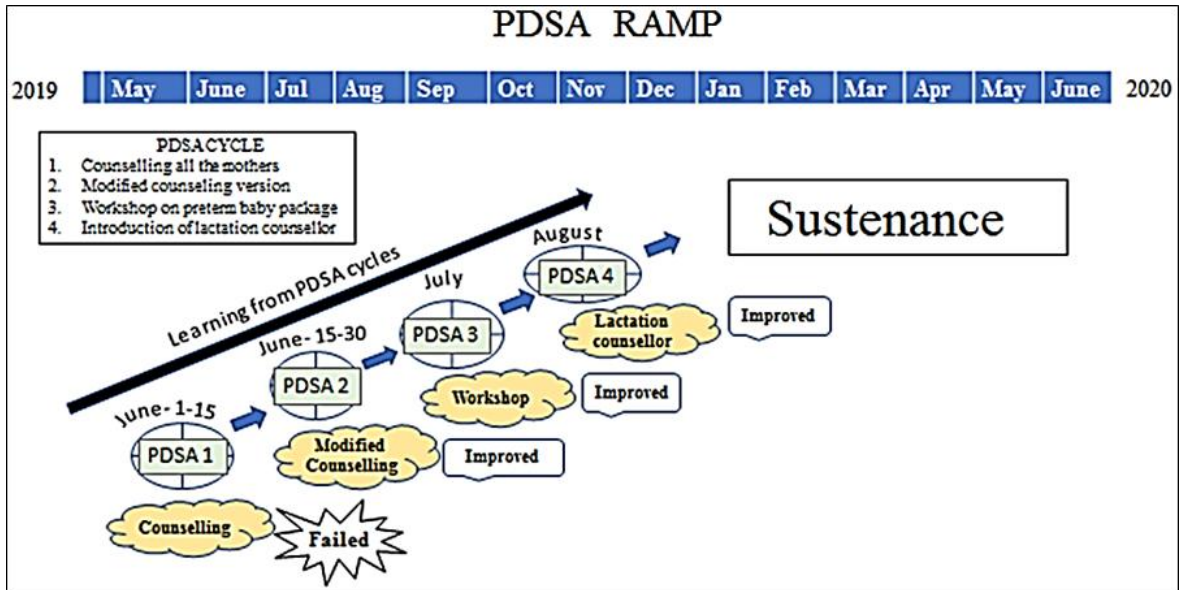


Fig 5

Table3: Process and Outcome Measures

Characteristic	Pre-intervention N-64	Post-intervention N-627	RR/Meandifference (95% CI)	P
Process indicator				
Introduction of Lactation counsellor	55.5%	64%	8.5(1.3-13.7)	<0.005
Outcome indicator				
Average percentage of EBM on PND-5	20%	78.2%	58(55.8-60.1)	<0.001
Balance measure				
Fall in EBM expression(Counselling)	20%	14.4%	-5.6(-13.4,1.4)	<0.089

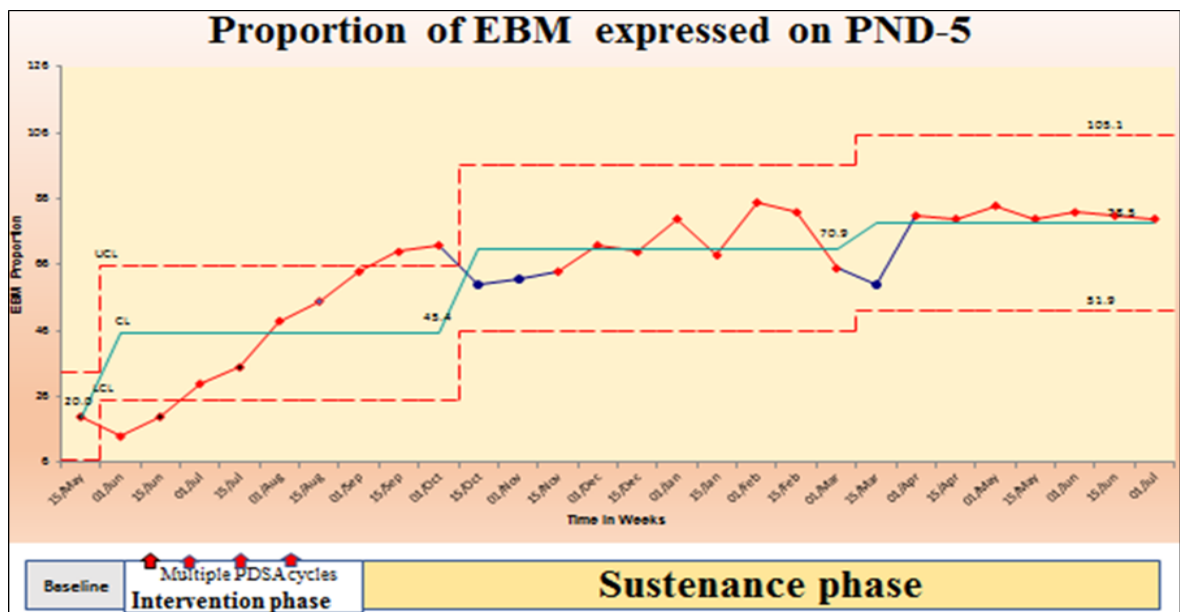


Fig6: Run Chart of the QI project

Table 4

	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Minimum	0	0	20.8	0	0	0	0	0	0	0	0	0	0
Q ¹	11.93	27.82	41.63	44.01	50.9	55	68	76	75.75	79.71	80	77	81.63
Median	14.12	32	50	65	72.05	62	71	82	87	83	86	78	85
Q ³	16.13	41.57	61.51	86.82	78.55	91	95	91.5	97.25	97.96	95.64	96	97.08
Maximum	20.83	66.66	83.33	100	98.03	100	100	100	100	100	100	100	100
Mean	13.83	34.17	52.11	61.62	64.23	65.48	70.47	75.76	77.46	79.21	80	77.76	80.47
Range	20.83	66.66	62.53	100	98.03	100	100	100	100	100	100	100	100
IQR	4.19	13.74	19.88	42.81	27.65	36	27	15.5	21.5	18.25	15.64	19	15.45

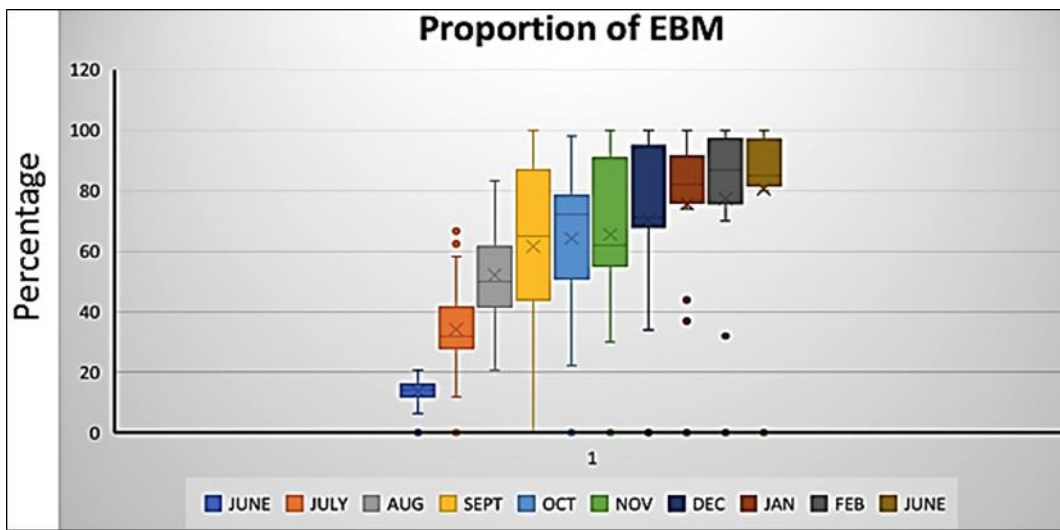


Fig 7: Box and whisker plot of EBM PND-5



Fig 8: Lactation counsellor

Discussion

Human milk has proven health benefits for infants^[4,7,15,16]. Feeding human milk to newborns is an evidence-based strategy to prevent morbidity and mortality. Our quality improvement

initiative resulted in a greater provision of human milk to newborns in SNCU. We showed significant and sustained improvement in the amount of EBM being given to babies on PND5 and throughout the course of NICU. Over a period of time, we have noticed that the culture of our SNCU has changed such that EBM has become the food of choice for the sick newborns. We found that, after the project launch, the number of mothers who expressed milk within 6 hours after birth improved significantly. The literature available says that support and encouragement by healthcare professionals has a major impact on a mother's decision to express breastmilk^[18-20]. The results of our study are comparable with the systematic review and other studies that multidisciplinary staff training has promoted human milk feedings in the NICU^[18, 19, 21-24].

In a study Sisk, *et al.*^[24] found that lactation counseling in mothers resulted in early initiation of milk expression and breast milk feeding with no effect on maternal stress and anxiety. Spatz *et al.* in 2004, put forth 10 steps for promoting and protecting breastfeeding in newborns^[11,25]. The main steps involved are lactation support by assisting the mother to establish and maintain milk supply, providing Kangaroo mother care, non-nutritive sucking at the breast and providing appropriate follow-up care. Fugate, *et al.*^[26] also used ten steps in a QI initiative and showed improvements in the percentages of mothers expressing their milk within 6 hours of delivery, newborns receiving MOM at initiation of feeds. The results of QI project that we conducted are similar to afore mentioned studies.

Although our QI aimed at first 5 days of life, significant challenges remain for mothers to maintain their milk supply throughout the baby's NICU stay. Number of factors influence a mother's ability to produce milk and express own milk, such as baby's health issues, socioeconomic status, cultural background, maternal age and maternal education^[27-30]. Provision of EBM is mediated by counseling that conveys the importance of human milk feeding to prevent devastating diseases. A mother's own milk may be the best immunologic match to the infant's needs and increases the mother-infant bond. Throughout intervention and sustenance phase, all the consultants and staff nurses were kept involved enthusiastically in the study by conducting fortnightly meetings and encouraging them by appreciating their service and giving them awards and prizes as best performer of the month.

Our future steps will have counseling mothers antenatally who have risk factors for preterm delivery about benefits of human milk, possibly even preconception. Appointing and training lactation consultants to each post natal ward (in born and out born). Provision of electric breast pumps to SNCU and post natal wards.

Conclusion

By systematic application of QI methods, EBM usage of mother's own milk in infants can be significantly improved and sustained. We analyzed our data for inability to achieve up to 90% we understood that, ours is a referral hospital where 30%-40% of mothers were from different hospitals and were not counselled. There is still a scope for further improvement by implementing QI care bundles at referring hospitals.

Funding

The study was funded through a grant by Queen Elizabeth Diamond Jubilee Trust (QEDJT) through Public Health Foundation of India (PHFI). The funding body had no role in the design of the study and collection, analysis, and interpretation of data and in writing the manuscript.

Acknowledgment

We gratefully acknowledge all the parents and babies who helped us with the study, and the staff nurses and pediatricians of SNCU and Pediatric Dept., SIMS. Shivamogga. We sincerely thank the neonatology team of AIIMS New Delhi who helped as facilitators to conduct first

workshop on quality Improvement, supervision and feedback during the project. (Dr. Ashok

Deorari, Dr. Anu Thukral, Dr. Ashish Jain, Dr. Pratima Anand and Dr. Srikanth) and Team from St John's medical College, Bangalore (Dr. Prasanth Y, Dr. Shashidhar T, Sister Sophia) who helped as facilitators to conduct second workshop (Preterm baby package) in Shivamogga.

Competing interests: None declared.

References

1. Pletsch D, Ulrich C, Angelini M, Fernandes G, Lee D. Mothers' "Liquid Gold": A Quality Improvement Initiative To Support Early Colostrum Delivery via Oral Immune Therapy (OIT) to Premature and Critically Ill Newborns. *Nurs Leadersh.* 2013 May;26:34-42.
2. Bagga N, Nadipineni R, Mohamed A, Poddutoor P, Chirla DK. A quality initiative to improve exclusive breast milk feeding in preterm neonates. *Int. J Pediatr. Adolesc. Med.* 2018 Dec;5(4):131-4.
3. Schanler RJ, Lau C, Hurst NM, Smith EOB. Randomized trial of donor human milk versus preterm formula as substitutes for mothers' own milk in the feeding of extremely premature infants. *Pediatrics.* 2005;116:400-6.
4. Schanler RJ, Shulman RJ, Lau C. Feeding strategies for premature infants: Beneficial outcomes of feeding fortified human milk versus preterm formula. *Pediatrics.* 1999;103:1150-7.
5. Smith H, Embleton ND. Improving expressed breast milk (EBM) provision in the neonatal unit: A rapid and effective quality improvement (QI) intervention. *J Neonatal Nurs.* 2013 Aug;19(4):149-53.
6. Vohr BR, Poindexter BB, Dusick AM, McKinley LT, Higgins RD, Langer JC *et al.* Persistent beneficial effects of breast milk ingested in the neonatal intensive care unit on outcomes of extremely low birth weight infants at 30 months of age. *Pediatrics.* 2007;120:e953-9.
7. Vohr BR, Poindexter BB, Dusick AM, McKinley LT, Wright LL, Langer JC, *et al.* Beneficial effects of breast milk in the neonatal intensive care unit on the developmental outcome of extremely low birth weight infants at 18 months of age. *Pediatrics.* 2006;118:e115-23.
8. Bliss. Breastfeeding and Expressing for a Sick and Premature Baby, 2008. www.bliss.org.uk.
9. Jones E, Spencer SA. Optimising the provision of human milk for preterm infants. *Arch Dis Child Fetal Neonatal Ed.* 2007;92:F236-F238.
10. Battersby C, Santhakumaran S, Upton M, Radbone L, Birch J, Modi N, *et al.* The impact of a regional care bundle on maternal breast milk use in preterm infants: outcomes of the East of England quality improvement programme. *Arch Dis Child Fetal Neonatal Ed.* 2014;99:F395-401.
11. Spatz DL. Ten Steps for Promoting and Protecting Breastfeeding for Vulnerable Infants: *J Perinat Neonatal Nurs.* 2004Oct;18(4):385-96.
12. Anatolitou F. Human milk benefits and breastfeeding. *J Pediatr Neonatal Individ Med.* 2012Oct;1(1):11-8.
13. Isaacs EB, Fischl BR, Quinn BT, Chong WK, Gadian DG, Lucas A. Impact of Breast Milk on Intelligence Quotient, Brain Size, and White Matter Development. *BRAIN Dev.*, 6.
14. 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 Infants. *J Hum Lact.* 2014 Nov;30(4):398-401.
15. Hylander MA, Strobino DM, Dhanireddy R. Human milk feedings and infection among very low birth weight infants. *Pediatrics.* 1998;102:E38.
 16. Hylander MA, Strobino DM, Pezzullo JC, *et al.* Association of human milk feedings with a reduction in retinopathy of prematurity among very low birthweight infants. *J Perinatol.* 2001;21:356-362.
 17. Meinen-Derr J, Poindexter B, Wrage L, *et al.* Role of human milk in extremely low birthweight infants' risk of necrotizing enterocolitis or death. *J Perinatol.* 2009;29:57-62.
 18. Miracle DJ, Meier PP, Bennett PA. Mothers' decisions to change from formula to mothers' milk for very-low-Birth weight infants. *J Obstet Neonatal Nurs.* 2004;33:692-703.
 19. Lu MC, Lange L, Slusser W, *et al.* Provider encouragement of breast-feeding: Evidence from a national survey. *Obstet. Gynecol.* 2001;97:290-295.
 20. Kistin N, Benton D, Rao S, *et al.* M. Breast-feeding rates among black urban low-income women: Effect of prenatal education. *Pediatrics.* 1990;86:741-746.
 21. Friedman S, Flidel-Rimon O, Lavie E, *et al.* The effect of prenatal consultation with a neonatologist on human milk feeding in preterm infants. *Acta Paediatr.* 2004;93:775-778.
 22. Meier PP, Engstrom JL, Patel AL, *et al.* Improving the use of human milk during and after the NICU stay. *Clin Perinatol.* 2010;37:217-245.
 23. Miracle DJ, Fredland V. Provider encouragement of breastfeeding: Efficacy and ethics. *J Midwifery Womens Health.* 2007;52:545-548.
 24. Sisk PM, Lovelady CA, Dillard RG, *et al.* Lactation counseling for mothers of very low birthweight infants: Effect on maternal anxiety and infant intake of human milk. *Pediatrics,* 2006, 117.
 25. Sehgal.P, Kumar.B, Sharma.M, Salameh A.A, Kumar.S, Asha.P (2022), Role of IoT In Transformation Of Marketing: A Quantitative Study Of Opportunities and Challenges, *Webology,* Vol. 18, no.3, pp 1-11
 26. Kumar, S. (2020). *Relevance of Buddhist Philosophy in Modern Management Theory. Psychology and Education,* Vol. 58, no.2, pp. 2104–2111.
 27. Roy, V., Shukla, P. K., Gupta, A. K., Goel, V., Shukla, P. K., & Shukla, S. (2021). Taxonomy on EEG Artifacts Removal Methods, Issues, and Healthcare Applications. *Journal of Organizational and End User Computing (JOEUC),* 33(1), 19-46. <http://doi.org/10.4018/JOEUC.2021010102>
 28. Shukla Prashant Kumar, Sandhu Jasminde Kaur, Ahirwar Anamika, Ghai Deepika, Maheshwary Priti, Shukla Piyush Kumar (2021). Multiobjective Genetic Algorithm and Convolutional Neural Network Based COVID-19 Identification in Chest X-Ray Images, *Mathematical Problems in Engineering,* vol. 2021, Article ID 7804540, 9 pages. <https://doi.org/10.1155/2021/7804540>
 29. Provost LP, Murray SK. Learning from Variation in Data In: Jossey Bass, editors. *The Healthy Care Data Guide Learning from Data for Improvement,* 1st ed. San Francisco: Wiley Inc., 2011, 116.
 30. Fugate K, Hernandez I, Ashmeade T, Miladinovic B, Spatz DL. Improving human milk and breastfeeding practices in the NICU. *J Obstet Gynecol Neonatal Nurs.* 2015;44:426-38.
 31. McInnes RJ, Shepherd AJ, Cheyne H, *et al.* Infant feeding in the neonatal unit. *Matern Child Nutr.* 2010;6:306-317.
 32. Pineda RG. Predictors of breastfeeding and breastmilk feeding among very low birthweight infants. *Breastfeed Med.* 2000;6:15-19.
 33. Lundqvist-Persson C, Lau G, Nordin P, *et al.* Early behavior and development in breast-

- fed premature infants are influence by omega-6 and omega-3 fatty acid status. *Early Hum Dev.* 2010;86:407-412.
34. Ostlund A, Nordstrom M, Dykes F, *et al.* Breastfeeding in preterm and term twins- Maternal factors associated with early cessation: A population-based study. *J Hum Lact.* 2010; 26:235-241.