

The Effects of Massage and Breastfeeding on Response to Venipuncture Pain among Hospitalized Neonates

Abstract

Background: Untreated procedural pain leads to long-term and short-term complications in neonates. Preventing pain in sick infants and neonates, whose conditions are getting worse, not only is a professional and legal duty but also a prevention measure to decrease future psychological and even neurological complications. Therefore, nurses should prevent newborns' pain. The aim of this study was to compare the effects of massage and breastfeeding on the pain of the neonates. **Materials and Methods:** This was a clinical trial conducted among 75 full-term and near-term infants who underwent venipuncture. The newborns were randomly allocated to the following groups ($n = 25$ for each): group 1, breastfeeding; group 2, massage; and group 3, control. In the first group, venipuncture was done 2 minutes after breastfeeding. In the second group, massage was done with effleurage technique for 3 minutes and venipuncture was done 2 minutes after massage. The Neonatal Infant Pain Scale (NIPS) was used for pain measurement in the first 30 seconds of venipuncture. Data were analyzed by *t*-test and one-way analysis of variance (ANOVA). **Results:** The lowest mean pain score recorded in the massage group (0.92) whereas it was 4.84 in the breastfeeding group and 6.16 in the control group. ANOVA test and post-hoc statistics revealed that both interventions resulted in a significant reduction of the pain scores. **Conclusions:** According to the findings of this study, the lowest pain score was in massage group, then in breastfeeding group and control group accordingly. Considering the fact that massage and breastfeeding are natural, useful, and cost free interventions and do not need any special facility, these methods are suggested in pain management and pain control during painful procedures administrated for infants.

Keywords: Complementary therapies, Iran, Neonatal Intensive Care, nursing, pain, venipuncture

Introduction

Pain is a worldwide health problem and a sensation which starts from birth and ends with death.^[1] For many years, it was believed that neonates and infants do not feel pain due to their inadequate nervous system development, however, recent researches revealed an opposite idea, as immaturity of pain modification system makes the neonates prone to feel more pain compared to adults.^[2]

Unmanaged pain in neonates can cause short-term and long-term complications. Its short-term complications include increased heart rate, blood pressure (BP) and oxygen bounded with hemoglobin, changes of sleep wake cycle, behavioral disorders up to 22 hours after a painful procedure, and increased awareness regarding the next painful procedure.^[2,3] Biochemical and endocrine changes such as hypoglycemia,

increased protein catabolism, increase in cortisol, catecholamine release, glucagon, growth hormone, rennin, aldosterone, antidiuretic hormone, and a decrease in insulin are among reported physiologic changes.

The psychological and mental complications of the first painful experience can be prevented through prevention of causing pain in neonates and infants. Behavioral responses to pain include cry, changes in body movements from relaxed tone to flexion and extension, and changes in facial muscles contractions.^[3] Long-term complications are changes in neonate future social behavior and disturbances in its growth and development.^[4] Therefore, if pain is controlled and managed among neonate and infants, mental and psychological complications due to the first painful experience can be prevented

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Access this article online

Website: www.ijnmrjournal.net

DOI: 10.4103/ijnmr.IJNMR_119_13

Quick Response Code:



How to cite this article: Zargham-Boroujeni A, Elsagh A, Mohammadizadeh M. The effects of massage and breastfeeding on response to venipuncture pain among hospitalized neonates. Iranian J Nursing Midwifery Res 2017;22:308-12.

Received: May, 2013. **Accepted:** February, 2017.

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in the next stages of life. In Neonatal Intensive Care Units (NICUs), numerous often painful medical and treatment procedures are administered for the neonates based on their disease. There are medicational and nonmedicational pain relief methods. Nurses administer pain relief medicines in special situations under supervision of a physician, however, some of the nonmedicational methods can be independently adopted by them before and sometimes during painful procedures. As experience of pain can have long-term complications, it should be specially noted.^[5] Based on nursing ethics, nurses should relieve pain in neonates who are exposed to pain. There are numerous nonmedicational pain relief methods. Recently, nonmedicational and nonsurgical pain relief methods have been highly emphasized as a better way of pain relief. These methods include sport therapy, acupressure, acupuncture, relaxation techniques, massage therapy, breast feeding, and meditation.^[6-8] In addition, personnel's and parental caring exercises can be effective in the reduction of pain response and stress. They include positioning, sleep regulation, music or skin touch, shaking and non-nutritive sucking.^[9-11] One of the strategies to reduce pain is breast feeding during painful procedures. The research on breast milk showed that neonates on breast feeding take numerous and notable long-term advantages from their mothers' milk.^[12] Numerous studies showed that feeding by breast influences the response to pain through a sensory-oral mechanism. It has been also reported that breast feeding by breasts contains natural methods to reduce pain including skin touch, sucking, and sweet taste of mothers' milk. A recent research showed that specific and favorite tastes diminish neonates' pain. Less than 2 cc of milk with its protein and lipid as well as its sweeteners diminish pain in human's neonates so that their cry disappears spontaneously.^[13] Mechanical effect of sucking blocks transition of pain impulses to brain through gate control mechanisms. Based on the gate control theory, if pain is not recognized, or transition of its impulses is blocked to brain, negative outcomes of pain would not happen.^[14] Low cost, quick effect, convenient availability, and being natural, joyful, effective, and safe are among the advantages of this pain control method.^[15]

Through some safe and easy palliative methods such as massage therapy, pain intensity, resulting from venipuncture, can be relieved.^[16] Neonatal massage diminishes the level of stress through the reduction of cortisol and norepinephrine serum levels. Its primary effect is the improvement of circulation. When muscles are rubbed and stretched, venous return to heart is improved and acids, such as lactic acid, are removed from muscles. It improves circulation leading to increased tissue perfusion and oxygenation, which stimulates endorphins release as the natural body pain relief agents.^[15] Various studies have reported that massage can have positive effects on the sleep, circadian cycles, cry pattern, neonates' stress level, mother–neonate interaction,

and growth and development of neonates.^[17,18] In a study conducted by Gray *et al.* among neonates undergoing blood sampling from their heels, the authors showed that the neonates receiving massage for 15 minutes prior to venipuncture procedure cried less and had less increase in heart rate compared to control.^[19] Advantages of massage include stimulation of circulation and digestive system, better weight gain, reduction of stress pressure, positive effect on neurological growth, better relationship between the parents and the neonate, and improvement of neonates' sleep. Massage therapy is known as a helpful complication free method.^[20] It seems that this method can be applicable among the neonates who cannot orally suck as well as those who are NPO. We studied the effect of massage and breast feeding on the response to pain due to venipuncture among neonates to suggest a way to reduce pain among the NPO neonates.

Materials and Methods

This is a double blind clinical trial (IRCT2013020212346N1) conducted on all neonates who were candidates for venipuncture in the NICUs of selected hospitals affiliated to the Isfahan University of Medical Sciences, 2013. The participants met the inclusion criteria which were conscious neonates, neonates' aged >34 weeks, term and near-term neonates, no limitation for breastfeeding, being on mother's milk feeding, having experience of being fed by mothers' breasts, no paralysis in limbs, and major congenital abnormalities such as Down syndrome and asphyxiation, being relaxed, no cry before venipuncture and a need for venipuncture.

Exclusion criteria were milk aspiration during study, or apnea which could disturb the intervention. The participants were selected through convenient sampling, and the sample size was calculated, considering confidence level of 95%, power of 0.80 and $d=0.8SD$, as 21 participants in each group. With regard to possible dropout of participants, 25 participants were assigned to each group. Then, the neonates meeting the inclusion criteria were assigned to each group (total of three groups) through random computation. The data were collected by a personal characteristics and height and weight record questionnaire and NIPS pain measurement scale. This scale was used to measure the pain intensity of the participants during venipuncture. First, all the nurses in each center who were responsible for venipuncture were selected for cooperation and underwent training. The education was conducted concurrently for all of them in a single place.

Their identical length of time spent on neonates' venipuncture and their performing the procedure effortlessly were first observed, and then, they started to work.

The nurse responsible for venipuncture was unaware of assignment of neonates to research groups. The researcher

was educated about superficial stroking massage technique. After making necessary coordination and detecting and selection of qualified neonates (neonates over 34 weeks old and term and near term neonates), the research goals were explained to their parents, and after gaining their trust, their written consent was obtained and the neonates entered the study. The neonates in three groups were capable of being on breastfeed of their mothers. A blue angiocatheter was used for their venipuncture, and if venipuncture failed in the first trial, 5 minutes was given to the neonate to rest, and the procedure was repeated again. Each neonate received total of two trials, and if venipuncture was not successful both times, the participants was removed from the study. If the neonate was in the breast feeding group (first group), the mother started breastfeeding until the researcher observed active sucking. This was continued for 3 minutes and then venipuncture was administrated.

If the neonate was in the massage group (second group) effluage massage technique (stroking) was administrated on venipuncture site for 3 minutes, and then, venipuncture was administrated (most of the research in this context report three minutes of massage to be adequate).^[20] In the control group (third group), no intervention was administrated to manage pain, and then, venipuncture was done. All stages of venipuncture were recorded by a Panasonic handy cam. Then, recorded films were observed and scored by a person who was blind to the assignment of neonates to the three different groups. To prevent bias and prejudice, this person was unaware of the group, which the neonate she was watching belonged to, so that scoring was made based on codes. Scoring started by beginning of venipuncture and was conducted only once. Scoring was for the first 30 seconds from insertion of the needle to the skin to dressing of the venipuncture site.

Ethical considerations

This study has been approved in both methodological and ethical aspects by the Isfahan University of Medical Sciences, after applying all of the necessary ethical measures, including informing the parents about the aims and procedures of the study, the right to exit the study at any time, confidentiality of their identity and getting written consent from all of them.

Results

This study was conducted on 75 neonates who were randomly assigned to the three groups of breast feeding, massage, and control (25 patients in each group).

Sampling was conducted from November 2012 to February 2013 and the data were collected. There were 14 female neonates (56%) in the breast feeding group, 16 (64%) neonates in the massage group, and 13 neonates (52%) in the control group. There were also 11 (44%) males in the breast feeding group, 9 (36%) in the massage

group, and 12 (48%) in the control group. Chi-square test showed no significant difference in the frequency distribution of sex in interventional groups. The number of neonate <2500 g was 5 (6.67%) in all the groups and the number of neonates >2500 g was 70 (93.33%). Chi-square test showed no significant difference in frequency distributions of weight between groups.

Number of neonate <37 weeks old, was 40 and in age groups ≥ 37 weeks was 35 (the number was accidentally obtained). As a difference was observed in the gestational mean age of groups, to omit the effect of this variable from the relationship of type of intervention and pain in neonates, variable of gestational age was entered to univariate ANOVA model as a covariance, in which the type of intervention was entered as the principle variable and score of pain as independent variable. Results showed that the association between type of intervention and neonates' pain was yet significant by deletion of the effect of gestational age variable ($F = 292.80$, $P < 0.01$). Mean scores of pain were 0.92, 6.16, and 4.84 in the massage, control, and breastfeeding groups, respectively, which showed a significant difference in pain scores ($F = 437.50$, $P < 0.01$).

Dunken *post hoc* test, at a significance level of 0.05, showed a significant difference in pain score between each group and the others. As mentioned before, randomization was successful as there was no significant difference in groups concerning age, sex, and weight.

Discussion

In the present study, negative effects of procedural pains in neonates have been indicated and pain management benefits have been explained. There is also significant research in this context and various methods have been suggested to reduce pain. As observed in evidence, the researchers worked on short invasive procedures to collect data in studies conducted on neonates, which led to a limitation in perception of pain behaviors among neonates. In fact, 10 years ago, Larson in a literature review on pain management in neonates, suggested several procedural and post operative pain reduction methods. Since then, no significant progress was noted in reduction of these sorts of pain. Meanwhile, advanced health system needs an applicable pain reduction method to be necessarily administrated in conventional neonates care so that there is no gap between research and clinical practice.

Klodia Maria (2008) stated that sucrose is efficient in pain reduction but causes nausea, vomiting and bloat in neonates and premature neonates. It also leaves some residual in neonates' stomach. Therefore, we tried to use a risk free, low cost, and convenient method (breastfeeding selected with regard to previous research context), which could be practically administrated by and conveniently

available to nurses. Emine Effe, in his study on the effect of breastfeeding on vaccination pain reduction, concluded that breast feeding significantly reduced vaccination pain and shortened the length of neonates' cry. In addition, 9 neonates out of 33 did not cry at all and the rest showed a significant reduction in their duration of cry.^[13]

Razak *et al.*, in a study on the effect of breast feeding on vaccination pain, showed that breastfeeding diminished pain in 30% of the neonates in the intervention group. Meanwhile, vaccination was painful in 95% of the neonates in control groups.^[21]

Garry *et al.* reported that massage in 33–40 week old neonates had positive effects on weigh gaining and heart rate.^[19]

Why Cheek (2012) stated that massage of upper limbs could be an efficient technique in reduction of venipuncture pain as it reduced pain manifestation behaviors. Pain score was measured by PIPP revealing the scores of 5.84 and 7.30 in the massage and control groups, respectively, which is consistent with the findings of the present study.^[22]

Based on research, massage is an appropriate method to relieve pain and is applied in clinics and medical treatment centers to relieve chronic pain, migraine headaches, labor pain, and rheumatoid arthritis, however, there is inadequate research in context of prevention of pain through massage. Gate control is the mechanism, which explains pain reduction due to massage therapy.^[23]

Based on this theory, pain stimulates shorter and less myelinated nerve fibers. On the other hand, the impulses made by pressure are transmitted to brain by longer and more myelinated fibers, through which the impulse reaches to brain sooner, consequently, the brain receives the impulses of massage sooner and the gate is closed; therefore, no more message is transmitted.^[24]

Another theory explains that massage increases serotonin, which is a natural body pain killer and suppresses the pain. Mean score of pain was less in massage group compared to other groups in the present study, which suggests that massaging neonates before venipuncture can reduce their pain. Mean score of pain was also less in breastfeeding group compared to control, however, the reduction in pain was less, compared to massage group. In the present study, breastfeeding stopped before venipuncture, however, in other similar studies, breastfeeding continued during this procedure, which can be possibly the reason for the difference in results of these studies.

Individual differences such as familial and psychological factors, and physiologic responses of the neonates can affect pain assessment. Although random allocation could control these factors by equally distribute the variables among the research groups, this can be considered as a limitation for this study.

Conclusion

According to the findings of this study, the lowest pain score was in massage group. Also breastfeeding group score was lower than control group. Considering the fact that massage and breastfeeding are both natural, useful and free interventions and do not need any special facility, these methods are suggested in pain management and control during painful procedures for infants.

Acknowledgement

We thank the parents and their infants for participating in this study. We also thank the attending physicians and the nurses at Amiralmomenin, Azahra & Beheshti Hospitals and all friends who assisted with the project.

Financial support and sponsorship

This research was supported by Isfahan University of Medical Sciences, project number 391294.

Conflicts of interest

There are no conflicts of interest.

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