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Comparison of the Effect of Kangaroo Care and Infant Massage on the Level of Maternal Anxiety and Neonatal Pain

A. Gholami (MSc)[1], F. Karimi (MSc)[2], Z. Ghasempour (MSc)[3], M. Abolhassani (MSc)[4], N. Rabiee (MSc)*[3]

1.Department of Midwifery, School of Medicine, Alborz University of Medical Sciences, Karaj, I.R.Iran

2.Department of Midwifery, Faculty of Medical Sciences, Birjand Branch, Islamic Azad University, Birjand, I.R.Iran

3.Student Research Committee, School of Nursing and Midwifery, Shahroud University of Medical Sciences, Shahroud, I.R.Iran

4.Student Research Committee, School of Public Health, Iran University of Medical Sciences, Tehran, I.R.Iran

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ABSTRACT

BACKGROUND AND OBJECTIVE: Caring for hospitalized premature infants, who are exposed to a variety of painful caregiving, exposes mothers to many challenges that lead to anxiety. This study was designed to provide solutions to reduce maternal anxiety and neonatal pain.

METHODS: This clinical trial was performed on 90 mothers with preterm infants in three groups of massage intervention, kangaroo care and control group. The interventions of both groups were performed from the time of stabilization of the neonates to the time of discharge from the neonatal intensive care unit. Spielberger overt and covert anxiety questionnaires with a minimum score of 20 and a maximum of 80 were completed before and after the intervention.

FINDINGS: There was a significant difference between the levels of overt and covert anxiety of mothers in the massage group (34.43±11.74 and 32.13±9.25) and the kangaroo care group (36.90±10.06 and 38.07±13.10) compared to the control group (57.47±10.86 and 50.10±9.19) ($p<0.001$). This difference in the levels of neonatal pain was also significant in the massage group (1.87±1.20) and in the kangaroo care group (2.00±1.02) compared with the control group (4.17±1.21) ($p<0.001$).

CONCLUSION: The results of the present study showed that infant massage and kangaroo care by the mother are effective in reducing maternal anxiety as well as reducing pain levels in preterm infants.

KEY WORDS: *Premature Delivery, Preterm Birth, Anxiety, Kangaroo Care, Pain Measurement*.

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***Corresponding Author: N. Rabiee (MSc)**

Address: Student Research Committee, School of Nursing and Midwifery, Shahroud University of Medical Sciences, Shahroud, I.R.Iran

Tel: +98 26 34918906

E-mail: N.rabiee2016@gmail.com

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Introduction

Infants born under 37 weeks of gestation are placed in the group of premature infants. About 8% of all births occur at this gestational age and prematurely (1). In Iran, about 12% premature and low birth weight infants are born daily (2). Premature infants are admitted to the intensive care unit for a longer period of time, which can lead to maternal stress and anxiety (3). These mothers experience twice as much postpartum depression as mothers with term infants (4). Keeping the infant in the intensive care unit in the incubator reduces the possibility of skin-to-skin contact between the mother and the infant and leads to a feeling of inadequacy and anxiety of the mother in caring for her baby. One of the solutions offered for this problem regarding the close contact between mother and infant is kangaroo mother care (KMC) (5).

Various studies have shown the benefits for kangaroo mother care technique, including increased skin-to-skin contact between mother and infant, higher chance of breastfeeding, faster weight gain, and stabilization of the hemodynamic and metabolic status of these infants. This type of care is directly related to maternal self-esteem and leads to an increase in mothers' ability to care for a premature infant (6, 7). Faramarzi et al. showed that kangaroo mother care increases mothers' adaptation to existing problems and helps them cope with the stressful conditions of premature birth (8). The findings of Adeli et al. also show the effect of kangaroo mother care in reducing the severity of overt and covert maternal anxiety (9). Since infants admitted to the Neonatal Intensive Care Unit are usually exposed to multiple invasive and painful care (6), prevention and reduction of pain in infants is of great importance (10).

Pain in infants is associated with the release of adrenaline, which leads to complications such as fear, irritability, sleep disturbance, decreased nutrition, delayed immune function, and impaired emotional relationships (11). In fact, touch is the first sensory system that forms the basis of the initial relationship between child and mother; so, massage therapy is one of the most important ways of emotional exchange between parents and the infant. Massage is one of the oldest and most natural healing techniques in the world that helps to heal, stimulate growth and reduce pain in people, including infants (12). In addition, infant massage reduces stress in parents whose premature infants are admitted to the NICU. Massage also strengthens attachment and positive interactions between mother and infant (13). The findings of Rafati et al. showed that infant massage reduces the severity of pain in infants admitted to the intensive care unit during blood sampling (14). Due to the importance of the issues stated above, this study was conducted to compare the effect of kangaroo care and massage of premature infants on anxiety levels of mothers with premature infants and neonatal pain.

Methods

After approval by the ethics committee of Shahroud University of Medical Sciences with code IRSHMU.REC.1397.122 and registration in the Iranian clinical trial database with code IRCT20180108038265N2, this quasi-experimental double-blind clinical trial was performed on women with premature infants who had referred to Bahar Hospital in Shahroud for delivery. This study had a pretest- posttest design and included two intervention groups and a control group.

Based on the study of Safari et al. and using the formula of comparing the means in the mean scores of anxiety and with a confidence interval of 95% and test power of 80% and considering the probability of 10% of sample loss, the sample size was considered 30 people in each group and a total of 90 people (15). Convenience sampling was done among the referring mothers who had preterm delivery and they were selected according to the inclusion criteria.

People with the ability to speak Persian and being literate, 18 to 35 years of age, no illness or specific physical or mental problems that require third party intervention in the care of the infant, lack of a history of depression and psychiatric diseases, mothers with infants in the ages of 28 and 36 weeks and with persistent vital signs, the absence of specific abnormalities or severe respiratory problems that do not allow out-of-incubation care without ventilator connection, and with the possibility of breastfeeding from the breast or gastrostomy tube were included in the study. Samples were excluded if the infants became ill during the study and the mother was forced to stop caring, the infant died or the mother was unwilling to continue caring.

Random allocation sequence was performed by the software. Each allocation was sealed in a white envelope and numbered. Eligible individuals were registered by the researcher and received a code according to which they entered the study. Basic

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questionnaires for individuals in each group were completed before receiving the intervention. Then, an envelope was opened for each person based on his code and the person was assigned to the specified group. Due to the fact that there was no possibility of blinding for the participants, so blinding was done for the researcher who completed the questionnaires and was unaware of the intervention each person received and also the statistical consultant who provided data related to the type of intervention with the codes one, two and three and therefore, the study was double-blind.

In the first intervention group, which was infant massage, the massage began after the infant was admitted to the NICU and the infant's condition stabilized physically and with the consent of the treating physician and after the mother's physical and mental readiness. After training the mother, the massage was performed by her three times a day, five minutes each time. The first massage was performed one hour after morning feeding, the second massage was performed half hour after mid-day feeding and the third massage was performed 45 minutes after the second massage.

To massage the infant, it was placed in prone position. The mother warmed the palms of her hands and was quiet while doing the work. The first part included massage from the top of the head to the back of the neck. The second and third parts of the massage were from the back of the neck to the shoulders. The fourth part was a massage from the back of the shoulders to the buttocks, but the contact with the vertebrae was avoided. The fifth part included simultaneous massage of both feet from the pelvis to the sole of the foot. The sixth part included movement of both hands simultaneously from the shoulders to the wrists. Massage techniques were routinely performed by mothers until the end of their stay in the intensive care unit.

In the second intervention group (kangaroo care group), the interventions started after the permission of the treating physician and ensuring the stability of the neonatal condition, and continued until discharge from the NICU. Kangaroo care started from 20 to 30 minutes once a day and gradually increased to 1 to 3 hours three times a day. Trained mothers hugged the babies so that the head was between the breasts and the baby's breast on the mother's breast and the head was placed to one side and slightly back to keep the baby's airway open and eye contact was obtained this way. The third group was the control group who received the usual care of the neonatal intensive care unit. Maternal demographic information questionnaire, Spielberger overt and covert anxiety questionnaire and Neonatal Infant Pain Scale was completed by the researcher in all three groups first after random assignment to the groups and before the beginning of the interventions and the second time after the end of the interventions and completed before discharge from the ward. Researcher-made demographic information questionnaire included information related to demographic characteristics such as age, education, place of residence, maternal occupation and information related to pregnancy and childbirth such as history of miscarriage or stillbirth, history of preterm labor and prelabor rupture of membranes, complications such as gestational hypertension, preeclampsia or gestational diabetes in the current pregnancy and the occurrence of fetal distress, placental abruption or placenta previa in the current pregnancy.

The mothers' level of anxiety was assessed using the Spielberger standard overt and covert anxiety questionnaire, which includes 20 questions related to overt anxiety that assess a person's feelings at "this moment and time of response" and 20 questions related to covert anxiety that measures general and usual feelings of a person's, and questions are graded on a Likert scale with “very little, little, much, and very much” options. The total score of the questionnaire is between 20 and 80. In Iran, in the study of Mahram, which was conducted to standardize this questionnaire for the Iranian community, Cronbach's alpha was reported to be 0.91 on the State Anxiety Scale, 0.90 on the Trait Anxiety Scale, and 0.94 on the overall scale (16).

Neonatal Pain Scale: This scale uses a tool of the same name (Neonatal Pain Scale) to measure the intensity of crying, facial expressions, breathing pattern, hand and leg movements, and level of consciousness of the infant. Crying: score zero to two (zero: calm, one: moaning and score two: intense crying), facial expression: score zero and one (score zero: calm, score one: frowning), breathing pattern: score zero and one (score zero: normal and score one: changes in normal breathing pattern), movement of arms and legs: score zero and one (score zero: normal, score one: flexion and extension), level of consciousness: score zero and one (score zero: asleep or awake and score one: shouting). The validity and reliability of this instrument has been confirmed by Suraseranivongse et al., with Cronbach's alpha of 0.98 (17). In Iran, alpha of 0.94 was

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confirmed by Sarhangi et al. (18). After completing the questionnaires, the data collected by SPSS-23 software were analyzed using inferential tests (Chi-square, Paired Samples T-Test and ANOVA) and $p<0.05$ was considered significant.

Results

The frequency distribution of mothers' demographic characteristics such as education level, place of residence, occupation and some midwifery characteristics and their fertility in all three groups was not significantly different and was homogeneous at the beginning of the study (Table 1). The results of ANOVA test showed that the mean age of mothers in the massage group was 27.03±6.55, in the kangaroo care group was 26.60±5.17 and in the control group was 26.60±5.17, which were not significantly different from each other. Regarding gestational age, the mean neonatal weight at the time of hospitalization, and length of hospitalization in the NICU and neonatal ward, there was no significant difference between the three groups. However, there was a significant difference between the intervention groups and control group regarding the mean neonatal weight at discharge (p=0.014) (Table 2).

Table 1. Frequency distribution of mothers according to demographic characteristics in the three groups

Group Variable	Control Number(%)	Massage Number(%)	Kangaroo Mother Care Number(%)	P-value
Education				
High school	8(26.7)	8(26.7)	6(20)	
Diploma	10(33.3)	12(40)	11(36.7)	0.981
Bachelor degree	10(33.3)	8(26.7)	10(33.3)	(Chi-square)
Higher	2(6.7)	2(6.7)	3(10)	
Place of living				
City	18(60)	19(63.3)	18(60)	0.954
Village	12(40)	11(36.7)	12(40)	(Chi-square)
Job				
Housewife	20(66.7)	20(66.7)	20(66.7)	0.850
Employed	8(26.7)	8(26.7)	6(20)	(Chi-square)
Student	2(6.7)	2(6.7)	4(13.3)	
History of abortion				
Yes	6(20)	8(26.7)	8(26.7)	0.786
No	24(80)	22(73.3)	22(73.3)	(Chi-square)
History of pre-term labor				
Yes	7(23.3)	6(20)	5(16.7)	0.812
No	23(76.7)	24(80)	25(83.3)	(Chi-square)
Premature rupture of membranes (PROM)				
Yes	10(33.3)	7(23.3)	9(30)	0.685
No	20(66.7)	23(76.7)	21(70)	(Chi-square)
History of preeclampsia				
Yes	4(13.3)	6(20)	7(23.3)	0.602
No	26(86.7)	24(80)	23(76.7)	(Chi-square)
Fetal distress				
Yes	5(16.7)	5(16.7)	9(30)	0.233
No	25(83.3)	25(83.3)	21(70)	(Chi-square)
Placental abruption				
Yes	2(6.7)	0(0)	2(6.7)	0.351
No	28(93.3)	30(100)	28(93.3)	(Chi-square)
Bleeding				
Yes	4(13.3)	3(10)	2(6.7)	0.690
No	26(86.7)	27(90)	28(93.3)	(Chi-square)
Diabetes				
Yes	5(16.7)	6(20)	8(26.7)	0.627
No	25(83.3)	24(80)	22(73.3)	(Chi-square)
Type of delivery				
Normal delivery	19(63.3)	22(73.3)	20(66.7)	0.700
Cesarean section	11(36.7)	8(26.7)	10(33.3)	(Chi-square)
Stillbirth				
No	2(6.7)	3(10)	2(6.7)	
1	5(16.7)	6(20)	5(16.7)	
2	7(23.3)	11(36.7)	15(50)	0.578
3	10(33.3)	6(20)	6(20)	(Chi-square)
4	5(16.7)	2(6.7)	1(3.3)	
5	1(3.3)	2(6.7)	1(3.3)	

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Furthermore, the results of ANOVA test showed that after the intervention, there was a significant difference (p<0.001) between the levels of overt and covert anxiety of mothers in the massage group (34.43±11.74 and 32.13±9.25) and the care kangaroo group (36.90±10.06 and 38.07±13.10) compared to the control group (57.47±10.86 and 50.10±9.19). This difference in neonatal pain levels was also significant in the massage group (1.87±1.20) and in the kangaroo care group (2.00±1.02) compared to the control group (4.17±1.21) (p<0.001) (Table 3).

Table 2. Evaluation and comparison of mean and standard deviation of demographic characteristics of mother and infant in the three groups

Group Variable	Control Mean±SD	Massage Mean±SD	Kangaroo Mother Care Mean±SD	P-value*
Mother's age	25.70±6.66 [a]	27.03±6.55 [a]	26.60±5.17 [a]	0.695
Intrauterine age	31.50±2.17 [a]	31.93±2.10 [a]	32.73±1.96 [a]	0.072
Neonatal weight at the time of admission	1380±343.09 [a]	1396.33±351.29 [a]	1456.33±342.83 [a]	0.668
Neonatal weight at discharge	1772.67±216.89 [a]	1949.33±268.12 [b]	1910±234.31 [b]	0.014
Duration of hospitalization in NICU	22.57±13.78 [a]	18.60±12.27 [a]	14.73±12.37 [a]	0.067
Duration of hospitalization in the ward	10.53±3.81 [a]	9.67±3.09 [a]	8.70±2.37 [a]	0.084

*Tukey (post hoc), [a, b]two-by-two and row comparison of variables

Table 3. Evaluation and comparison of the mean of measured variables before and after the intervention in the three groups of control, massage and kangaroo care

Variable	Control Mean±SD	Massage Mean±SD	Kangaroo Mother Care Mean±SD	P-value*
Overt anxiety				
Before intervention	56.23±10.69 [a]	49.97±15.61	52.37±14.22 [a]	0.207
After intervention	57.47±10.86 [a]	34.43±11.74 [b]	36.90±10.06 [b]	<0.001
P-value (Paired Samples T-Test)	0.800	<0.001	<0.001	-
Covert anxiety				
Before intervention	55.93±8.09 [a]	51.77±12.41 [a]	54.03±13.72 [a]	0.387
After intervention	50.10±9.19	32.13±9.25 [b]	38.07±13.10 [b]	<0.001
P-value (Paired Samples T-Test)	<0.001	<0.001	<0.001	-
Pain				
Before intervention	4.80±1.21 [a]	5.13±1.22 [a]	5.17±1.18 [a]	0.431
After intervention	4.17±1.21 [a]	1.87±1.20 [b]	2.00±1.02 [b]	<0.001
P-value (Paired Samples T-Test)	0.037	<0.001	<0.001	-

*Tukey (post hoc), [a, b]two-by-two and row comparison of variables

Discussion

The results showed that kangaroo care and massage had a significant effect on improving mothers' overt and covert anxiety and neonatal pain based on the mean scores of the subjects in the intervention and control groups after the intervention. Studies by Arnon et al., Svensson et al., and Feldman et al. showed that skin-to-skin contact between mothers and infants caused a positive feeling and reduced anxiety in mothers (19-21). In our study, kangaroo care and massage had an effect on the mental state of the mother and the level of anxiety was significantly reduced. Kashaninia et al. and Zahedpasha et al. also concluded in a study that kangaroo care reduces stress and improves the mental health of mothers with preterm infants, and kangaroo care is especially recommended for mothers of premature infants (5, 22). However, the duration of kangaroo care in Kashaninia et al.'s study was four weeks and in Zahedpasha et al.'s study was one week,

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while in our study, mothers did kangaroo care until discharge and the duration increased by 1 to 3 hours. Charpak et al. also stated that kangaroo care reduces stress in mothers and increases the positive relationship between the infant and the family (23). However, in the study of Arzani et al., there was no significant difference between kangaroo care and mothers' self-esteem; this difference may be due to differences in the number of samples (7).

Kostandy et al. and Cong et al. in their study stated that after kangaroo care by the mother, the infant's crying and pain caused by the lancet needle in the sole of the foot in term and preterm infants decreased significantly (24, 25). In our study, kangaroo care significantly reduced neonatal pain, which is a sign of the positive effect of kangaroo care on infant pain; thus, it is consistent with the above studies. In Karimi et al.'s study, the results showed that kangaroo care and massage were significantly effective on maternal anxiety, stress and depression, as well as neonatal pain intensity. This is consistent with our study and shows the positive effect of kangaroo care on maternal anxiety and infant pain (3).

Infants in the NICU are exposed to a variety of painful interventions (6). In two separate studies, Axelin et al found that parental massage had a positive effect on premature infant pain (26). Ward-Larson et al. reported a significant difference between the control and massage groups in evaluating the two groups regarding the effectiveness of massage in painful methods in infants (27). In our study, the effect of massage on reducing pain in infants was observed and there was a significant relationship between massage and pain; so, it is consistent with these two studies. In their study, Fujita et al. found that the group that massaged their infants had less anxiety at the end of the intervention compared to the control group (28). In our study, mothers had less overt anxiety than the control group, indicating the effect of massage on maternal anxiety.

In general, kangaroo care and massage care can improve maternal anxiety and reduce the severity of infant pain by increasing skin contact and easy training by midwives and nurses. by prescribing these two methods, it is possible to reduce maternal anxiety and infant pain so that the period of hospitalization of the infant in intensive care unit passes easier for mothers and infants and ends with fewer complications. Lack of full cooperation of mothers to participate in the project due to special circumstances, fear of harm to their infants and increased risk of nosocomial infections in premature infants due to increased contact with them were among the limitations of the study.

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