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BREAST PUMP VERSUS MANUAL METHOD FOR EXPRESSION OF BREAST MILK IN FEMALES DELIVERING PRETERM BABIES DURING THE FIRST POSTNATAL WEEK

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ABSTRACT

Background: The production of milk in mothers giving birth to preterm infants is a complex process that is affected by the type of milk expression and timing of milk expression. The literature data existing is scarce concerning the use of breast pumps for long-term supply of milk.

Aim: The present clinical study was aimed to comparatively assess the volume of breast milk in breast pump expression and manual method in mothers of preterm infants during the first postnatal week.

Methods: The study assessed females who have completed 34 weeks of their gestation where breast pump expression of milk was assessed using the pigeon manual breast pump and manual expression of breast milk using the Marmet technique. The milk expression initiated within the one hour following delivery was assessed. In all females, the volume of expressed breast milk (EBM) was assessed at different times of the first week along with the cumulative volume of milk.

Results: The study assessed 85 females where breast pump milk expression was done in 42 females and manual breast milk expression in 43 females. Among 64 females following inclusion, 32 females were allotted to each group. The median volume of expressed breast milk was similar on day 2 and day 7 of manual and pump milk with p=0.12 and 0.64 respectively. The cumulative milk had a median volume having a non-significant difference from pumped milk with p=0.53. In both manual and pumped milk, comparable females gave breast milk only to their neonates in the first postnatal week with p=0.16.

Conclusion: The present study concludes that the volume of expressed breast milk is comparable in females of premature neonates using either a manual method or breast pump for milk expression during the first postnatal week.

Keywords: Breast milk, breast pump, Neonates, nutrition, volume

INTRODUCTION

The milk of the mother giving birth to the neonates has always been kept on priority for the neonates and is considered a rich source of nutrition in the neonate's bone prematurely. However, the premature birth of neonates is usually associated with immaturity in the mammary glands of the mothers along with the presence of maternal stress, lack of physiological breast suckling,

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delayed phase II lactogenesis onset, and low production of breast milk in the initial postpartum days.[1]

The availability of breast milk to infants is largely governed by the expression of breast milk within one hour of delivery and childbirth which is a vital factor deciding the availability of breast milk during the later stages.[2] Manual expression of breast milk is a traditional practice performed globally including in India for ensuring the availability of milk for the infant, whereas, the use of a breast pump is another technique that is used much less commonly and is kept reserved for cases where lactation is failed and breast pump is used as a rescue measure. The use of breast pumps is mainly advocated owing to better comfort of the mother during milk expression.[3]

The production of milk in mothers that gave birth to premature infants is considered a physiologic but complex phenomenon that is affected by various factors. The two most common factors affecting milk production in females that gave birth to premature neonates are type of milk expression and timing of milk expression. The existing literature data is scarce concerning the efficacy and use of the breast pump in females during the initial postpartum time for the long-term milk supply and production of colostrum.[4,5]

Considering the vital role of the mother's milk in providing adequate nutrition to the infant, the present study had the objective to assess the efficacy of using a breast pump exclusively for the expression of the mother's milk in females having preterm infants and comparing it to the manual expression of availability of expressed breast milk volume during its initiation in one hour of delivery.

MATERIALS AND METHODS

The present randomized controlled clinical study was aimed to comparatively assess the volume of breast milk in breast pump expression and manual method in mothers of preterm infants during the first postnatal week. The study was done at Department of Obstetrics and Gynecology, Sri Siddhartha Institute of Medical Sciences, Thippagondanahalli, Karnataka from March 2023-July 2023. The study population was from the Department of Obstetrics and Gynecology of the Institute.

The inclusion criteria for the study were females who gave birth to a live infant, had a gestational age of a minimum of 34 weeks, and were willing to participate in the study. The exclusion criteria were females with contraindications to breastfeeding, who had a recent history of breast surgery and did not give consent for study participation. Written and verbal consent was taken from all the study females before study participation.

The study subjects were divided into two groups by computer randomization. In the females divided into a manual expression of breastmilk group, the Marmet technique was explained to all the subjects, whereas, in the breast pump group, a manual pigeon breast pump was given to all the subjects immediately following delivery which was autoclaved every use and was given for 7 days postpartum. In both groups, assistance was provided by nursing staff in the delivery room for expression of breast milk within one hour of delivery not considering the feeding state of the

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infant. The technique of milk expression was explained via either hands-on support, verbal instruction, or educational videos in the initial 3-4 sessions. A minimum of 6 cycles for at least 15 minutes each was practiced with pumping done every 2-3 hours and not taking a break of more than 5 hours was followed in females of both the groups. Strict compliance was followed by the nursing staff for all the sessions to ensure adequate following of the protocol during their working shifts.

Either assisted or self-massage of the breast was done for every session of milk expression. The milk was kept in the sterilized container and volume was assessed using a syringe. The volume was written in a document kept by the females that noted the volume taken at each session, the expression method, and the time of milk expression. The logs were maintained for the 7 days postnatal. Females, that did not express milk for a minimum of 3 sessions every 12 hours were sent to counseling by a lactation nurse educator.

When the mother's milk was not available following the needs of the infants, the nutrition purpose was fulfilled by pasteurized donor breast milk. Irrespective of the milk output and expression, no galactagogues were given to any female during the study period. The subjects were instructed to only use the explained method for milk expression for 7 days after delivery. In preterm neonates, Kangaroo mother care was given to those not needing intensive care management and those who were stable hemodynamically. The expressed breast milk volume on various postnatal days and cumulative expressed breast milk volume in the first postnatal week were compared for the manual and breast pump groups.

The demographic and study characteristics assessed in females of both groups were age, socioeconomic status, employment status, education, parity, and mode of conception. Maternal health status was assessed with parameters including antenatal steroid use, premature membrane rupture, thyroid disorders, hypertension, and gestational diabetes. The data also assessed were the frequency of milk expression, initial milk expression timing, and mode of delivery. In the neonates, data collected were the type of feeding, gestational age, gender, and birthweight along with enteral nutrition including feed advancement and trophic feeding.

The data gathered were analyzed statistically using SPSS software version 21.0 (IBM Corp., NY, USA) with the Chi-square test and Mann-Whitney U test. The p-value of <0.05 was considered a level of statistical significance.

RESULTS

The present randomized controlled clinical study was aimed to comparatively assess the volume of breast milk in breast pump expression and manual method in mothers of preterm infants during the first postnatal week. The study included females of gestation age <34 weeks. In the study duration, a total of 85 females delivered the neonate that had a gestational age of <34 weeks. Following the study randomization and the anti-natal counseling, a final sample allocated 41 females to the breast pump group and 44 females to the group where breast milk expression was done using the manual method. The complete data of milk expression in the first-week post-

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natal was available for 35 mothers in the manual and 33 mothers in the breast pump group. The final study analysis comprised 32 females each in the manual and breast pump group.

In the present study, a total of 73 neonates were born from 64 mothers where twin pregnancy was noted in 20 females. The mean birthweight of the neonates was 1383.4±314.2 grams and the mean gestational age was 31.1±2.3 weeks. Among 64 females and 73 neonates, vaginal delivery was done in 53.12% (n=34) of females that gave birth to 57.53% (n=42) neonates. The majority of the neonates in the study were born at the gestational age of 32-34 weeks with 50.68% (n=37) neonates followed by 34.24% (n=25) neonates in 28-32 gestational weeks.

For the demographic and maternity data of study females in two groups, the mean gestational age was 31.2±2.55 and 31.7±2.43 years respectively in the manual and breast pump group. The occupation of females was a housewife in 81.8% (n=36) and 82.92% (n=34) females from the manual and breast pump group and 18.1% (n=8) and 17.07% (n=7) females were working from manual and breast pump group respectively. The majority of the females were from upper middle socioeconomic status with 31.8% (n=14) and 41.4% (n=17) females respectively from manual and breast pump groups respectively. The majority of the subjects were educated with primary schooling with 50% (n=22) and 46.3% (n=19) females respectively from manual and breast pump groups. The mode of delivery was cesarean most commonly seen in 65.9% (n=29) and 60.97% (n=25) females respectively from the manual and breast pump groups as shown in Table 1.

In the majority of the study females, in the manual group, singleton pregnancy was seen in 77.2% (n=34) females, and 45.4% of females were primigravida. In the breast pump group, singleton pregnancy was seen in 31.70% (n=13) females and 60.97% (n=25) females were primigravida. Kangaroo mother care was needed in 15.9% (n=7) and 19.51% (n=8) females from manual and breast pump groups respectively. Antenatal steroids were needed in 61.3% (n=27) and 34.14% (n=14) study subjects respectively. PPROM (preterm premature rupture of membranes was seen in 29.5% (n=13) and 29.26% (n=12) females from manual and breast pump groups respectively. The cardio-pulmonary disease was seen in 2.27% (n=1) and 4.87% (n=2) subjects from the manual and breast pump milk expression group. Pregnancy-induced hypertension, thyroid disease, and gestational diabetes were seen in 29.54% (n=13), 43.18% (n=19), and 20.45% (n=9) subjects from the manual group and 34.14% (n=14), 14.63% (n=6), and 19.51% (n=8) females from manual and breast pump milk expression group respectively as depicted in Table 1.

Concerning the evaluation of expressed breast milk volume (mL) in two groups of study subjects in the first postnatal week, the median (interquartile ratio) was 4 (1, 8), 12 (5, 26), 45 (37, 67), 92 (63, 117), 142 (96, 184), 212 (152, 273), and 282 (222, 358) respectively on day 1, 2, 3, 4, 5, 6, and 7 post-natal in breast pump milk expression group was respectively 2 (0.5, 6), 10 (4, 20), 42 (32,50), 83 (63, 112), 122 (92, 184), 188 (152, 254), and 282 (222, 354) in manual milk expression group. The difference was statistically non-significant on days 1, 2, 3, 4, 5, 6, and 7 with p=0.07, 0.12, 0.12, 0.24, 0.51, 0.72, and 0.64 respectively. The cumulative milk volume was

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846 (573, 1007) and 735 (595, 997) in the breast pump and manual milk expression group which was statistically non-significant with p=0.53 (Table 2).

DISCUSSION

The present study included females of gestation age <34 weeks. In the study duration, a total of 85 females delivered the neonate that had a gestational age of <34 weeks. Following the study randomization and the anti-natal counseling, a final sample allocated 41 females to the breast pump group and 44 females to the group where breast milk expression was done using the manual method. The complete data of milk expression in the first-week post-natal was available for 35 mothers in the manual and 33 mothers in the breast pump group. The final study analysis comprised 32 females each in the manual and breast pump group. These data were similar to the studies of Slusher T et al[6] in 2007 and Panda SK et al[7] in 2021 where authors assessed similar cohorts in their studies as assessed in the present study.

It was seen that a total of 73 neonates were born from 64 mothers where twin pregnancy was noted in 20 females. The mean birthweight of the neonates was 1383.4±314.2 grams and the mean gestational age was 31.1±2.3 weeks. Among 64 females and 73 neonates, vaginal delivery was done in 53.12% (n=34) of females that gave birth to 57.53% (n=42) neonates. The majority of the neonates in the study were born at the gestational age of 32-34 weeks with 50.68% (n=37) neonates followed by 34.24% (n=25) neonates in 28-32 gestational weeks. These results correlated with the findings of Sethi A et al[8] in 2017 and Becker GE et al[9] in 2016 where maternity data of females assessed for breast milk expression was similar to the present study.

The study results showed that concerning the demographic and maternity data of study females in two groups, the mean gestational age was 31.2±2.55 and 31.7±2.43 years respectively in the manual and breast pump groups. The occupation of females was a housewife in 81.8% (n=36) and 82.92% (n=34) females from the manual and breast pump group and 18.1% (n=8) and 17.07% (n=7) females were working from manual and breast pump group respectively. The majority of the females were from upper middle socioeconomic status with 31.8% (n=14) and 41.4% (n=17) females respectively from manual and breast pump groups respectively. The majority of the subjects were educated with primary schooling with 50% (n=22) and 46.3% (n=19) females respectively from manual and breast pump groups. The mode of delivery was caesarean most commonly seen in 65.9% (n=29) and 60.97% (n=25) females respectively from the manual and breast pump group. These results were consistent with the studies of Clemons JS et al[10] in 2010 and Pang WW et al[11] in 2007 where authors assessed subjects with demographic and maternity data similar to the present study in their respective studies.

It was also seen that in the majority of the study females, in the manual group, singleton pregnancy was seen in 77.2% (n=34) females, and 45.4% of females were primigravida. In the breast pump group, singleton pregnancy was seen in 31.70% (n=13) females and 60.97% (n=25) females were primigravida. Kangaroo mother care was needed in 15.9% (n=7) and 19.51% (n=8) females from manual and breast pump groups respectively. Antenatal steroids were needed in 61.3% (n=27) and 34.14% (n=14) study subjects respectively. PPROM (preterm premature rupture of membranes was seen in 29.5% (n=13) and 29.26% (n=12) females from manual and

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breast pump groups respectively. The cardio-pulmonary disease was seen in 2.27% (n=1) and 4.87% (n=2) subjects from the manual and breast pump milk expression group. Pregnancy-induced hypertension, thyroid disease, and gestational diabetes were seen in 29.54% (n=13), 43.18% (n=19), and 20.45% (n=9) subjects from the manual group and 34.14% (n=14), 14.63% (n=6), and 19.51% (n=8) females from manual and breast pump milk expression group respectively. These results were in agreement with the findings of Henderson JJ et al[12] in 2008 and Suman RP et al[13] in 2008 where antenatal steroids intake and kangaroo care needed were similar to the present study as seen in the present study.

On evaluation of expressed breast milk volume (mL) in two groups of study subjects in the first postnatal week, the median (interquartile ratio) was 4 (1, 8), 12 (5, 26), 45 (37, 67), 92 (63, 117), 142 (96, 184), 212 (152, 273), and 282 (222, 358) respectively on day 1, 2, 3, 4, 5, 6, and 7 post-natal in breast pump milk expression group was respectively 2 (0.5, 6), 10 (4, 20), 42 (32,50), 83 (63, 112), 122 (92, 184), 188 (152, 254), and 282 (222, 354) in manual milk expression group. The difference was statistically non-significant on days 1, 2, 3, 4, 5, 6, and 7 with p=0.07, 0.12, 0.12, 0.24, 0.51, 0.72, and 0.64 respectively. The cumulative milk volume was 846 (573, 1007) and 735 (595, 997) in the breast pump and manual milk expression group which was statistically non-significant with p=0.53. These findings were in line with the studies of Paul VK et al[14] in 1996 and Ohyama M et al[15] in 2010 where authors reported similar differences in breast milk production with the manual method and breast pump method as seen in the present study with the non-significant result.

CONCLUSION

Within its limitations, the present study concludes that the volume of expressed breast milk is comparable in females of premature neonates using either a manual method or a breast pump for milk expression during the first postnatal week. However, the study assessed subjects in smaller geographical areas with limited sample size and a short monitoring period warranting further longitudinal studies comprising of a larger sample size.

REFERENCES

1. Hill PD, Aldag JC, Chatterton RT, Zinaman M. Comparison of milk output between mothers of preterm and term infants: the first 6 weeks after birth. J Hum Lact. 2005;21:22-30.
2. Parker LA, Sullivan S, Krueger C, Mueller M. Association of the timing of initiation of breastmilk expression on milk volume and timing of lactogenesis stage II among mothers of very low-birth-weight infants. Breastfeed Med. 2015;10:84-91.
3. Furman L, Minich N, Hack M. Correlates of lactation in mothers of very low birth weight infants. Pediatrics. 2002; 109:57.
4. Cregan MD, De Mello TR, Kershaw D. Initiation of lactation in women after preterm delivery. Acta Obstet Gynecol Scand. 2002;81:870-7.
5. Cleminson JS, Zalewski SP , Embleton ND. Nutrition in the preterm infant: what's new? Curr Opin Clin Nutr Metab Care. 2016;19:220-5.

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 08, 2023

6. Slusher T, Slusher IL, Biomdo M, et al. Electric breast pump use increases maternal milk volume in African nurseries. J Trop Pediatr. 2007;53:125-30.
7. Panda SK, Sahoo K, Jena PK, et al. Availability of breast milk for preterm neonates by gestational age during NICU stay. J Child Sci. 2021;11:227-32.
8. Sethi A, Joshi M, Thukral A, et al. A quality improvement initiative: improving exclusive breastfeeding rates of preterm neonates. Indian J Pediatr. 2017;84:322-25.
9. Becker GE, Smith HA, Cooney F. Methods of milk expression for lactating women. Cochrane Database Syst Rev. 2016;9:CD006170.
10. Clemons SN, Amir LH. Breastfeeding women's experience of expressing: a descriptive study. J Hum Lact. 2010;26:258-65.
11. Pang WW, Hartmann PE. Initiation of human lactation: Secretory differentiation and secretory activation. J Mammary Gland Biol Neoplasia. 2007;12:211-21.
12. Henderson JJ, Hartmann PE, Newnham JP, Simmer K. Effect of preterm birth and antenatal corticosteroid treatment on lactogenesis II in women. Pediatrics. 2008;121:92–100.
13. Suman RP, Udani R, Nanavati R. Kangaroo mother care for low-birth-weight infants: a randomized controlled trial. Indian Pediatr. 2008;45:17-23.
14. Paul VK, Singh M, Deorari AK, et al. Manual and pump methods of expression of breast milk. Indian J Pediatr. 1996;63:87-92.
15. Ohyama M, Watabe H, Hayasaka Y. Manual expression and electric breast pumping in the first 48 h after delivery. Pediatr Int. 2010;52:39-43.

TABLES

Characteristics	**Subgroup**	**Manual (n=44)**		**Breast pump (n=41)**	
		N	**%**	**N**	**%**
Gestational age (weeks)		31.2±2.55		31.7±2.43	
Occupation					
	Housewife	36	81.8	34	82.92
	Working	8	18.1	7	17.07
Socioeconomic status	Lower	1	2.27	2	4.87
	Upper lower	8	18.1	7	17.07
	Lower middle	16	36.3	12	29.2
	Upper middle	14	31.8	17	41.4
	Upper	5	11.3	3	7.31
Education	Primary	22	50	19	46.3
	Intermediate	9	20.4	7	17.07’
	Graduate	7	15.9	10	24.3
	Postgraduate	5	11.3	5	12.19
Mode of delivery	Cesarean	29	65.9	25	60.97
	Vaginal	15	34.09	16	39.02
Pregnancy	Primigravida	20	45.4	25	60.97
	Multiple	10	22.7	28	68.29
	Singleton	34	77.2	13	31.70

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	Kangaroo mother care	7	15.9	8	19.51
	Antenatal steroids	27	61.3	26	63.41
	PPROM	13	29.5	12	29.26
	Cardio-pulmonary disease	1	2.27	2	4.87
	PIH	13	29.54	14	34.14
	Thyroid disease	19	43.18	6	14.63
	Gestational diabetes	9	20.45	8	19.51

Table 1: Demographic and maternity data of females in the two study groups

Postnatal days	**Breast pump milk expression (n=32) Median (IQR)**	**Manual milk expression (n=32) Median (IQR)**	**p-value**
1	4 (1, 8)	2 (0.5, 6)	0.07
2	12 (5, 26)	10 (4, 20)	0.12
3	45 (37, 67)	42 (32,50)	0.12
4	92 (63, 117)	83 (63, 112)	0.24
5	142 (96, 184)	122 (92, 184)	0.51
6	212 (152, 273)	188 (152, 254)	0.72
7	282 (222, 358)	282 (222, 354)	0.64
Cumulative milk volume	846 (573, 1007)	735 (595, 997)	0.53

Table 2: Expressed breast milk volume (mL) in two groups of study subjects in the first postnatal week