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The Effectiveness of Kangaroo Mother Care (KMC) on attachment of mothers with premature infants

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ABSTRACT

Objective: Attachment is a socio-emotional relationship between the mother and infant that increases the probability of a preterm infant's survival. This study aimed to evaluate the effectiveness of Kangaroo Mother Care (KMC) on maternal attachments of mothers with premature infants.

Study design: This quasi-experimental study was performed on 100 mothers of premature infants who were admitted to neonatal intensive care units. A questionnaire comprising demographic information and the Maternal Attachment Scale were used as data collection tools. All data analysis was performed using SPSS software version 25. Significant level is considered $P < 0.05$.

Results: After the intervention, the levels of maternal attachment of mothers in the intervention group were significantly higher than in the control group (47.7 ± 2.9 vs. 40.4 ± 5.4 , $P = 0.003$). After the intervention, the infants in the intervention group has a significantly higher number of breastfeeding than the control group (10.6 ± 1.8 vs. 8.2 ± 1.6 , $P = 0.000$). Moreover, the infant of the intervention group had a statistically significant higher weight at discharge time (2164.4 ± 481.1 vs. 1965.2 ± 372 , $P = 0.042$).

Conclusion: The results of the present study showed that Kangaroo Mother Care can be used to improve the maternal attachments in mothers with premature infants. It improves the breastfeeding and weight gain status in infants as well.

1. Introduction

A preterm infant is related to an infant born before 37 weeks of gestation and they may need special care in the neonatal intensive care units (NICUs) [1]. The separation of infants from their mothers and the NICU environment restricts the visual and tactile interactions between mothers and babies causing anxiety in mothers [2]. The hospitalization of a premature baby increases the emotional vulnerability of mothers and therefore increases the stress and anxiety related to the infant [3]. It is demonstrated that mothers have greater stress than fathers and other family members [4]. Long-term hospitalization of preterm infants results in limited contact with mothers. These matters may lead to developmental delay and prevent form the usual attachment between mothers and infants [5,6].

The maternal attachment is shaped throughout the first days

postpartum and is the base of the mother-infant relationship. The mother's perception of the infant is positively affected while looking, touching, and interacting with her infant [7]. Maternal attachment is an exceptional relationship that allows a baby to develop healthily and affects the physical and psychological development of the child [8].

Recently more attention is paid to kangaroo Mother care (KMC), a significant practice to improve maternal attachment levels and preserve long-term attachment. KMC is a method that begins primary-maternal attachment and assists in adaptation between the mother and the infant [9–11]. It was shown that KMC had positive impacts on preterm infants to alleviate physiological symptoms, improve mother-infant interaction, and decrease the stress level of mothers [9].

Most of the research has been done on the impacts of KMC was on different aspects of infant health and a few numbers were on KMC effects on the mother. In postpartum care, mostly physical care is focused and

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not enough attention has been paid to mental health. Considering the effects of maternal attachment on preterm infants' development and also considering that kangaroo care is an easy, cheap, and safe method for infants and mothers, this study aims to investigate the effectiveness of Kangaroo Mother Care on maternal attachments in mothers with premature infants.

2. Methods

In this quasi-experimental study, 100 mothers of premature infants who were admitted to the neonatal intensive care units of Imam and Bu Ali Sina hospitals in Sari, from March 2019 to February 2020, have participated. The study was approved by the ethics committee of Mazandaran University of Medical Sciences (IR.MAZUMS.REC.1398.7073). Written informed consent was obtained from mothers after explaining to them the process of the study.

Stratified random sampling was used to determine the sample size. Using the following formula, the sample size for each group was obtained 45 people and taking into account the possible loss of each group, 50 people were calculated, which was 100 people in total. The power was 80%, the first type error was 0.05, the sample volume ratio in the two groups (λ) was 1, the correlation coefficient between the repetitions (ρ) was 0.7, and the standardized effect size value (Δ_{plan}) was assumed to be 0.7.

$$n_{paired} = R \times \left[\left(1 + \frac{1}{\lambda} \right)^2 \times \frac{(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta})^2}{\Delta_{plan}^2} - \frac{Z_{1-\frac{\alpha}{2}}^2}{4} \right]$$

$$R = [1 - \rho^2]$$

Premature infant with a gestational age of fewer than 37 weeks, being admitted to intensive care unit, being single, having no birth defects, having no history of using mechanical ventilation and surgery, lack of mother's employment in health care centers, having no history of mental disorder and having a minimum literacy of mothers were defined as inclusion criteria. The reluctance of mothers to participate in the study was considered exclusion criteria.

2.1. Intervention

Data were collected using a questionnaire containing demographic information such as maternal age, type of delivery, education level, infant sex, fetal age, infant weight, length of hospital stay.

3. Kangaroo Mother Care (KMC)

Kangaroo mother care is an easy-care technique in which the baby is cared for by skin-to-skin contact with parents. The infant is located on the mother's breast, thus the baby's chest and head were on the mother's breast and skin-to-skin contact was established. The mother may perform this while sitting or leaning on the bed or chair. The mother held the baby's body and neck with her hands by bending her body back for a while. Infants in both groups were assessed for body temperature, weight, frequency of breastfeeding per day, length of hospital stay, and infection by two nurses. In the intervention, group mothers were trained to perform KMC twice per day for a week for 45 min. The mother's performance was checked by the researcher. In the control group, mothers enjoyed the normal care process in the ward. Attachment of mothers was assessed at the beginning and after one month (pre-test-post-test) from the time of hospitalization of the infant based on the mentioned questionnaires.

4. Maternal attachment scale

This scale was first used by Nagata et al. [12] in 2000. A self-report scale was completed by mothers. It has 15 items and has two subgroups of basic attachment and anxiety related to the baby, which are scored on a 4-point Likert scale including always, often, sometimes, and not at all. A higher score on the Maternal Attachment Scale indicates a higher degree of maternal attachment to the infant and a higher score on items related to anxiety on the above scale indicates a lower degree of maternal anxiety than the infant. This is a standard scale and has the following validity. To determine the validity, the content and face validity method has been used. Thus, this questionnaire was provided to a number of faculty members of Mashhad University of Medical Sciences after preparing it, and by using their corrective and suggested opinions, the final tool was confirmed for collecting information. Its reliability was confirmed by the equivalent reliability method with $r = 0.88$; Thus, the scale was first completed by the researcher and then by a person who was scientifically equal to him, separately, and the correlation of the findings was calculated.

In Soltanifar et al.'s study, the validity of this questionnaire was confirmed by the content validity method and its reliability was confirmed by Cronbach's alpha coefficient as 0.89 [13]. The validity and reliability of this scale in the study of Nematbakhsh et al. [14] have been confirmed by using the method of content validity and internal consistency, respectively ($\alpha = 0.7$).

5. Statistical analysis

Data were analyzed using SPSS software version 25. The central indicators such as mean, median, and mode were used for descriptive statistics. Dispersion indices including variance, standard deviation, range of change, and coefficient of variation were used for quantitative variables as well as the frequency and percentage, and prevalence were used for qualitative variables. To study the hypotheses, parametric tests including t-student and chi-square tests and a non-parametric test, Mann-Whitney, were used after examining the normality of the data. The significance level is considered as $P > 0.05$.

6. Results

The results show that mothers with premature infants participating in the study had the age range of 20–39 years with a mean and standard deviation of 28.7 ± 5.4 years. Demographic characteristics of mothers with premature infants are shown in Table 1. no significant difference was observed between intervention and control groups ($P > 0.05$).

A comparison of demographic characteristics of preterm infants based on intervention and control groups shows that the two groups had a statistically significant difference in weight at discharge time ($P = 0.042$), but in other cases, there was no statistically significant difference ($P < 0.05$) (Table 2).

There was no significant difference in the number of breastfeeding times before intervention between the intervention and control groups ($P = 0.866$), however, the intervention group (10.6 ± 1.8) has a significantly higher number of breastfeeding than the control group (8.2 ± 1.6) ($P = 0.000$).

Examination of the Mothers' Attachment Questionnaire showed that before the intervention the mean and standard deviation of attachment score was 40.6 ± 5.4 and after the intervention, it was 43 ± 4.6 .

Evaluation of attachment of mothers before the intervention in the two groups showed that there was no significant difference between the two groups before the intervention ($P = 0.868$), but after the intervention in the intervention group attachment was significantly higher ($P = 0.003$) than the control group (Table 3).

Pairwise comparison of attachment before and after the intervention in the two groups shows that in the intervention group attachment ($P = 0.001$) was significantly different from before the intervention,

Table 1

Demographic characteristics of mothers with premature infants based on intervention and control groups.

	Intervention	Control	P-value
Age, y	29.1 ± 5.3	28.3 ± 5.5	0.486
Gravida (number of pregnancies)	2 ± 0.8	2.1 ± 0.8	0.410
Para (number of births)	1 ± 0.8	1.1 ± 0.8	0.410
Living children	1.1 ± 0.8	1 ± 0.8	0.386
Abortions	0.2 ± 0.4	0.2 ± 0.4	1.000
Education			0.882
Diploma or Less	19 (38)	17 (34)	
Associate degree	10 (20)	10 (20)	
Bachelor degree	19 (38)	22 (44)	
Master or higher	2 (4)	1 (2)	
Occupation			0.182
Housewife	33 (66)	38 (76)	
Employee	9 (18)	3 (6)	
Self-employed	8 (16)	9 (18)	
History of abortion			0.564
Yes	6 (12)	8 (16)	
No	44 (88)	42 (84)	
History of infertility			0.695
Yes	4 (8)	3 (6)	
No	46 (92)	47 (94)	
Previous child death history			0.646
Yes	3 (6)	2 (4)	
No	47 (94)	48 (96)	
Type of delivery			0.829
Cesarean section	35 (70)	34 (68)	
Vaginal delivery	15 (30)	16 (32)	
Infection			0.558
Yes	1 (2)	2 (4)	
No	49 (98)	48 (96)	

Data are presented as mean ± SD and No. (%).

Table 2

Demographic characteristics of preterm infants based on intervention and control groups.

	Intervention	Control	P-value
Age, d	12.6 ± 6.8	11.5 ± 6.3	0.422
Length of hospitalization	17.5 ± 5.5	18.8 ± 6.2	0.270
Birth weight	1464.4 ± 360.1	1485.2 ± 319	0.142
Discharge weight	2164.4 ± 481.1	1965.2 ± 372	0.042
Apgar Score	7.3 ± 1.1	7.4 ± 1.1	0.789
Gestational age (GA)	32.1 ± 2.9	33.2 ± 2.8	0.073

Data are presented as mean ± SD.

Table 3

Attachment of mothers before and after the intervention in two groups.

Attachment	Intervention	Control	P-Value
Before Intervention	40.7 ± 5.5	40.5 ± 5.3	0.868
After Intervention	47.7 ± 2.9	40.4 ± 5.4	0.003

Table 4

Comparison of attachment before and after the intervention in the two groups.

	Paired variables	Mean ± SD	t	P-value
Intervention	Pre-intervention attachment and Post-intervention attachment	6.18 ± 3.00	3.434	0.001
Control	Pre-intervention attachment and Post-intervention attachment	7.26 ± 0.16	0.156	0.877

however, no statistically significant difference was obtained in the control group ($P = 0.877$) (Table 4).

7. Discussion

This study aimed to evaluate the effect of kangaroo mother care on mothers' attachment status in mothers of preterm infants. The study of maternal attachment in the present study showed that this rate was significantly higher in the intervention group who received the Kangaroo Mother care than in the control group with the conventional method.

In a study by Cho et al. on the impact of KMC for Preterm Infants in the NICU on maternal-infant attachment, it was found that the intervention group had the greater scores of maternal-infant attachment [9]. In another study by Karimi et al. KMC developed mother-infant attachment and decreased the mothers' anxiety about the infant. They suggested that KMC is an easy and acceptable method for mothers and may be continued at home [15]. Erduran et al. study also determined that kangaroo care resulted in the higher maternal attachment [16]. Kurt et al. also evaluated the kangaroo care effect on maternal attachment in preterm infants and found that the mean maternal attachment scale score of the KMC group was significantly superior to the control group [17]. In a study by Shahraki Pour et al. on 30 mothers of preterm infants it was demonstrated that increasing the numbers and times of kangaroo care improves the maternal attachment and the clinical condition of infants [18]. Zehra et al. study demonstrated that 65 min of KMC improved maternal-fetal attachment scores [19].

Furman and Kennell believe that skin-to-skin contact causes the mother to feel closer to the baby and increases the mother-infant attachment [20]. Charpak et al. also believe that skin contact makes parents more aware of the baby and as a result, they are more responsive to the baby's needs and take better care of him/her, which is an incentive to improve the attachment of the family and baby [21]. Some have also considered the effect of skin contact on maternal and infant attachment due to its physiological effects. Klaus believes that attachment may be biochemically induced by oxytocin secreted following early mother-infant contact, breast-sucking, and mother-infant cohabitation [22]. The raised concentrations of oxytocin are associated with improved maternal mental health [23]. Another probable mechanism of the skin to skincare is the microbiota of the infants. The early microbial colonization of infants is significant for the development of the immune system and the gastrointestinal tract [24]. Possibly, skin-to-skin care assists the development of the infant intestinal microbiota, consequently influencing infant outcomes. Skin-to-skin care could provide chances to exchange bacteria from the mother's skin to the infant, hence increasing microbiota improvement [25]. Also, communication was found between the gut and the brain and the stress hormone cortisol has a significant role [26]. As it seems, touching the baby in the skin-to-skin contact between mother and baby results in a stronger attachment pattern, which significantly increases the mother's care for the baby. Attachment causes behavioral changes in the mother, which includes knowledge of the baby's needs, which in turn increases the mother's confidence and reduces the mother's anxiety. Therefore, the mother eagerly responds to the opportunities that arise to care for the child.

In the present study, the meantime of breastfeeding in the infants of the KMC group was significantly higher than in the control group. Moreover, the mean weight gains in neonates receiving kangaroo care were higher than in the control group. Mekonnen et al. in a meta-analysis study reported that the time to breastfeeding initiation in preterm infants was about 2.5 days earlier in KMC group infants than in the conventional group [27]. Changrani et al. in a review showed that KMC leads to an increase in successful breastfeeding as well as better maternal-infant interaction [28]. Gathwala et al. also showed that the average breastfeeding rate was higher in infants receiving kangaroo care [29]. In a study by Samra et al. on preterm infants with low birth weight, kangaroo care combined with breastfeeding resulted in a shorter

duration of initial weight loss. They started gaining weight earlier, and the rate of daily weight gain was higher than in the non-kangaroo care control group [30]. Also, in the study of Suman et al., it was proved that kangaroo care is effective on the average daily weight gain of low birth weight infants [31]. Ghazi et al. study demonstrated that the home visit program based on KMC was effective in increasing premature infants' development [32]. In El-Farrash's study, premature neonates' longer Kangaroo care resulted in better breastfeeding, neurobehavioral performance, tissue oxygenation, and thermal control [33]. Therefore, the kangaroo care method can be used as a suitable and simple method to improve the developmental process of preterm infants.

8. Conclusion

This study suggests that providing support programs like Kangaroo mother care to mothers with preterm infants who are admitted to the intensive care unit has significant positive impacts on mothers' mental health and attachment and consequently improves infants' status.

Limitation

The study has limitations such as a small sample size and lack of follow-up on weight gain and development of infants for a longer time.

Declaration of Competing Interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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