

Evaluation of the Effect of Massage by the Mother on the Pain of Term Infants after Care Measures

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ABSTRACT

Introduction: Hospitalized infants undergo a lot of painful procedures during care and treatment, and the use of non-pharmacological methods to reduce the effects of pain helps the infants to relax and stay healthy. Therefore, this study aimed to determine the effect of massage by the mother on the pain of term infants after care measures.

Materials and methods: This quasi-experimental study was performed on 80 infants in the neonatal ward. Neonates were selected by random sampling and randomly divided into two groups. In both groups, the pain score was measured in the first time of the invasive procedure and then in the experimental group after 5 days of massage and the control group without massage, again in the next time of the invasive procedure, the pain score was measured before, during and after the intervention. Findings obtained from the NIPS questionnaire were analyzed using SPSS statistical software.

Results: The difference between the pain scores before the intervention was not significant in the control and experimental groups, but after five days of massage, the pain score in the experimental group was significantly lower than the control group. The results show that pain in children increases during and after the procedure, but the amount of pain decreases with massage by mothers.

Conclusion: Clinical and therapeutic measures in the intensive care unit cause neonatal pain and massage is one of the cost-free and simple solutions to reduce pain in infants. According to the findings of our study on the positive effect of massage by the mother on neonatal pain, it is recommended that nurses use it as an effective intervention in reducing the pain of infants.

Keywords: Massage, neonatal pain, nursing care

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INTRODUCTION

Every newborn infant (especially premature infants) experiences painful and invasive procedures, because of the need for diagnostic, therapeutic, and sometimes preventive measures [1]. From birth, babies experience pains such as vitamin K injections, vaccinations, circumcision, and heel sampling. They respond to this pain through facial expressions and behaviors. The more frequent the painful procedures, the greater the negative physiological, behavioral, and psychological consequences. Failure to manage neonatal pain may lead to permanent changes in the process of organizing the brain, learning and recalling information in the future, and creating maladaptive behaviors in the infant [2]. Prevention and management of pain is one of the most important challenges in the intensive care unit of infants [3]. Pain is an unpleasant sensation and an emotional experience that is associated with actual or potential tissue damage [4]. Pain in infants is often undetected and untreated and could cause behavioral, physiological, and metabolic changes. Evidence-based reports indicate that controlling the pain caused by medical diagnostic procedures in infants could be very useful, which would increase physiological, behavioral, and hormonal development in infants [5]. In addition, stressful experiences in infants are associated with the release of stress hormones such as cortisol and adrenaline and may lead to dangerous side effects such as fear, irritability, sleep disturbance, impaired immune response, and emotional disturbances [6]. For many years, it was believed that infants and children would not feel pain due to the underdevelopment of their nervous system,

however, research has shown that infants are more prone to pain than adults. The expression of pain in infants is different from older children and adults [7]. Infants are unable to express pain, but in response to painful stimuli, a range of behavioral and physiological reactions such as facial changes, crying, increased heart rate and respiration, and decreased oxygen saturation could be observed in them, which are conclusive evidence of their pain [8]. Due to its short-term effects and good tolerability, non-pharmacological treatment is recommended for the treatment of mild pain. Non-pharmacological pain treatment is a safe, non-invasive, inexpensive method that nurses could perform independently. Reducing non-pharmacological pain does not cost much and does not cause side effects for patients, therefore they could be very useful. Pain management reduces suffering and improves patients' quality of life. In a Review article by Alvarez *et al.*, the proven benefits of massage therapy in hospitalized preterm infants, including better nerve growth, positive effect on brain growth, reduced risk of neonatal sepsis, reduced length of hospitalization, and reduced neonatal stress have been mentioned [9]. Touch stimulation releases analgesics by releasing neurotransmitters that affect the nervous system and thereby inhibits the pain [10]. In a study conducted by Zargarzadeh *et al.* With the aim of identifying barriers to the use of complementary drugs in reducing pain by nurses, the findings showed that nurses' lack of knowledge is the most important barrier [11]. Paying attention to the right educational strategies is another important issue [12]. Further research is now very important to obtain relevant information [13]. Nurses could facilitate mother-infant bonding and reduce

stress by encouraging communication and participation in care, massage, or breastfeeding (Medina *et al.*, 2018) [14]. Infant nurses could be trained in infant massage and can teach infant massage techniques to the parents, thus enhance the health and well-being of children and parents [15]. In a study by Zahedpasha *et al.*, with the aim of determining the barriers to the use of non-pharmacological pain control methods in intensive care units, the findings showed that continuous training on pain is a practical approach to the use of non-pharmacological methods in pain control; Nurses who did not participate in pain management workshops in the last 2 years had less knowledge about pain management. The results suggest that infant massage while improving the mother-child relationship reduces pain symptoms in infants [16]. Infants experience pain during hospitalization and it affects their adaptation to the outside world and leads to stress and physiological imbalance. Therefore, prevention and reduction of pain in infants is of great importance [17, 18]. A number of evidence-based non-pharmacological methods have been reported to reduce neonatal pain, some of which include kangaroo care, sugar sucrose [19, 20], breastfeeding [21], music therapy [22, 23], foot massage [24] and ear protection [25]; But none of them are completely effective and there is no clear method. Also, further studies are also necessary to evaluate the possible long-term consequences of each of these methods [26]. Therefore, this study was conducted to investigate the effect of massage by the mother after care measures on the pain of term infants.

MATERIALS AND METHODS

Study design

The present study was performed on 80 infants admitted to the intensive care unit of Hazrat Ali Asghar Hospital during 2017-2020. After approving the proposal and obtaining permission from the ethics committee and obtaining written permission from the parents and approval of the treating physician in terms of stabilizing the physiological or clinical condition of the neonates, the sampling method was performed randomly using a table of random numbers from the statistical reference book. After selecting the samples to enter the research and sufficient and clear explanations for mothers about the goals and type of research by the researcher, as well as a detailed explanation of how to assess pain and obtaining written consent, the infants were included in this study.

Inclusion and exclusion criteria

Inclusion criteria: The mother is Iranian, and the mother could be present with the baby 24 hours a day to feed the baby. Non-addiction of mothers to drugs and alcohol. The baby is not the result of IVF or after years of infertility. The baby is a result of singlet pregnancy. The mother wanted to be pregnant (The baby is not the result of unwanted fertility). The birth weight of the baby is 2500 grams and more. The gestational age of the baby is 37 weeks or more. Permission for complete oral feeding of the infant through the mother's breast is issued according to the doctor's instructions. Infants should be in a stable clinical condition. (The baby should not be attached to equipment that prevents massage of the whole surface of the baby, such as having a chest tube or ventilator. Infants who need drugs as a result of surgery or have received analgesics, or if surgical incisions prevent massage of the whole surface of the baby, or if there is a possibility of bleeding as a result of the massage, would be excluded; Or that for any reason

the doctor does not allow the massage and does not consider the massage appropriate for the clinical condition of the baby). Babies should not be undergoing phototherapy. At least 3 days have elapsed since the infant was admitted to the neonatal care unit, during which time the mother visits her infant at least 3 times in a row or alternately.

Exclusion criteria: discharge of infant before the end of the intervention and disturbance of the stability and general conditions of mother and infant.

Data collection

The first data collection tool was a questionnaire containing demographic characteristics such as the mother's level of education, type of insurance, family income status, mother's job, family residence, infant gender, and the relationship between the mother and infant, which were completed by the mother, and information such as the number of maternal gestation, chronological and gestational age of the baby, birth weight, weight before the massage, weight on the first day after the massage, weight on the third day after the massage, weight on the fifth day after the massage was recorded by the researcher.

Procedure

The educational video of massage for mothers was shown by the researcher. The environment of the massage training classes was in the conference hall of the hospital. The training classes were conducted in 2 one-hour sessions and the mothers practiced massage on the model in the presence of the researcher, through face-to-face training, and when the mother needed more sessions and hours to train, the training was continued until she learned the massage properly. The correct performance of the massage and the fact that all mothers have the correct perception of the massage training was controlled by the researcher by observing the massage performed by the mothers on the replica. In all stages of showing the film to teach massage and practical massage practice, the researcher was present to provide further explanations, solve possible problems, and answer the questions of mothers. The researcher's contact number was also provided to the mothers to answer their questions 24 hours a day. For the first time, the infant was massaged by the mother in the presence of the researcher. In the intervention group, the massage was performed by the mothers for 5 days and in the control group, the infants received no intervention other than routine care, then the pain score of both groups was calculated before, during and after the first invasive procedure (venipuncture) according to the NIPS tool. Neonatal Infant Pain Scale (NIPS) was used to measure the pain of premature and mature infants up to six weeks after birth. 1.Facial posture (score zero for relaxed posture and score one for frown posture), 2.Infants' crying (score zero for not crying, score one for moaning and score 2 for intense crying), 3.Respiratory pattern (score zero for relaxed condition and score one for a change of breathing), 4.Hand mobility (score zero for relaxed condition and score one for folding or opening), 5.Leg mobility (score zero for a relaxed condition or lying down and score one for folding or opening), 6.State of consciousness (zero for sleep or wakefulness and one for screaming). In general, a score of 0-3 indicates no pain, a score of 3-5 indicates moderate pain, and a score of 5-7 indicates severe pain.

RESULTS

Table 1. Demographic characteristics of the study population

Variables	Classification	Frequency	Percentage
infant's gender	girl	38	48
	boy	42	52
maternal age (years)	Less than 25	29	36
	25 to 30	31	39
	More than 30	20	25
marital age (years)	Less than 25	34	43
	25 to 30	29	36
	More than 30	17	21
educational level	High school	36	45
	Bachelor's degree or higher	44	55
maternal occupation	housewife	50	63
	employed	30	37

According to demographic information, it could be concluded that the number of girls and boys are close to each other and the percentage of girls is 48% and boys 52%. The age of 25 to 30 years for mothers with 39% is the highest age among mothers, while the age of marriage of less than 25 years with 43% has the highest frequency. The educational level of 55% of mothers was bachelor's

degree and above and 63% of mothers were housewives. Also, by analyzing demographic information, which includes infant's gender, maternal age, marital age, education, and maternal occupation, it could be concluded that the two experimental and control groups, were not significantly different in terms of contextual variables and were the same.

Control group: 40 Intervention group:40

Table 2- Findings related to demographic variables

	mean	standard deviation	mean	standard deviation	probability value
gestational age	38.1	1.001	39.4	1.007	0.98
chronological age	5.2	0.65	5.9	0.44	0.06
length of hospital stays	5.1	1.90	5.3	1.98	0.34

According to the data on demographic variables in the control and experimental groups, there is no significant difference in terms of gestational age, chronological age and length of hospital stay.

Table 3 - Results of t-test in relation to massage score

Procedure	group	probability value	mean	standard deviation
Before	Intervention	0.55	0.69	0.08
	Control	0.60	0.50	0.06
During	Intervention	0.01	5.9	0.4
	Control	0.01	6	0.4
After	Intervention	0.01	5.5	0.1
	Control	0.01	5.9	0.2

Pain scores were measured before, during, and after the invasive procedure, before the samples were included in the study. It should be noted that no significant difference was observed in pain scores between the intervention and control groups. However, in the intervention group after the massage, there was a significant difference in the mean pain scores caused by invasive procedures, in comparison with the control group. In general, the findings indicate that pain in children increases during and after the

procedure, but the amount of pain decreases with massage by mothers.

According to Figure 1, it could be derived that massage during and after the procedure has reduced pain in infants. The graph related to pain scores in the study groups demonstrates the difference between the pain scores of intervention and control groups, during and after the procedure.

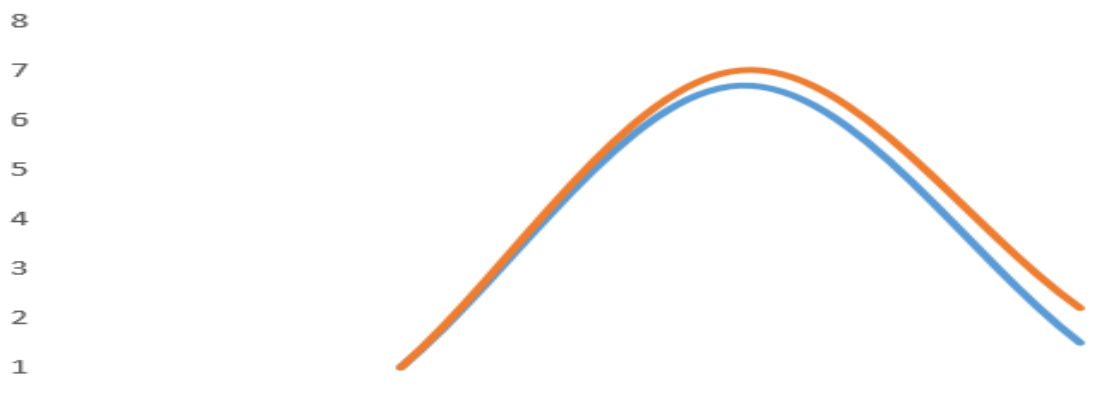


Figure 1. Graph related to the pain scores of the two study groups. The red diagram shows the intervention group, and the blue diagram shows the control group.

DISCUSSION

According to the findings of this study, massage reduces pain in infants. The results showed that before the procedure in the intervention group the probability value is equal to 0.55 and in the control group, this number is equal to 0.6. Therefore, it could be concluded that there is no significant difference between the two groups in terms of pain score. However, massage in the intervention group affected the amount of pain during and after the invasive procedure, in comparison with the control group. In general, the findings indicate that pain in children increases during and after the procedure, but the amount of pain decreases with massage by mothers. In this regard, the results of Elsagh study showed that massage leads to a decrease in HR and an increase in SaO₂, compared to the control group [27].

In our study, the effect of massage on pain score was investigated, but attention to other interventions such as

breastfeeding could also be effective in reducing pain. In a 2017 study by Boroujeni *et al.*, the effect of massage and breastfeeding in response to intravenous (IV) blood sampling pain was examined among 75 neonates. Infants were randomly divided into three breastfeeding, massage, and control groups. In the breastfeeding group, the intravenous sampling procedure was performed 2 minutes after breastfeeding. Based on the findings of this study, the lowest pain score was in the massage group, then in the breastfeeding group and in the control group, respectively. They stated that since massage and breastfeeding are natural interventions, they are useful and cost-free and do not require special facilities, these methods are recommended in the treatment of pain and pain control during the painful care measures prescribed for infants. [17] Another study also suggested that upper limb massage may be effective in reducing neonatal venipuncture pain [28].

In the present study, the results showed that before the procedure in the intervention group the probability value is equal to 0.55 and in the control group, this number is equal to 0.6. Therefore, it could be concluded that there is no significant difference between the two groups in terms of pain score. Though, massage in the intervention group affected the amount of pain during and after the invasive procedure, in comparison with the control group. However, in a study by Castral *et al.*, skin-to-skin contact with infants showed no significant difference in heart rate [29]; The inconsistency of this result may be due to the difference in the method of implementation of this study compared with the present study that massage was performed by the mother.

In his study, Zhang recommended that mothers intervene in the NICU to care for premature infants. [30] In this study, infants were also massaged by their mothers. In another study, acupuncture and foot massage reduced pain and were effective in infants, but there was no statistically significant difference between acupuncture and massage. Acupuncture and massage could be used to treat procedural pain in infants [24]. In general, the findings of the present study show that pain in children increases during and after the procedure, but with Massage by mothers the amount of pain significantly decreases.

Esfahani *et al.* stated that breastfeeding during vaccination has a greater analgesic effect than massage therapy [31]; In the above study, in the massage therapy group, the researcher massaged the baby's middle finger, ring finger, or palm for 60 seconds and finally performed the vaccination procedure; But the difference in the method of massage in this study could be the reason for lower the effectiveness of massage, compared to the present study.

Another study suggested that there may be a number of infants with CHD for whom postoperative massage is not an effective non-pharmacological pain intervention. Maternal anxiety may be associated with pain and drugs. This suggests that interventions to reduce parental anxiety may be a potential way to reduce postoperative pain in the infant. Further research is needed to determine the effect of gentle massage on the baby after surgery [32]. However, in the present study, the infants did not have surgery or congenital disease and the massage was performed by the mothers.

In general, the findings of the present study demonstrate that pain increases in children during and after invasive procedures, but with a massage performed by mothers, the amount of pain decreases significantly. A study by Mirzarahimi *et al.* showed that gentle massage could block the pain transmission through closing the valves or activating opioid and non-opioid endogenous pathways; This study supports the hypothesis that massage therapy would have an analgesic and relaxing effect on neonatal pain. [33]

Infants, who cannot communicate verbally, use crying to communicate. Crying has been accepted as an important behavioral indicator for pain assessment in infants [17, 34]. This study also showed that acupuncture and massage reduce the duration of crying and demonstrated the effect of acupuncture and massage in reducing pain [35], which is consistent with the present study.

Another study suggested that massage may improve the deposition of body fat and, thus, the quality of growth of preterm infants in a specific sexual way. [36] Breastfeeding and massage reduce neonatal pain during Intravenous blood sampling procedures. It is

recommended that breastfeeding and massage be performed to reduce neonatal pain during painful stages [37]. This also shows the important role of massage in neonatal health as a treatment strategy.

In a study by Roshanray, the results showed that after 5 minutes, pain and heart rate were significantly reduced in the mother hug group compared to the massage and control groups. It is recommended to place the baby in the mother's arms during painful stages to reduce pain, improve physiological symptoms, and promote neonatal health [38]. In this study, the infants were massaged by their mothers, which established a kind of relationship between mother and infant.

There was one limitation in this study, and that was infants' facial reactions to pain. Physiological reactions may be influenced by a variety of disturbing factors, including infant hunger or discomfort, mood, sleep / wake state, and previous painful experiences. Although some of these variables were controlled as much as possible in our analysis, future studies should consider these factors in the neonatal selection and data analysis. It is also important to determine whether massage has lasting effects or whether its beneficial effects diminish or disappear after cessation of massage, and longitudinal studies are needed to investigate this issue.

CONCLUSION

Clinical and therapeutic interventions in the intensive care unit cause pain in infants and babies are able to feel and remember this pain. Considering that frequent exposure to painful procedures and lack of pain relief in infants could cause physical, mental, and behavioral complications in them, and considering the effect of body massage by the mother in reducing neonatal pain, which is caused by invasive procedures, it is recommended that nurses use this method as an effective intervention to reduce the pain of infants.

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