To study the impact of expressing breastmilk inside the neonatal intensive care unit (NICU) besides a neonate, in comparison to expression outside the NICU: a quasi- experimental study

Tejaswi Reddy[1], Swapna Lingaldinna[2], *Kotha Rakesh[2], Sadiqua Anjum[3], Alimelu Madireddy[4]

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Abstract

Introduction: The proximity of the mother to the newborn following delivery is essential for the early initiation and establishment of exclusive breast feeding. It leads to the conditioning of the oxytocin reflex, allowing the expression of breast milk. However, preterm and sick babies are nursed in an environment away from their mothers in the NICU, thus leading to delayed initiation and inadequate expression of breast milk.

Objective: To estimate the volume of breastmilk expressed close to the baby in comparison to breastmilk expressed away from her baby.

Method: This quasi-experimental study was conducted in a tertiary healthcare hospital in Hyderabad over a duration of one month. Postpartum mothers of newborns delivered in this hospital and admitted to the NICU were included in the study. The enrolled mothers were shown a video and poster on manual expression of breast milk and were assisted by lactational counselors for support. The enrolled mothers initially expressed milk in the mother's room, and an average of three expressions was taken. The next day, the mother was asked to go near the baby in the NICU and express milk in front of her baby, and the average of three feeds was determined in a similar fashion. Data analysis was done using a paired t-test.

Results: A total of 30 postnatal mothers were enrolled in the study. The mean volume of breast milk expressed by the mother in the mother's room was 9.9 ± 2.5ml and the mean volume of breast milk obtained when expressed close to her baby in the newborn care unit was 11.2 ± 2.7ml. The volume of milk expressed near the baby was significantly higher when compared to milk expressed away from the newborn ($p<0.001$).

Conclusions: This study showed that mothers who expressed their feed near their admitted newborns in the newborn care unit had a significant increase in the volume of expressed breastmilk in comparison to expressing the milk away from their babies.

[1]*Senior Registrar,* [2]*Associate Professor,* [3]*Assistant Professor,* [4]*Professor, Department of Neonatology, Niloufer Hospital, Hyderabad, India*
**Correspondence:* dr.rakeshkotha@gmail.com
https://orcid.org/0000-0002-3319-5217

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Introduction

World Health Organisation (WHO) recommends early initiation of breastfeeding in the first hour of life[1]. Early initiation is associated with decreased neonatal morbidity and mortality[2]. Forty-six lower middle-income countries included early initiation of breastfeeding within an hour of birth; however, 54% recorded that less than half of all newborns were put to breast within an hour; no country had more than 80% of babies associated with early breastfeeding[3]. The close proximity of the mother to her newborn immediately after birth helps in the successful initiation and establishment of lactation; lactation is influenced by a complex hormonal milieu, including reproductive and metabolic hormones[4]. In addition, breastfeeding involves psychological and emotional responses in the mother[5].

Oxytocin, which is central to milk release, is described as a hormone of calm and connection[6]. The oxytocin reflex, also called the let-down reflex or milk ejection reflex, is produced more quickly than the prolactin reflex. It starts working when a mother expects a feed and also when the baby is suckling. The reflex becomes conditioned to the mother's sensations and feelings, such as seeing, touching, smelling, hearing her baby cry, or thinking lovingly about the baby. The oxytocin reflex explains why the baby and mother should be kept together[7]. In general, it takes around a minute of infant suckling or stimulation with a breast pump before milk ejection occurs[8]. Milk ejection occurs prior to the physical attachment of the infant or a breast pump[9]. The other hormone necessary for secretion of milk by the cells of the alveoli is prolactin. Prolactin levels increase when the baby suckles; secretion peaks about 30 minutes after the beginning of the feed[10].

However, preterm and sick babies are nursed in an environment away from the mother. Usually, the mothers bring their expressed breastmilk to feed their babies admitted to the newborn care unit. Eventually, the majority of mothers complain about inadequate breast milk, leading to lactation failure. A study with mothers of neonates hospitalized in neonatal intensive care units (NICUs) found that around 68% of mothers of hospitalized neonates perceived breastmilk insufficiency[11]. Our study allows the mother to express the milk near her baby, thus leading to the conditioning of the oxytocin reflex. The milk output is compared objectively with the volume expressed away from the baby. Thus, the present study aims to address lactational failure in mothers of hospitalized neonates.

Objective
To estimate the volume of breast milk expressed in the mother's room in comparison to expressing milk close to her baby admitted to a newborn care unit in a tertiary care hospital.

Method
This was a quasi-experimental pilot study conducted in a tertiary care hospital in Hyderabad from March 1st, 2021 to March 31st, 2021. Postpartum mothers of babies delivered in this hospital and admitted to the newborn care unit or neonatal intensive care unit (NICU) were enrolled. Postnatal mothers from day 2 to day 8 were enrolled. Mothers expressing breast milk manually by hand were also included. We excluded sick mothers who were unable to express breastmilk, mothers using galactogogues, breast pumps, or breast massage-like techniques to increase milk output, mothers of newborns who were critically ill and mothers of newborns who were on total parenteral nutrition

In the absence of previous studies to use as a reference, and this being a feasibility study, it was decided arbitrarily to enroll 30 postnatal mothers after obtaining informed written consent. Baseline characteristics of enrolled mothers were recorded in the questionnaire. Mothers were shown the video of manual expression of breast milk and had access to such posters in the hospital. They were even helped by the lactational counselors of the milk bank in demonstrating the technique of manual expression of breast milk.

Mothers were asked to express breast milk every second hour and bring their feed to the newborn care unit where their baby was admitted. The quantity of milk was measured by a trained nurse with a 2 ml syringe to an accuracy of 0.5 ml. The average of three feeds (morning, afternoon, and night feeds) was calculated. The following day, the mother was asked to visit the newborn care unit prior to the expression of breast milk. After ensuring hand hygiene, the mother was allowed to nurse her baby, which included seeing, gently touching, caring for, and thinking lovingly of the baby for about 10 to 15 minutes, and then express breastmilk besides her baby in the newborn care unit. The quantity of milk was measured, and the average was calculated in a similar way.

Ethical issues: We obtained study approval from the ethical committee of Niloufer Hospital, Hyderabad, India (No. ECR/ 300/ Inst/ AP/ 2013/ RR-16). Informed written consent was obtained from the participating mothers.

Statistical analysis: The data obtained were represented using the mean and standard deviation if the distribution was normal and the median and interquartile range if the distribution was skewed. The normality of the test was assessed using the Shapiro-Wilk test. Statistical significance was assessed by using Pearson's Chi square test for categorical variables and a two-tailed paired student t-test for continuous variables.

Results
A total of 30 mothers were enrolled in the study. Their baseline characteristics are shown in Table 1.

Table 1: ***Baseline characteristics of enrolled mothers***

Maternal characteristic	Measurement
Mean maternal age (years): Mean ± SD	23 ± 2.14
Mean gestational age (weeks): Mean ± SD	31.4 ± 1.92
Mean birth weight of baby(kg): Mean ± SD	1.38 ± 0.39
Mean postnatal day of milk expression (days): Mean ± SD	3.6 ± 0.93
Primigravida mothers: n (%)	13 (40.0)
Caesarean section delivery: n (%)	17 (56.6)
Illiterate: n (%)	05 (16.6)
Primary education: n (%)	14 (46.6)
*Upper lower socioeconomic class: n (%)	12 (40.0)
Antenatal counselling on exclusive breastfeeding: n (%)	10 (33.3)

**Modified Kuppuswamy's classification*

The data on milk output followed a normal distribution using the Shapiro-Wilk normality test. Therefore, the data was represented using the mean and standard deviation (Figures 1 and 2).

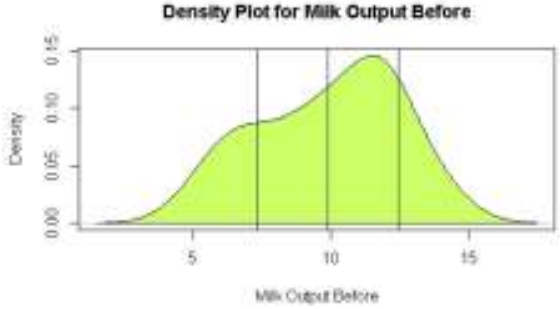

Figure 1: Normal distribution curve for milk output when expressed away from the newborn

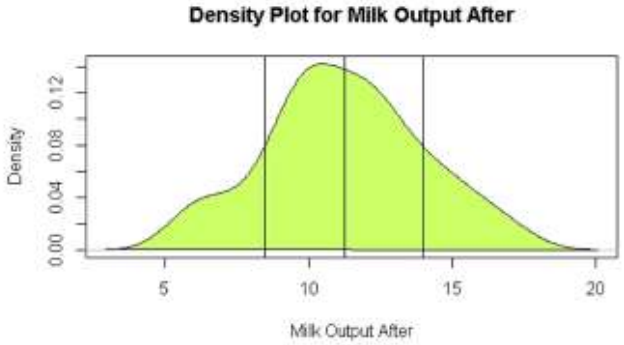

Figure 2: Normal distribution curve for milk output when expressed near the newborn

Mean volume of breast milk expressed by mother away from her baby in mother's room was 9.9 ± 2.5ml. Mean volume of breast milk obtained when expressed close to her baby in the newborn care unit was 11.2 ± 2.7ml. The difference in the volume of expressed breastmilk was statistically significant (p <0.001) (Table 2).

Table 2: ***Statistical analysis comparing the two means using paired t test***

Mean volume of milk expressed away from the baby	Mean volume of milk expressed near the baby	Mean difference	p-value	95% CI
9.9 ± 2.5ml	11.2 ± 2.7ml	-1.33	0.0008	-2.06 to -0.60

Discussion

This study aims to address lactational failure in mothers of newborns admitted to a newborn care unit, or NICU, by conditioning the oxytocin reflex. It is a usual practice in many of the newborn care units, where the mother expresses breastmilk and then brings it to feed her baby in the NICU. This study has observed whether there is any difference in milk output when the mother expresses the feed near her baby in the newborn care unit in comparison to expressing milk away from the baby. Mother's sensations like seeing, smelling, gentle touch, and hearing her baby cry would condition the oxytocin reflex, resulting in increased milk output.

The results of this feasibility study show that there is a significant increase in milk output when a mother expresses breastmilk near her baby in the newborn care unit. The mean volume of breast milk expressed by the mother away from her baby in the mother's room was less than the breast milk obtained when expressed close to her baby in the newborn care unit. The difference in the volume of expressed breastmilk was statistically significant (p <0.001) and a 95% confidence interval ranging from -2 to -0.6.

Dowling DA, *et al*[12] reported that the majority of mothers reported concern about their milk supply at some point during hospitalization, and 47.5% reported having breast problems; 55% of the mothers were most comfortable pumping in their own homes because of the increased privacy. A retrospective cohort study by Pineda R[13] showed an association between direct breastfeeding behaviour in the NICU and success in providing breast milk at discharge. Acuña-Muga J, *et al*[14] showed that the average amount of milk was significantly higher when pumping took place close to the infant. When only the amounts of milk expressed near the infant were considered, the amounts obtained during Kangaroo mother care (KMC) [107.7 mL (91.8–123.5) and after KMC [117.7 mL (99.0-136.5)] were significantly higher than those next to the incubator [(96.9 mL (79.9–113.9)], p =0.0030 and p =0.0024, respectively. Coşkun D, *et al*[15] stated that kangaroo care was effective in stimulating milk production and reducing maternal stress levels.

Insufficient milk supply, leading to lactational failure, would hinder the confidence of the mother in feeding breastmilk. Thus, eventually, it leads to the introduction of supplementary formulas. The increase in milk output, which was objectively measured in this study, would be reassuring to the mothers and thus improve compliance. However, strict asepsis should be maintained if mothers are allowed into the newborn care unit, with an emphasis on hand hygiene.

In this study, it is seen that antenatal counselling was received by only 33% of mothers. Postnatal counselling for the mother and the family on the successful establishment of exclusive breastfeeding becomes vital to support the mothers and instill confidence in them, especially when their newborns are cared for in the NICU away from their mother. The study on perceived breastmilk insufficiency in mothers of neonates hospitalized in the NICU concluded that lactational failure following delayed initiation of breastfeeding can be countered by subsequent extensive counseling[11].

The major limitation of our study is the very small sample size. Randomized studies are needed to strengthen the evidence.

Conclusions

This study showed that mothers who expressed their feed near their admitted newborns in the newborn care unit had a significant increase in the volume of expressed breastmilk in comparison to expressing the milk away from their babies.

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