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# The Effect of Breastfeeding on the Newborn's Comfort and Pain Levels During Heel Blood Collection

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## ABSTRACT

This research was planned to determine the effect of breastfeeding on newborns' behavioral pain and comfort scores during heel blood collection. A pretest/posttest experimental-control group design was used. The research was conducted between August 2021 and June 2022. A total of 50 newborns, including 25 in each of the experimental and control groups, were included in the study. An Infant Descriptive Information Form, the COMFORTneo Behaviour Scale, the NIPS-Neonatal Infant Pain Scale, and the LATCH Breastfeeding Diagnosis and Assessment Tool were used in the study. The comfort behaviors and pain scores of infants in the experimental and control groups were evaluated during the heel blood collection process. The comparison of the comfort behaviors (comfort, pain, and distress), differences between pretest-posttest scores on the NIPPS pain score, and crying duration of the newborns in the experimental and control groups indicated a significant difference ( $p < 0.05$ ). The intra-group differences between the mean pretest and posttest scores of both the intervention and control groups were found to be statistically significant ( $p < 0.05$ ). Breastfeeding is an important nursing intervention for reducing procedural pain in newborns. The breastfeeding method reduces pain and distress and increases comfort for newborns during the heel blood collection process.

## HIGHLIGHTS

- Breastfeeding is an important nursing intervention for reducing procedural pain in newborns.
- The breastfeeding method reduces the pain and distress of the newborn during the heel blood collection process and increases comfort.
- Neonatal nurses can diversify the effectiveness of non-pharmacological methods in painful interventions by evaluating them with appropriate tools

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Breastfeeding; neonatal pain; comfort behaviors; heel blood

## Introduction

Pain is a symptom that should be managed in newborns due to its physiological and psychological negative effects. Nursing interventions are largely effective in pain management in painful interventions in newborns. Many procedures such as blood collection and

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intramuscular injections cause pain in newborns (Akcan & Yiğit, 2016; Eroğlu & Arslan, 2018). It is not clear how newborns can assess their pain (Eriksson & Campbell-Yeo, 2019). Pain is graded by interpreting behavioral, physiological, and neurochemical (hormonal and metabolic) changes in acute painful procedures in newborns and infants (Eroğlu & Arslan, 2018). Crying accompanied by the baby's facial expression, protrusion of the eyebrows, and opening of eyes, nasal flare, and mouth during painful interventions are among the most general evaluation criteria (Eriksson & Campbell-Yeo, 2019; Yılmaz & Kurt, 2021). Crying is usually associated with pain, but hunger and other stimuli may also cause crying (Koress et al., 2019). These behavioral assessments also reflect the infant's comfort. The inability to manage painful interventions negatively affects mother-infant interaction, nutrition, adaptation to the outside world, and the development of senses (Dinçer et al., 2011). This negatively affects the development of the baby in the early period.

The use of pharmacological agents for interventions such as vaccination and blood collection in newborns is not common. Instead, positioning the baby appropriately, oral sucrose, hot-cold applications, reflexology, massage, music, and breastfeeding are among the most preferred non-pharmacological methods (Fallah et al., 2017; Gad et al., 2019; Göl & Altuğ Özsoy, 2017; Kucukoglu et al., 2016). Oral applications were found to be superior to other methods in pain management since the 0–1 age period is considered the oral period and the infant's greatest source of pleasure is sucking (Zurita-Cruz et al., 2017). Breastfeeding the baby and the bond it establishes with the mother during this time support the basic sense of trust, helping to reduce stress and the resulting negative physiological effects (Komaroff & Forest, 2020). The relationship between pain and breast milk is explained by the anti-nociceptive mechanism, the pacifier method, and mother-infant communication (Erkul & Efe, 2015; Harrison et al., 2016). In addition, skin and eye contact between the mother and the baby during breastfeeding helps to regulate the infant's body temperature, the baby in the holding position to feel less pain, and the physiological responses to decrease (Cirik & Efe, 2020; Fallah et al., 2017). These positive effects of breastfeeding help the infant to calm down after the painful intervention. Breastfeeding continues to be the first preferred method in the pain management of infants due to its practical and easy implementation and the absence of any cost and negative effects. In the literature, non-pharmacological methods, such as massage, appropriate position, and warm application, are frequently used during heel blood collection. In this study, the effect of breastfeeding on the pain and comfort of the newborn during the heel blood collection process was evaluated.

## Methods

### *Purpose and type of the research*

This study was carried out to determine the effect of breastfeeding on behavioral pain and comfort scores of newborns during the heel blood collection process.

### *Setting*

A pretest/posttest experimental-control design was used. The research was carried out in the Obstetrics and Gynecology Clinic of a state hospital located in a province in the western

region of Turkey between August 2021 and June 2022. The study group included a total of 50 infants, 25 in each of the experimental and control groups.

### ***Sample characteristics***

The study sample consisted of infants who were born between the 38<sup>th</sup> and 40<sup>th</sup> gestational weeks by cesarean section or normal birth, were healthy, and did not have any respiratory or cardiac problems. Healthy infants of 50 mothers who agreed to participate in the study made up the sample. The necessary sample size for the study was calculated as 26 subjects in each group on the GPOWER 3.1.09 statistical software based on the pain scores in the study of Modarres et al. (2013), a significance level of 0.05, power of 80%, and an effect size of 0.80 calculated in the study of Modarres et al. (2013).

### ***Inclusion criteria for newborns***

Newborns who were born between the 38<sup>th</sup>–40<sup>th</sup> gestational weeks and whose mothers started breastfeeding and agreed to participate in the study were included.

### ***Exclusion criteria for newborns***

Newborns who were born premature, who had respiratory problems or could not be breastfed for some reason, and whose mothers did not agree to participate in the study were not included.

## **Data collection tools**

### ***Newborn descriptive information form***

This form was used to evaluate the infant's birth week, birth weight and height, birth mode, and sucking status. It was created by the researchers based on studies in the literature with similar design to our study on the assessment of pain and other parameters of infants during the heel blood collection process (Avan Antepi et al., 2022; Aydin & İnal, 2019).

### ***COMFORTneo behaviour scale***

The Comfort Scale is a scale developed by Ambuel et al. (1992) to evaluate the distress of patients receiving ventilator support in the pediatric intensive care unit (Ambuel et al., 1992). Van Dijk et al. (2009) revised the scale and determined the validity and reliability of the COMFORTneo scale to measure behavior in newborns without physiological parameters (Van Dijk et al., 2009). The validity and reliability of the Turkish version of the COMFORTneo scale was performed by Kahraman et al. (2014).

This is a Likert-type scale consisting of six parameters: alertness, calmness/agitation, respiratory response, crying, body movements, facial tension, and muscle tone. The “respiratory response” parameter was evaluated in newborns who received mechanical ventilator support, and the “crying” parameter was evaluated in those who did not receive this support. The NCBS is an assessment tool that includes numerical assessment scales to

enable nurses to evaluate the infant's pain and distress and to determine comfort. Numerical evaluation scales are intended to do evaluations based on nurses' observations. Each item on the scale is scored from 1 to 5 and the assessment is made on the total score. Scores on the NCBS range between 6 and 30, which are interpreted as follows: 9–13, the infant is comfortable; 14–30, the infant has pain or distress, is uncomfortable, and needs interventions for comfort. In addition, on this scale, the nurse or observer evaluates the pain and distress levels of the babies between 0 and 10. When the nurse evaluates pain between 1–3, it is considered low-level pain; between 4–6, it is considered moderate pain; and between 7–10, it is considered severe pain. When the nurse evaluates distress between 1 and 3, it is considered low-level distress; between 4 and 6, it is considered moderate distress; and between 7 and 10, it is considered serious stress (Kahraman et al., 2014).

### ***The NIPS-Neonatal Infant Pain Scale***

This scale is used to evaluate the behavioral pain status of newborns after interventional procedures. It was developed by Lawrence et al. (1993). Cronbach's alpha was found as 0.95, 0.87, and 0.88 before, during, and after the procedure, respectively (Lawrence et al., 1993). Turkish validity and reliability study was conducted by Akdovan (1999) and according to the before-, during- and after-procedure scores, Cronbach's alpha values were found to be 0.83, 0.83, and 0.86, respectively. The scale was created to measure the response of term or preterm newborns to procedural pain and can be used in newborns up to six weeks. Assessment parameters include infants' facial expressions, crying, breathing patterns, arm movements, leg movements, and stimulation.

### ***LATCH Breastfeeding Diagnosis and Assessment Tool***

This is an observational scale used for the evaluation and diagnosis of breastfeeding. It was developed by Jensen et al. (1994). In the LATCH Breastfeeding Diagnosis and Assessment Tool, L stands for "latch on breast," A for "audible swallowing," T for "the type of nipple," C for "the comfort of breast/nipple," and H for "the hold/position." Each item is evaluated between 0–2 points. The lowest score that can be obtained from the total scale is 0 and the highest score is 10. The scale has no cutoff point. A low score on the scale indicates the need for active intervention, support, and follow-up after discharge regarding breastfeeding. Higher scores on the LATCH scale show a high level of breastfeeding success. In the latest Turkish validity and reliability study of the scale, Cronbach's alpha value was found to be 0.95 (Yenal & Okumuş, 2003).

## **Procedures**

The heel blood of the infants in the experimental group ( $n = 25$ ) was collected while they were in their mother's embrace and were breastfed. In infants in the control group ( $n = 25$ ), heel blood was taken in the supine position, where the position of the infant was fixed by the nurse, which is the standard practice of the clinic. LATCH breastfeeding, neonatal pain, and newborn comfort behavior scale scores, procedure time, and crying time were recorded for babies in both groups. The LATCH scale was used in both groups to evaluate the sucking skills of the infants. In both groups, while heel blood was taken from the babies, the mothers

were present in the room where the procedure was performed. The data in the study were collected by three nurses, one of whom had a master's degree, who participated in the study as a researcher.

## Data analysis

IBM SPSS 24 software package was used for data analysis. Descriptive data were evaluated with frequency, percentage, and mean values. The distribution of the data obtained via the scales was evaluated with the Shapiro-Wilks test, and it was determined that the data did not have a normal distribution according to the groups. The Mann-Whitney U test was used to make an intra-group time comparison of scale scores of the experimental group, and the Wilcoxon test was used to compare the mean pre-and posttest scores of the groups. The significance level was accepted as 0.05.

## Ethical consideration

In order to conduct the study, approval was obtained from the University's Non-Invasive Clinical Research Ethics Committee and the hospital. Written and verbal consent was obtained from the mothers of the infants participating in our study.

## Results

When the sample characteristics were examined, it was determined that the experimental and control groups were similar in terms of their descriptive characteristics and that there was no statistical difference (Table 1).

The mean pretest and posttest scores of the experimental group on the comfort scale were  $9.44 \pm 1.08$  and  $12.36 \pm 3.87$ , respectively and the difference was  $2.92 \pm 3.35$ . The same scores of the control group on the comfort scale and the difference between the scores were  $8.92 \pm 2.08$ ,  $22.96 \pm 4.48$ , and  $14.04 \pm 3.76$ , respectively. There was no statistical difference 180 between the mean pretest scores of the experimental and control groups ( $p > .05$ ), while a significant difference was found between the groups when posttest and pretest-posttest score differences were compared ( $p < .05$ ). It was also found that the intra-group mean pretest-posttest score differences of both the intervention and control groups were statistically significant ( $p < .05$ ) (Table 2).

**Table 1.** Descriptive characteristics of the experimental and control groups.

Variables	Experimental	Control	U/ $\chi^2$	<i>p</i>	
Birth week	39.44 ± 1.00	38.76 ± 2.18	258.000	.262	
Birth weight	3522.40 ± 458.10	3346.60 ± 392.85	251.500	.236	
Birth height	50.44 ± 1.15	50.32 ± 1.11	290.000	.639	
Head circumference	35.16 ± 0.68	35.00 ± 0.41	277.000	.370	
LACTH score	9.40 ± 2.08	10.00 ± 0.00	275.000	.077	
Infant's gender	Female	12 %48.0	12 %48.0	0.000	1.000
	Male	13 %52.0	13 %52.0		
Mode of birth	Normal	13 %52.0	13 %52.0	0.000	1.000
	C-section	12 %48.0	12 %48.0		
Feeding in the last half an hour	Yes	11 %44.0	14 %56.0	0.320	.572
	No	14 %56.0	11 %44.0		

**Table 2.** Comparison of the mean pain and distress scores assessed by nurse, and comfort scale score.

Comfort scale score						
Group	<i>n</i>	Pretest M ± SD	Posttest M ± SD	Difference M ± SD	Z	<i>p</i>
Experimental	25	9.44 ± 1.08	12.36 ± 3.87	2.92 ± 3.35	3.531	<.001
Control	25	8.92 ± 2.08	22.96 ± 4.48	14.04 ± 3.76	4.380	<.001
U		259.000	31.000	7.500		
<i>p</i>		0.256	<0.001	<0.001		

Pain score assessed by nurse						
Group	<i>n</i>	Pretest M ± SD	Posttest M ± SD	Difference M ± SD	Z	<i>p</i>
Experimental	25	0.00 ± 0.00	1.52 ± 1.98	1.52 ± 1.98	3.197	<.001
Control	25	0.00 ± 0.00	7.28 ± 1.79	7.28 ± 1.79	4.391	<.001
U		312.500	15.500	15.500		
<i>p</i>		1.000	<0.001	<0.001		

Distress scale score assessed by nurse						
Group	<i>n</i>	Pretest M ± SD	Posttest M ± SD	Difference M ± SD	Z	<i>p</i>
Experimental	25	0.00 ± 0.00	1.40 ± 2.00	1.40 ± 2.00	3.088	<.001
Control	25	0.00 ± 0.00	7.28 ± 1.79	7.28 ± 1.79	4.391	<.001
U		312.500	15.500	15.500		
<i>p</i>		1.000	<0.001	<0.001		

**Table 3.** Comparison of the NIPS scores of experimental and control groups.

NIPS scale score						
Group	<i>n</i>	Pretest M ± SD	Posttest M ± SD	Difference M ± SD	Z	<i>p</i>
Experimental	25	0.00 ± 0.00	1.32 ± 1.72	1.32 ± 1.72	3.208	.001
Control	25	0.00 ± 0.00	5.92 ± 1.25	5.92 ± 1.25	4.455	<.001
U		312.500	22.500	22.500		
<i>p</i>		1.000	<.001	<.001		

The mean pretest and posttest pain scores and the difference between the scores were 0.00 ± 0.00, 1.52 ± 1.98, and .52 ± 1.98 for the experimental group and 0.00 ± 0.00, 7.28 ± 1.79, and 7.28 ± 1.79 for the control group, respectively. No statistical difference was found between the mean pretest scores of the experimental and control groups (*p* > .05). When the posttest and pretest-posttest score differences were compared between the experimental and control groups, a significant difference was found (*p* < .05). Also, the intra-group mean pretest-posttest score differences of both the intervention and control groups were found to be statistically significant (*p* < .05).

The mean pretest and posttest distress scale scores and the difference between the scores were 0.00 ± 0.00, 1.40 ± 2.00, and 1.40 ± 2.00 for the experimental group and 0.00 ± 0.00, 7.28 ± 1.79, and 7.28 ± 1.79 for the control group, respectively. There was no statistical difference between the mean pretest scores of the experimental and control groups (*p* > .05). When the posttest and pretest-posttest score differences were compared between the experimental and control groups, a significant difference was found (*p* < .05). In addition, the intra-group mean pretest-posttest score differences of both the intervention and control groups were statistically significant (*p* < .05) (Table 2).

The mean pretest and posttest scores of the experimental group on the NIPS scale were  $0.00 \pm 0.00$  and  $1.32 \pm 1.72$ , respectively and the difference was  $1.32 \pm 1.72$ . The scores of the control group on the same scale and the difference between the scores were  $0.00 \pm 0.00$ ,  $5.92 \pm 1.25$ , and  $5.92 \pm 1.25$ , respectively. There was no statistical difference between the mean pretest scores of the experimental and control groups ( $p > .05$ ); however, there was a significant difference between the groups when posttest and pretest-posttest score differences were compared ( $p < .05$ ). It was also found that the intra-group mean pretest-posttest score differences of both the intervention and control groups were statistically significant ( $p < .05$ ) (Table 3).

The mean crying time values of the experimental and control groups after the procedure were  $1.13 \pm 2.33$  and  $1.75 \pm 1.45$ , respectively. A significant difference was found between the crying times of the experimental and control groups ( $p = .001$ ).

## Discussion

Many non-pharmacological methods applied to newborns during painful procedures increase comfort by reducing pain and distress. Some studies have shown that skin-to-skin contact, holding, and breastfeeding are very effective in pain during the heel blood collection process of newborns (Aydin & İnal, 2019; Wang et al., 2022). Our study included detailed evaluations thanks to its design and revealed that breastfeeding positively affected the stress and comfort of the newborn by reducing the pain during heel blood collection. In our study, effective sucking skills were evaluated with the LATCH scale, and the infants in the experimental and control groups were found similar in this respect. In similar studies, it was seen that breastfeeding provided an effective position with skin contact and holding and provided relief for the baby in painful interventions (Aydin & İnal, 2019; Erkul & Efe, 2015). Although it varies according to the severity of pain, newborns respond with body movements, such as crying, alertness, and muscle tone. Tension in the body, face, and body movements is important in evaluating the comfort of the newborn. Multiple sensory stimuli have been found to be effective in calming the newborn and increasing comfort during painful procedures (Aydin & İnal, 2019; Wang et al., 2022). With breastfeeding via the oral route, which is an important source of pleasure, the baby calms down, and the basic sense of trust thanks to eye contact with the mother and the body temperature balance via skin contact is provided. In our study, newborn comfort behaviors were evaluated by the nurse. When the before- and after-procedure comfort scores were evaluated, a significant difference was found between the intervention and control groups in terms of the posttest and pretest-posttest score differences ( $p < .05$ ). In this study, the routine practice of putting the baby to bed and collecting heel blood was compared with the mother's breastfeeding. The process of collecting heel blood by just holding the baby in the mother's arms has not been compared. The main objective of this study is to compare breastfeeding with routine practice. However, there are also studies in the literature showing that pain decreases, especially when holding the baby or taking heel blood during kangaroo care (Cirik et al., 2023; İnal et al., 2022). Just holding the baby in your arms reduces the baby's heart rate, oxygen saturation, respiratory rate, and crying time during painful interventions and increases the baby's comfort (Çantaş Ayar et al., 2023; Todil & Cetinkaya, 2022). In this study, we evaluated the effect of exclusive breastfeeding on the pain experienced during the

heel prick procedure. We think that if the mother's holding situation had also been evaluated, the pain might have decreased, although not to the same level.

The stimulus provided for the baby with breastfeeding is one of the most practical methods to increase comfort in pain management. The results of our study are similar to those in the literature. In addition, the newborn comfort behavior scale enabled the nurse to evaluate the distress and pain of the newborn before and after the procedure. According to the newborn comfort behavior scale, it was observed that there were no signs of distress or pain in the newborns before the procedure. However, after the heel blood collection procedure, a statistically significant difference was found in the distress and pain scores of the breastfed babies in the experimental group compared to the babies in the control group. With breastfeeding, the comfort behaviors of babies increased and their distress and pain scores decreased. Newborns are relieved by methods, such as hugging, vocal stimuli, and pacifier use, due to their undeveloped self-regulation skills in painful interventions (Gad et al., 2019; Koukou et al., 2022). The effectiveness of these methods also differs according to the intensity of the pain. In similar studies, the NIPPS pain scale has been frequently used in the evaluation of acute painful interventions. In our study, no difference was found between the pretest NIPPS scores of both groups, while the mean pain scores of breastfed babies after the procedure decreased compared to the control group, and a statistically significant difference was found. Heel blood collection is an acute procedure and causes intense pain in newborns. Breastfeeding is among the most preferred clinical practices for reducing pain, calming the baby, and reducing the crying time (Gad et al., 2019). The positive effect of breastfeeding on painful interventions strengthens the mother-infant interaction. During breastfeeding, the mother's embrace and communication with the baby lead to a decrease in the accelerated heart rate, respiratory rate, and oxygen requirement in the newborn. In this way, the self-regulation behaviors of the newborn regarding pain are also supported (Benoit et al., 2021).

Another parameter evaluated in our study was the crying time. Newborns cry longer when they experience intense pain and are not appropriately sedated. The shorter the crying period due to pain is, the more easily the baby calms down. It was found that the mean crying times of the infants in the breastfeeding group were significantly shorter than in the control group, due to better management of pain. In similar studies, the breastfeeding method was found to reduce the crying time of infants during the heel blood collection process. These results were found to be consistent with the literature.

## Conclusion

Nurses can apply non-pharmacological, practical, and effective interventions in the prevention, correct evaluation, and management of newborn pain. At the same time, these interventions reduce the newborn's pain, increase comfort, and may be effective in managing the newborn's stress. Breastfeeding is an important nursing intervention for reducing procedural pain in newborns. The breastfeeding method reduces the pain and distress of the newborn during the heel blood collection process and increases comfort. Neonatal nurses can diversify the effectiveness of non-pharmacological methods in painful interventions by evaluating them with appropriate tools. As a result of our study, it was determined that breastfeeding reduces pain and increases comfort.

However, since breastfeeding also involves embracing, this may also have a non-pharmacological effect. This method may also need to be evaluated as a separate group in studies.

### Limitations

During the dates when our research was carried out, the capacity of the obstetrics clinic was reduced due to the pandemic, and most pregnant women were directed to different hospitals. Some nurses working in the obstetrics clinic were also assigned to different clinics. Therefore, the planned sample size could not be reached. Pain and comfort were evaluated based on observation. An evaluation could not be made by taking a record. This is another limitation of our study.

### Contribution practice

Neonatal nurses use practical methods to effectively manage pain in interventional procedures. Successful breastfeeding is effective in pain management as well as nutrition. Heel blood collection is a painful procedure that must be managed by a neonatal nurse. Breastfeeding can be applied to newborns with different developmental characteristics for providing comfort and effective management of pain. There is a need for studies on the examination of the effects of other non-pharmacological methods that can be used in combination with breastfeeding on pain and comfort. In future studies, it is recommended to plan studies that will make comparisons with standard practices while the baby is breastfed only on the mother's lap. During these studies, it is recommended that the pain and comfort be evaluated by someone who has not seen the baby before by recording.

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### Authors contributions

İ.B. and A.A.K. conceived, designed the study and helped draft the manuscript. İ.B. and S.Ş.O. were involved in data acquisition and interpretation of data. İ.B. was the study statistician and contributed to the study design. S.Ş.O, P.K and H.U data collection, interpretation of data, preparation of the study report, manuscript writing, and reading and approving the drafts. İ.B, and A.A.K. participated in the interpretation of data, manuscript writing, critical review, and revising the manuscript.

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