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Effect of Breast Milk Expression during Kangaroo Mother Care on Milk Volume in Mothers with Premature Infants Admitted to Neonatal Intensive Care Unit

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Abstract

Background: Breastfeeding is a two-way interaction between mother and infant, the sustainability of which requires the presence of both parts given their complementary roles.

Aim: The present study was conducted to investigate the effect of breast milk expression during kangaroo mother care (KMC) on milk volume in mothers with premature neonates.

Method: This quasi-experimental study was performed on 40 mothers with premature newborns admitted to a neonatal intensive care unit in a city in the west of Iran in 2019. The participants were randomly assigned into two groups of intervention and control. Breast milk in both groups was expressed 8 times a day from day 4 to day 6 after birth using a 20-cc syringe and recorded in a checklist. In the intervention group, two milking sessions were performed during the KMC. However, in the control group, milking was conducted according to the ward routine. Data were analyzed in SPSS software (version 23) using repeated-measures ANOVA.

Results: The mean ages of the participants in the intervention and control groups were 29.05±4.09 and 27.85±3.58 years, respectively. There was a statistically significant difference between the milk volume of the intervention and control groups on days 4 (P=0.04), 5 (P=0.02), and 6 (P=0.007) and between the total volume of milk during the three days (P=0.01).

Implications for Practice: Breast milk expression during KMC could have a positive effect on increasing milk volume. Therefore, can be recommended as an intervention to support mothers with insufficient milk.

Keywords: Breast milk expression, Kangaroo mother care, Neonatal intensive care unit, Premature infant

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Introduction

Annually, about 20 million neonates with low birth weight are born worldwide, mostly in developing countries (1). Despite all the efforts made to prevent preterm delivery and the birth of premature and low birth weight neonates, the birth rate of such newborns remains high. Every year, the United States witnesses the birth of 250,000 premature and low birth weight neonates, constituting about 8.5% of births (2).

Premature neonates are not able to get enough milk volume for various reasons. This is a major concern for mothers (3) since premature newborns require breastfeeding in their infancy more than ever to achieve optimal growth (4). The best nutrition for premature neonates is breast milk. Breastfeeding has positive psychoemotional effects on mothers. However, the lack of enough milk is a common problem for many mothers with premature newborns (5), while the separation of the premature neonates is inevitable (6). Such conditions lead to the disruption of lactation initiation and force the family and medical team to feed the newborn with formula. Moreover, failure to breastfeed undermines maternal confidence, thereby impairing the evolution of the relationship between mothers and infants. Finally, breastfeeding cessation is the main result of insufficient milk production and the resultant anxiety (7, 8).

It is necessary for the members of the medical team to consider parents as clients, in addition to providing care for the neonates. Furthermore, it is required to provide appropriate interventions to prevent stress due to inadequate lactation (9) since parental support is one of the main tasks of nurses (10). The nurses can help mothers to increase their ability to cope with negative emotions and problems, adapt to their maternal role, and improve their confidence by enhancing breastfeeding (11).

Numerous studies have been conducted to identify the effective interventions facilitating the enhancement of breast milk secretion. Some of the proposed interventions include the stimulation of oxytocin secretion by various methods, such as back massage, foot reflexology (4), relaxation training (5), use of galactopoietic foods (12), and use of music while expressing milk (13).

The majority of the studies have focused on mother-centered interventions. Meanwhile, breastfeeding is a two-way interaction between mother and infant, who have complementary roles in the initiation and sustainability of the feeding process. Therefore, it is emphasized to recommend interventions that can be performed with the participation of mothers and infants. The interaction of infants with mothers can lead to the display of intuitive behaviors in infants. These behaviors increase response to the stimulation of maternal and neonatal bodies and develop nutritional behaviors through the engagement of olfactory and tactile senses in the neonate and visual, olfactory, and tactile senses in mothers (14).

One of the interventions that can be effective for mother-infant interaction is kangaroo mother care (KMC) (15). This type of care provides an opportunity for the neonate to breastfeed and enhances the bonding and attachment between mothers and infants (14). There are a number of studies addressing the impact of KMC on maternal variables, such as mental health, satisfaction (16), and mother-infant attachment (17). Some other studies have examined the impact of KMC on infant-related outcomes (e.g., weight gain and length of hospital stay) (18) and physiological parameters (19). In addition, there is a study examining the volume of milk obtained in relation to the location and circumstances of expression (i.e., at home, next to the neonatal incubator, during KMC, and after KMC) (20).

The insufficient breast milk in mothers with premature newborns and the limitations of studies in the field of KMC and milk expression during a specific time underscore the need for the implementation of research addressing these factors. Regarding this, the present study was conducted to determine the effect of breast milk expression during KMC on the volume of milk in mothers with premature neonates admitted to the neonatal intensive care unit (NICU).

Methods

This quasi-experimental study was carried out on mothers with premature neonates admitted to the NICU of Shahid Sadoughi Medical Training Hospital with 30 beds, located in the center of Iran in 2019. The sample size was calculated using the formula of "comparing two independent society". The sample size was estimated at 25 participants in each group with 95% confidence level, 80% power, 3.5 standard deviations for the expressed milk volume and considering 5-unit difference in the mean milk volume based on a study performed by Acuña-Muga et al. (20), as well as 10% dropout.

Therefore, a total of 50 participants with preterm newborns admitted to NICU were selected and equally randomized into two groups of intervention and control using the random allocation software. No blindness was considered during the implementation of the study.

The inclusion criteria for the mothers were: 1) 24-hour presence in the NICU and use of maternal resting place, 2) desire to breastfeed the neonate, 3) desire to perform KMC, 4) no addiction, 5) lack of physical and mental diseases (e.g., tuberculosis, AIDS, cancer, breast abscess, purulent secretion, blood in breast milk, depression, and postpartum psychosis). On the other hand, the exclusion criteria for others included: 1) hospitalization during the study period, 2) death during the study period, 3) unwillingness to continue participating in the study, and 4) partial or complete breastfeeding of the neonate as instructed by the treating physician.

With regard to the newborns, the inclusion criteria were: 1) physiological stability (i.e., pulse, breathing, and temperature), 2) a minimum weight of 1,250 g, 3) gestational age of 33-28 weeks, 4) maximum hospitalization time of 3 days after birth, 5) permission of physician to perform KMC, 6) no congenital abnormalities (e.g., omphalocele, meningocele, and hydrocephalus), 7) lack of grades 3 and 4 cerebral hemorrhage, 8) no need for central venous catheter in the shoulder, umbilical catheter, or chest tube. On the other hand, the exclusion criteria for the neonates included: 1) connection to mechanical ventilation, 2) instability in clinical conditions, 3) death, and 4) transfer to another hospital.

The participants completed the maternal and neonatal demographic questionnaire and the milking record checklist, including data related to milking time, milk volume, and milking position, for 3 days (i.e., from day 4 to day 6 after birth). Ten faculty members of the School of Nursing and Midwifery, Yazd University of Medical Sciences, Yazd, Iran, explored and approved the content validity of the given questionnaire and checklist.

The mothers in the control group performed the KMC twice a day according to the routine of the ward. Milking was performed every 3 h to collect breast milk at different locations according to the mother's desire (i.e., in the resting place, next to the neonate bed, and in the milking room). In doing so, the mother pumped her milk from both breasts for 20 min with an electric pump 8 times a day, and the volume of milk was recorded in the checklist.

In the intervention group, the mothers were milking according to the routine of the ward, like the control group. However, in this group, two sessions of milking were performed during KMC. To this end, 30 min after KMC, while the KMC was still going on, the ward nurse expressed breast milk by means of an electric pump. In both groups, the mothers measured the volume of their breast milk with a 20-cc syringe and recorded the data in a checklist for 3 days (i.e., from day 4 to day 6 of birth).

It should be noted that five mothers were excluded from each of the control and intervention groups. The reasons for exclusion in the control group included noncooperation (n=3) and neonatal need for mechanical ventilation (n=2). Additionally, those in the intervention group were excluded due to neonatal mortality, maternal hospitalization, neonatal transfer to another hospital, neonatal need for mechanical ventilation, and maternal noncooperation. In line with the research ethics principles, the researcher referred to the NICU and explained the research objectives and procedure to the mothers. Subsequently, both written and oral informed consents were obtained from all participants.

All data were presented as mean, standard deviation, and percentage. The statistical analysis was performed using the descriptive statistics, Kolmogorov-Smirnov (to determine the normality of the variables), Chi-square test, independent t-test, and repeated measures ANOVA. All analyses were carried out in the SPSS software, version 23. A p-value less than 0.05 was considered statistically significant.

Results

According to the results of the Kolmogorov-Smirnov test, the data had a normal distribution; therefore, data analysis was performed using parametric tests. There was no significant difference between the two groups in terms of maternal age, birth order, neonatal age, neonatal gender, and birth weight (Table 1). Comparison of milk volume between the intervention (221.2±69.2) and control

Table 1. Comparison of quantitative variables between the study groups

Variable	Mean±standard deviation		P-value
	Intervention group	Control group	(independent sample t-test)
Maternal age (years)	29.05±4.09	27.85±3.58	0.56
Neonatal age (weeks)	30.85±1.69	31.2±1.90	0.57
Neonatal weight (g)	1725.6±556.45	1556.66±733.66	0.43
	n (%)		
Neonatal gender			
Female	10 (50%)	12 (60%)	
Male	10 (50%)	8 (40%)	0.36
Being indigenous			
Yes	13 (65%)	12 (60%)	
No	7 (35%)	8 (40%)	0.27
Birth order *			
First	11 (55%)	12 (60%)	
Second	5 (25%)	3 (15%)	0.38
Third	4 (20%)	5 (25%)	

Table 2. Comparison of the mean volume of milk between the study groups

Variable	Mean±standard deviation		P-value
	Intervention group	Control group	(independent sample t-test)
Volume of milk on the 4th day	221.2±69.27	178.1±63.51	0.04
Volume of milk on the 5th day	239.3±69.62	181.3±63.83	0.02
Volume of milk on the 6th day	243.6±70.21	182.6±64.28	0.007
Volume of milk over 3 days	704.1±209.70	542.6±191.52	0.01

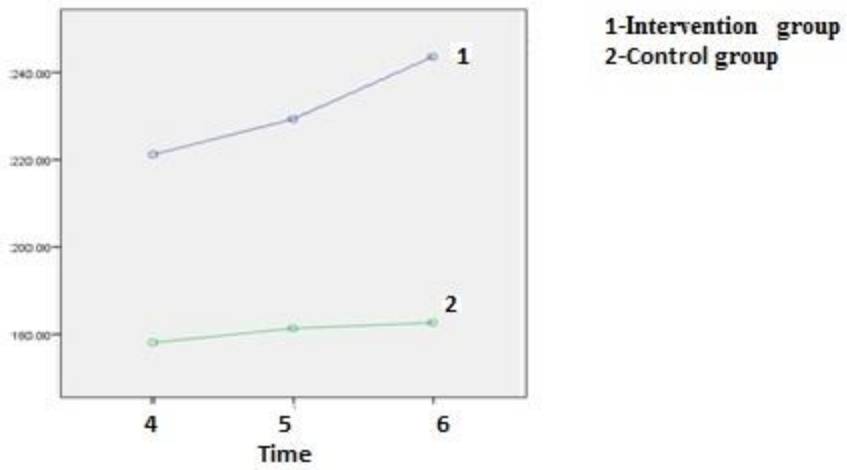

Figure 1. Trend of changes in the volume of milk obtained in the three stages of measurement

(178.1±63.5) groups on the 4th day after birth (i.e., first study day) by the independent sample t-test showed a significant difference (P=0.04). Likewise, there was a significant difference between the two groups in this regard on the 5th day after birth (i.e., the 2nd day of the study; P=0.02).

Furthermore, on the 6th day after birth (i.e., 3rd day of the study), there was a significant difference between the intervention (243.6±70.2) and control (182.6±64.2) groups in terms of the volume of milk (P=0.02). Additionally, the comparison of the total volume of milk between the intervention (704.1±209.7) and control (542.6±191.5) groups showed a significant difference (P=0.01; Table 2).

According to the results of the repeated measures ANOVA, it was revealed that the changes in the milk volume were significant over time, regardless of the group type (P<0.05). Furthermore, the trend of changes in the volume of milk from the 4th to 5th and 6th days (time and group interaction) was significantly different between the two groups (P<0.05; Figure 1).

Discussion

The results of this study showed that breast milk expression during KMC increased the volume of milk. Consistent with this finding, Acuña-Muga et al., examining the rate of milk secretion during and after KMC, showed that the milk volume was higher in mothers during KMC than that in mothers without KMC (i.e., those being next to the neonate or at home during breast milk expression) (20).

In another study, Hurst et al. investigated the effect of keeping the infant in contact with the mother (i.e., skin-to-skin) on the volume of breast milk in mothers with premature infants. They observed a significant increase in the amount of milk production in the mothers having skin contact with their infants for 24 h, compared to those who had no skin contact with their infants (21). The results of the mentioned study are consistent with those of the present study, which showed the positive effect of KMC on the amount of milk volume.

Heon et al. examined the strategies for increasing milk production during the first 6 weeks postpartum. To this end, they provided training, involving KMC as one of the recommended interventions, to mothers. The evaluation of the milk volume over 6 weeks showed no significant difference between the mothers using training support and those in the control group. However, clinically, the mothers who received training support and performed the KMC had a higher milk volume than other mothers (22).

Based on the results of this study and those of the literature, it can be concluded that KMC plays an important role in lactation sustainability as it keeps the infant and mother in contact. Skin contact between infant and mother during KMC leads to the enhancement of oxytocin secretion, which, in turn, increases the volume of breast milk (23). Moreover, the infant and mother skin contact with each other is accompanied by the display of intuitive behaviors, including verbal and tactical interactions. This increases the maternal body's response to skin provocation and positively affects the neonatal nutritional behaviors (24, 25). Olfactory and thermo- receptors, which are among the strongest vagal neurotransmitters, stimulate the release of oxytocin during skin contact (26).

In a qualitative study reviewing the biological experiences of mothers with premature infants, Wilson introduced this intervention as an effective strategy to increase the amount of maternal milk production. In the mentioned study, mothers reported that during touching the infant, the touch was considered to be a stimulation for milk production and had a significant impact on the milk transfer process and milk excretion. Some mothers even reported that KMC increased the amount of milk in their breasts (27).

The present study entails a number of limitations, including the possibility of forgetting to record the milk volume in the relevant checklist by mothers, which was tried to be prevented through reminder texting. Another limitation is the loss of samples in both groups, which reduced the sample size. In addition, the use of the availability sampling technique prevents the generalization of the results. Therefore, it is recommended to perform further studies using random sampling and a larger sample size.

Implications for Practice

As the results of this study indicated, breast milk expression during KMC had a positive effect on increasing the volume of milk. This outcome is of value in planning support for mothers at hospitals. Therefore, nurses can recommend this intervention for mothers.

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Conflicts of Interest

None declared.

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