

Comparing the Effect of Kangaroo Mother Care and Massage on Preterm Infant Pain Score, Stress, Anxiety, Depression, and Stress Coping Strategies of Their Mothers

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Abstract

Background: The need to care for premature infants causes a lot of anxiety and stress in their mothers. This study aimed to compare the effect of kangaroo mother care and Preterm infant massage on pain score, stress, anxiety, depression, and stress coping strategies of their mothers.

Methods: This double-blind three-group clinical trial study was conducted in Bahar Hospital in Shahroud, Iran, in 2019. 90 Mothers with preterm infants were assigned randomly to one of the three groups. Each group consisted of 30 mothers. The massage group received three 5-min massages each day for five consecutive days. In the Kangaroo Mother Care group, the baby remained in skin to skin condition for at least 15 minutes or more during five consecutive days. The control group received only routine care in the neonatal intensive care unit. Data in all three groups were collected before and after the interventions using the Coping Responses Inventory for Adult (CRI-A), the Depression, Anxiety, Stress Scale 21, and Neonatal Infant Pain Scale.

Results: The Paired Sample T-Test revealed that the mean score of infant pain in both intervention groups before and after the intervention was statistically significant ($P < 0.001$). The ANOVA test and The Paired Sample T-Test also showed that the mean scores of depression, Emotion-focused coping, and problem solving-based coping in mothers in all three groups, were significantly different before and after the intervention ($P < 0.001$). Conclusions: Kangaroo mother care and massage can reduce the pain in preterm infants, as well as the level of anxiety, depression, and stress of mothers; and increase the strategies to deal with stress in mothers.

Conclusion: Due to the high prevalence of birth trauma in infants in Iran, therefore, interventions are recommended to reduce it. Further studies on the factors affecting it need to be done to appropriate interventions to reduce it.

Key Words: Anxiety, Coping Behaviors, Kangaroo-Mother Care Method, Massage, Preterm birth.

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1- INTRODUCTION

Preterm birth is defined as a delivery that occurs less than 37 weeks gestation. However, the initial number of gestational weeks recorded as statistics varies from region to country. In the world, about 15 million preterm infants are born every year only by knowing statistically. Preterm birth is associated with 75% of perinatal death and accounts for 50% of the cause of long-term morbidity (1).

Iran is among the countries with a high incidence of preterm birth. Approximately 5000 babies are born daily in Iran, about 12% of whom are preterm or low-birth-weight neonates. On average, about 9% of babies require care in a neonatal intensive care unit (NICU) after birth (2).

Vulnerable preterm infants commonly require special care in the neonatal intensive care units (NICUs) for a more extended period. This prolonged hospitalization results in stress and anxiety for most of the mothers. The levels of maternal stress and the symptoms of psychological trauma experienced by the mothers have remained high, from 30% to 70%. Stress and anxiety affect every individual differently. In actuality, anxiety is not directly caused by a stressor, but rather by the failure to adapt to a stressor. The distinctiveness of anxiety was reported to have a significant relationship with uneventful birth outcomes – i.e., preterm birth (3). Mothers of preterm infants are nearly twice as likely to experience PPD as mothers of infants born at term (4). High levels of stress following a preterm birth may develop into more severe psychological disorders, including post-traumatic stress disorder and depression (4).

Neglecting the emotional and psychological stress of the parents has caused the parents not to be attached to the baby during the discharge. It will increase the vulnerability of the baby and the

parents. It is essential to check parental stress because the baby can receive anxiety and pressure from the parents. Parents are the most influential people in the infant support system so that confusion in parental emotions affects the growth of infant emotions. Any disturbance in parenting can have a negative effect on the baby (5).

The birth of a preterm baby impairs the mother's ability to function properly and the power of logical thinking; and this causes other stresses to increase the risk of having a high-risk baby. It can lead to weak interaction with the baby. Stress and anxiety are associated with reduced loving and responsible maternal behaviors as well as impaired parental behaviors and increased anxiety (6). According to Lazarus (2000), there are two main types of coping with stress. In dealing with a Problem solving-based coping, people focus on the stressor and try to take constructive steps to change or eliminate the stressor. In contrast, in Emotion-focused coping, attempts are made to control the emotional consequences of the stressful event to maintain the person's emotional balance (7). Preterm infants hospitalized after birth are exposed to repeated painful procedures as part of their routine medical care. Early neonatal exposure to unmanaged pain has been linked to numerous negative long-term outcomes, such as the development of pain hypersensitivity, detrimental psychological symptomology, and altered neurodevelopment. These findings emphasize the crucial role of pain management in neonatal care (8).

The importance of pain in hospitalized newborns was first recognized in the 1980s. Before this time, it was assumed that infants could not perceive pain early in life and that risks of pharmacological agents outweighed potential benefits. Routine endotracheal suctioning was found to initiate changes in cerebral blood flow,

demonstrating that procedural stress in the preterm infant undergoing neonatal intensive care unit (NICU) might affect the brain. Neonates are more sensitive to pain/stress than infants born at full term. Preterm infants display a lower threshold to touch and more pronounced reflex responses to touch, compared to full-term infants. With a repeated touch, this lower threshold declines further due to the excitability of sensory neurons in the spinal cord (9). Thus, for the very preterm group, skin-to-skin maternal contact, or Kangaroo Mother Care (KMC), would appear to be a method that could decrease pain response.

Furthermore, it would provide the mothers with an opportunity to comfort their infant during painful procedures in a technologically invasive environment. Skin-to-skin contact by the mother, referred to as Kangaroo Mother Care (KMC), is found to be efficient in reducing pain in three previous studies (10). KMC, which is a part of the preterm infant care and skin-to-skin contact) has been used for decades in neonatal intensive care units as alternative care for preterm infants in incubators. This method was first used in 1978 by Rey Edgar in Colombia due to a lack of adequate equipment such as incubators (11).

Involving parents in taking care of a hospitalized preterm infant can facilitate the neonate's development and help the early discharge from the hospital and decrease the length of hospital stay, costs, and hospital infections (12). Mothers with LBW infants are at risk of stress due to separation from their babies.

Kangaroo Mother Care (KMC) is one of the methods of care that may affect the mental health of the mother in the postpartum period (13). Some randomized controlled trial (RCT) studies found that KMC could reduce maternal anxiety, maternal stress, and maternal postpartum depression (13). In developed countries,

the use of complementary medicine and infant stimulation has recently increased, and massage is considered an additional supportive measure for infants in the NICU. Moreover, complementary treatments are not only economical, but they also have no serious adverse effects, drug reactions, or interactions, and are easy to perform. Lotfalipour et al. (2018) stated that massage of a preterm infant by the mother reduced maternal anxiety and depression and improved the mother's mood (12). Massage, voice, smell, and eye contact, engages more areas of the brain and saturates the sensory channels, thus decreasing painful stimuli (14).

Given the importance of this issue, the study was aimed at comparing the effect of kangaroo mother care and massage on preterm infant pain score, as well as the stress, anxiety, depression, and stress coping strategies of their mothers.

2- METHOD AND MATERIAL

2-1. Study design and population

This double-blind three-group clinical trial study was conducted in the Bahar Hospital with a tertiary level neonatal intensive care unit (NICU) in the northeast of IRAN over eight months in 2019, from December 2018 to July 2019.

After legal procedures and obtaining a license from Shahroud University of Medical Sciences and obtaining a letter of introduction for the cooperation of Bahar Hospital and the necessary coordination with the neonatal intensive care unit of Bahar Hospital in Shahroud, the process of sampling began by using the comparison formula of two averages to assess the anxiety score with 80% test power and 95% confidence coefficient. Considering the possible drop of samples in this study, 90 people were examined. They were randomly assigned into three groups of maternal education (30 people), acupuncture (30 people), and control (30 people).

The sampling method of the study was Convenience sampling. The individuals then entered the study using predetermined random allotment sequences under the website and the supervision of a statistician in the form of 6 blocks.

A total of 90 eligible women entered the study and completed the Form of Conscious Satisfaction. Given the sample size (90 women), the numbers range (1 - 90) were given to the computer randomization program (Random allocation software) to sort them to each group randomly. Each random sequence generated was recorded on a card, and the cards were placed in non-transparent, sealed and opaque envelopes, respectively. To save randomization, the outer surface of the envelopes was numbered in the same order. Finally, the envelopes were closed and placed in a box, then participants were assigned randomly to one of the three groups (each group 30), respectively.

2-2. Method

The sample size with 95% confidence interval and 80% test power, with a consideration of the sample loss was calculated 30 in each group.

$$\frac{\left(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta}\right)^2 (\sigma_1^2 + \sigma_2^2)}{(\mu_1 - \mu_2)^2}$$

$$\alpha = 0.05 \quad \beta = 0.2 \quad \delta_1 = 2.55$$

$$\delta_2 = 2.20 \quad \mu_1 = 7.86 \quad \mu_2 = 5.96$$

2-3. Measuring Tools

The data collection instruments included a questionnaire of the participants' demographic information, the Coping Responses Inventory for Adult (CRI-A), the Depression, Anxiety and Stress Scale (DASS-21), and The Neonatal Infant Pain Scale (NIPS). The demographic information questionnaire contained 30 items written by the researchers and

developed after reviewing the latest international books and articles on the topic of study; the validity of which was also determined via content validity. So, after being prepared, it was submitted to 7 faculty members and professors at Shahroud University of Medical Sciences for checking its validity.

The Coping Responses Inventory for Adult (CRI-A): Billings and Moose prepared a questionnaire containing 32 questions to evaluate the coping response. This questionnaire is in the form of a 4-point Likert scale (never, sometimes, often, and always), for each question, the answer is between zero and 3, respectively. This questionnaire has 5 subscales including problem solving (questions 1-7-32), cognitive assessment (questions 3-5-6-8-29), based on excitement (questions 10-12-13-14-17-18-19-21-28-30), social (questions 2-4-9-11-16-21) and physical (questions 15-22-23-24-25-26-27-31) support. The final score of this questionnaire is obtained as a problem- and emotion-oriented confrontation. The sum scores of the two subscales of problem-solving and cognitive assessment give the score of the problem-solving counterpart, and the sum scores of the three subscales of emotion-based, social support, and physicalization provide the score of the emotion-oriented countermeasure. So that the highest score in problem-solving is 24 and the lowest one is zero, and in emotion-oriented, the highest is 72, and the lowest is zero (15). The reliability of the index was confirmed with a *Cronbach's alpha* of 0.79 (16). In the current study, its *Cronbach's Alpha* coefficient were estimated as 0.87.

The Depression, Anxiety, and Stress Scale-21 (DASS-21): Items of this scale are scored based on a 4-point Likert scale from 0 (not applied to me at all) to 3 (applied to me very much or most of the time). Higher scores indicate more frequent symptomatology. Each of the

three scales are composed of seven items, including depression (1-5-10-13-16-17-21), anxiety (2-4-7-9-15-19-20), and stress (3-6-8-11-12-14-18). Since this questionnaire is a shortened form of a 42-question scale, the scores of each of the subscales should be doubled. In a study conducted by Sahebi et al. (2005), the internal consistency of DASS-21 was calculated using Cronbach's alpha coefficient obtained at 0.77, 0.79, and 0.7 for depression, anxiety, and stress scales, respectively. The validity of this form has been also confirmed according to a structural narrative study conducted by Sahebi et al. in Iran in 2005 (17). The reliability of the DASS-21 questionnaire in this study was determined using a Cronbach's alpha coefficient of 0.81 for the whole questionnaire.

Neonatal Infant Pain Scale (NIPS): This scale includes six items assessing six states of neonates, including facial expression, cry, breathing patterns, movement of arms, movement of legs, and state of arousal. Each item is scored 0 to 1, except the state of cry which is scored 0, 1, and 2, for a possible total score of 7. Neonates have no pain if the NIPS score is 0-2, moderate pain if the NIPS score is 3-4, and severe pain if the NIPS score is more than 4. In IRAN, the inter-rater reliability of the scale was so high ($r=0.92-0.97$), and the minimum correlation coefficient between the inter-raters was 0.868 (18). In the current study, its Cronbach's Alpha coefficients was estimated as 0.80.

All three groups completed the questionnaires as the pre and post-tests. Firstly after hospitalization and before the start of the intervention and secondly 5 days after the intervention.

2-4 Intervention

The massaged infants received three 5-min massages administered at 9, 11 a.m., and 1 p.m. each day for five consecutive days. The massages started on a Monday and

ended on Friday of the same week, for a total of 15 massages. The preterm infants received their massages from licensed massage therapists who were trained on a structured protocol that included, (1) with the infants in a prone position, applying moderate pressure stroking to the head, shoulders, back, legs and arms for 5 minutes, (2) kinesthetic stimulation consisting of flexing and extending the limbs in a supine position for the next 5 minutes, and (3) returning the infant to the prone position and repeating the moderate pressure massage stroking sequence for the last 5 min (same as the first 5 minutes). Details of the massage protocol, including the timing of the strokes, are reported in several papers by our group (19). In the KMC condition, the diaper-clad infant was held upright, at an angle of approximately 60°, between the mother's breasts, providing maximal skin-to-skin contact between the baby and his/her mother. A blanket and then the mother's clothing was placed over the infant's back and tucked under each side of the mother. The baby remained in this condition at least 15 minutes or more, one or two times per day for five consecutive days. The mother was allowed to speak to her infant (20). The control group did not receive massage therapy, or KMC; and all groups received standard NICU care as prescribed by their attending physicians. Data in all three groups in two time periods, the first time before interventions and the second time after the end of the sessions, were compared and evaluated using the relevant questionnaires. The second author completed the relevant questionnaires for the subjects under study at each group without knowing what intervention each person had received, and the information after coding by the second author was entered into the SPSS 24 software. The type of interventions were determined with letters A to C, so the statistical consultant was blind about them.

2.5 Ethical consideration

Ethics Committee of Shahroud University of Medical Sciences with the code no. IR.SHMU.REC.1397.122 and the registration code IRCT201801208038 on the Iranian Randomized Clinical Trial site.

2-6. Inclusion and exclusion criteria

Inclusion criteria include: mother's age between 18 to 45 with Preterm infant aged 28^w to 36^w/6^d, Satisfaction for participating in the study, infant's Apgar scores above six at the fifth minute, his/her not having any major congenital anomalies, not suffering from Grade III or IV intraventricular hemorrhage or subsequent periventricular leukomalacia, not having undergone surgery, not having received paralytic, analgesic, or sedative medications within 48 hours, and the mother's Lack of a history of confirmed depression and psychiatric illnesses. Mothers and their preterm neonates were excluded if they had any of the following conditions: being medically unstable, requiring oxygen or respiratory support, or the mother having a history of drug abuse during pregnancy.

2-7. Data Analyses

After data collection, all data were done using Statistical Packages for Social Science (SPSS) version 24.0 (IBM, Armonk, NY, USA). Kolmogorov-Smirnov test was performed for checking the normality of the distribution. Values are expressed as Mean±SD or percentage. The Chi-Square test was used to describe the abundance of data, and the paired t-test was used to compare the data. To analyze the hypothesis, the mean scores are different in groups; a two-way analysis of variance with repeated measurements was used. P-values less than 0.05 were considered significant.

3- RESULTS

A total of 90 women were evaluated for eligibility (figure 1). The results of

demographic variables showed that the average age of the mothers was 25.70 in the control group, 27.03 in the massage group, and 26.60 in the KMC group. 66.6% of mothers in the control group had a diploma and bachelor's degree, 40% in the massage group, and 36.7% in the KMC group. 60% of the mothers, in the control group, and the KMC group and 63.3% in the massage group were living in the city. The majority of mothers were unemployed in all three groups. The Other demographic information in the study groups were found to be homogenous in all cases (**Tables 1 and 2**)

The ANOVA test showed a statistically significant difference between the mean scores of anxiety after the intervention in the three groups ($P<0.001$), based on the Tukey test, the difference was between the massage and the control group ($P=0.002$) and between the KMC and the control group ($P<0.001$). The Paired Sample T-Test also showed that the mean scores of anxiety in the massage and KMC groups before and after the intervention were significantly different ($P<0.001$) (**Table 3**).

The ANOVA test showed a statistically significant difference between the mean depression scores after the intervention in the three groups ($P<0.001$). The difference was based on the Tukey test between the massage group and the control group ($P<0.001$) and between the control group and the KMC group ($P<0.001$) (**Table 3**).

The ANOVA test showed a statistically significant difference between the mean stress score after the intervention in the three groups ($P<0.001$). Based on the Tukey test, the difference was between the massage group and the control group ($P<0.001$), and between the control group and KMC group ($P<0.001$). The Paired Sample T-Test also showed that the mean stress scores of the massage and the KMC groups before and after the intervention were statistically significant ($P<0.001$) (**Table 3**).

Table-1: Frequency distribution of mothers according to demographic characteristics in the three groups, N=30

Variable		group						P-Value Chi (square)
		Control		massage		(KMC)*		
		N	%	N	%	N	%	
Education level	High school	8	26.7	8	26.7	6	20	0.981
	Diploma	10	33.3	12	40	11	36.7	
	Bachelor	10	33.3	8	26.7	10	33.3	
	master of science, MD.PhD	2	6.7	2	6.7	3	10	
Residence Place	city	18	60	19	63.3	18	60	0.954
	rural area	12	40	11	36.7	12	40	
Occupation	Unemployed	20	66.7	20	66.7	20	66.7	0.850
	employed	8	26.7	8	26.7	6	20	
	Student	2	6.7	2	6.7	4	13.3	
History of abortion in previous pregnancy	Yes	6	20	8	26.7	8	26.7	0.786
	No	24	80	22	73.3	22	73.3	
History of preterm labour in previous pregnancy	Yes	7	23.3	6	20	5	16.7	0.812
	No	23	76.7	24	80	25	83.3	
Preterm premature of membranes in recent pregnancy	Yes	10	33.3	7	23.3	9	30	0.685
	No	20	66.7	23	76.7	21	70	
Preeclampsia in recent pregnancy	Yes	4	13.3	6	20	7	23.3	0.602
	No	26	86.7	24	80	23	76.7	
History of placental Abruption in the recent pregnancy	Yes	2	6.7	0	0	2	6.7	0.351
	No	28	93.3	30	100	28	93.3	
History of bleeding in the recent pregnancy	Yes	4	13.3	3	10	2	6.7	0.690
	No	26	86.7	27	90	28	93.3	
History of pregnancy gestational diabetes in the recent pregnancy	Yes	5	20	6	20	8	26.7	0.627
	No	25	80	24	80	22	73.3	
Type of Delivery in the recent pregnancy	NVD**	19	63.3	22	73.3	20	66.7	0.700
	C/S***	11	36.7	8	26.7	10	23.3	
Infant resuscitation in the recent pregnancy	-	-	-	-	-	-	-	-

* Kangaroo Mother Care

** Normal Vaginal Delivery

*** Caesarean Section

Table-2: Mean and Standard deviation of maternal demographic characteristics in the three groups

Variable	GROUP						P-value (ANOVA)
	KMC* N=30		Massage, N=30		Control, N=30		
-	Mean	SD	Mean	SD	Mean	SD	
Age (yr)	26.60	5.17	21.03	6.55	25.70	6.66	0.695
Gestational Age(W)	31.73	1.96	31.93	2.10	31.50	2.17	0.072
Infant's Birth Weight(g)	1456.33	342.83	1396.33	351.29	1380	343.09	0.668
Infant's weight when discharged from hospital(g)	1910	234.31	1949.33	268.12	1772.67	216.89	0.014
Length of NICU stay(day)	14.73	12.37	18.60	12.27	22.57	13.78	0.067

* Kangaroo Mother Care

Table-3: Investigating and comparing the Mean (SD) of the variables before and after the intervention in the three groups of control, massage, and KMC*

Variable	-	Group						P-value (ANOVA)
		KMC, N=30		Massage, N=30		Control, N=30		
		Mean	SD	Mean	SD	Mean	SD	
Anxiety	Before intervention	15.43	6.03	16.30	5.42	15.03	4.74	0.653
	After intervention	9.57	3.64	11.10	4.75	15.00	4.34	0.001>
	-	0.001>		0.001>		0.949		-
Depression	Before intervention	16.7	5.50	16.57	5.51	15.53	4.61	0.742
	After intervention	10.47	4.16	11.27	4.50	17.83	5.57	0.001>
	-	0.001>		0.001>		0.001>		-
Stress	Before intervention	16.50	5.68	17.17	5.80	19.03	5.63	0.210
	After intervention	11.40	3.87	12.07	4.13	19.67	6.23	0.001>
	-	0.001>		0.001>		0.079		-
Emotion-focused coping	Before intervention	40.07	10.02	42.27	10.93	43.73	9.59	0.378
	After intervention	56.43	6.97	54.63	8.93	47.37	8.91	0.001>
	-	0.001>		0.001>		0.001>		-
Problem solving-based coping	Before intervention	14.77	3.05	14.600	3.16	15.00	3.16	0.883
	After intervention	8.87	11.81	18.77	1.55	16.87	2.93	0.001
	-	0.001>		0.001>		0.001>		-
Infant Pain	Before intervention	5.17	1.18	5.13	1.22	4.80	1.21	0.431
	After intervention	2.00	1.02	1.87	1.20	4.17	1.21	0.001>
	-	0.001>		0.001>		0.037		-

* Kangaroo Mother Care

The ANOVA test showed a statistically significant difference between the mean Emotion-focused coping scores after the intervention in the three groups ($P < 0.001$). The difference based on the Tukey test was between the massage group and the control group ($P = 0.003$), and between the control group and the KMC group was ($P < 0.001$).

The Paired Sample T-Test also showed a statistically significant difference between the mean Emotion-focused coping scores before and after the intervention in the three groups ($P < 0.001$) (**Table 3**).

The ANOVA test showed a statistically significant difference between the mean Problem solving-based coping score after the intervention in the three groups ($P = 0.001$). There were significant differences, based on the Tukey test, between the massage group and the control group ($P = 0.003$), and between the control group and the KMC group ($P = 0.002$). The Paired Sample T-Test also showed a statistically significant difference between the problem solving-based coping scores before and after the intervention in the three groups ($P < 0.001$). (**Table 3**).

The ANOVA test showed a statistically significant difference between the mean pain scores after the intervention in the three groups ($P < 0.001$). The difference, based on the Tukey test, was between the massage group and the control group ($P < 0.001$), and between the control group and the KMC group ($P < 0.001$). The Paired Sample T-Test also showed that the mean pain scores of the massage and the KMC groups before and after the intervention were significantly different ($P < 0.001$) (**Table 3**).

4- DISCUSSION

This study aimed to compare the effect of kangaroo mother care and massage on preterm infant pain score, stress, anxiety, depression, and stress coping strategies of their mothers. The results of this study

revealed that KMC and massage were effective in reducing pain in preterm infants and reducing stress, anxiety, and depression in mothers and increasing the scores of Problem solving-based coping and Emotion-focused coping strategies. The mean pain scores in the massage and the KMC groups before and after the intervention were significantly different ($P < 0.001$).

Skin-to-skin contact by the mother, known as Kangaroo Mother Care (KMC) was previously examined in three studies conducted in 2000, 2003, and 2005 on full-term infants, infants aged 36-32 weeks and infants under 30 weeks. It was found to reduce the baby's pain and crying (10). An RCT study showed that the effects of repeated Kangaroo Mother Care analgesia remains stable in preterm infants over repeated painful procedures, and Kangaroo Mother Care may be a safe analgesic alternative in preterm infants, in whom it is feasible (20). Another study stated that KMC might help mediate the physiologic response to painful procedures in preterm infants (21), which was in line with the results of the present study. Skin-to-skin contact between the preterm infant and the mother is an effective and safe alternative to conventional bed or incubator neonatal intensive care and has been documented to decrease pain, has positive effects on infant sleep patterns, and also improves parent-infant interactions (22). A study stated that massage therapy by mothers can reduce the pain in the stable preterm infant (23). Research findings also suggest that massage has pacifying or stress-reducing effects on preterm infants (19), which was in line with the results of the present study.

Regarding stress coping strategies in mothers of preterm infants, the mean scores of problem-solving and Emotion-focused coping in all three groups before and after the intervention were significantly different. Coping strategies are effective problem-solving methods that

are used to decrease stress between people and their environment. Being in the NICU is a very stressful experience for parents, and parents' overall adjustment, attachment, and well-being are affected by how they cope with the NICU experience (24). Even though the mothers of preterm babies cope differently after delivery, their coping abilities, which included praying, attachment to baby, and acceptance of the situation, were significantly determined by the condition of their babies as well as the support they received from significant others (25). The results of these studies are in line with our research. However, another study found a correlation between coping with stress and the level of anxiety and depression in mothers (26). One of the reasons for the decrease in maternal depression in all three groups of the present study could be the increase in strategies to cope with stress among mothers (skin-to-skin contact with the baby, eye and skin contact in kangaroo care, support from others and regular contact with babies). In the present study, the levels of anxiety and stress of mothers in two groups of massage and KMC showed a significant decrease, but the average scores of depression before and after the intervention were significantly different in all three groups ($P < 0.001$). Kangaroo Mother Care improves mother-infant attachment and reduces the mother's anxiety about the baby; it is simply acceptable to mothers and can be continued at home (27). The weight gain experienced by preterm neonates receiving moderate-pressure massage therapy may be mediated by increased vagal activity, gastric motility and mothers experienced low levels of anxiety (28). It was also shown in an RCT study that the mothers' stress and anxiety scores decreased after their babies were massaged (29). The results of these studies are in line with our research. Another study stated that Depression was less common in mothers who were in the KMC group, and also

found that KMC was associated with a predictive effect on postpartum depression (30). Yet another study proposed that infant massage by mothers is an effective treatment for facilitating mother-infant interaction in mothers with postnatal depression (31). The results regarding depression in some studies were inconsistent with those of our study, which may be due to differences in the tools and methods used in the studies; or due to the mothers' increase in coping strategies or the improvement in babies' condition, which might have affected the mothers' depression.

5- LIMITATIONS

Lack of full cooperation of mothers to participate in the study due to particular circumstances and fear of harming their infants. Increased risk of nosocomial infections in preterm infants due to the increased contact with them and improved mobility. To solve this problem, it was emphasized that procedures such as massaging the baby should be performed only after proper and thorough hand washing and hygiene.

6- CONCLUSION

KMC and preterm infant massage reduce the pain of infants by accelerating the maturation of the autonomic system and the neurobehavioral development of preterm infants. Moreover, due to the increase in mother-infant interaction, they can be effective in reducing the level of anxiety, depression, and stress of mothers and increasing the strategies to deal with stress in mothers. Providing support programs to mothers whose infants have been admitted to the intensive care unit and increasing and applying strategies for mother-infant interaction have significant positive effects on preterm women and infants.

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