J Pediatr Res 2022;9(2):146-56
DOI: 10.4274/jpr.galenos.2021.31957

Original Article

Effect of Prone Position, Pacifier and Smelling Breast Milk on Pain and Stress Parameters Among Term Neonates Undergoing Venipuncture: A Randomized Controlled Trail

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ABSTRACT

Aim: This study was conducted to examine the effect of three different methods for reducing pain and stress among term neonates undergoing venipuncture.

Materials and Methods: The research sample comprised 80 term neonates with hyperbilirubinemia who were being treated at the Neonatal Intensive Care Unit. The term neonates were allocated, according to the randomization method, into a smelling breast milk group (n=20), a pacifier/dummy group (n=20), a prone position group (n=20), and a control group (n=20).

Results: It was determined that there was a statistically significant correlation between the pain and stress score averages of the breast milk, prone position, and pacifier/dummy groups according to all measurements taken before, during, and after the procedure ($p<0.001$). It was discovered that there was a difference between the Premature Infant Pain Profile-Revised form (PIPP-R) and the mean stress scores of the control group and the breast milk, prone position, and pacifier/dummy groups after the procedure ($p<0.001$).

Conclusion: In study, it was concluded that the breast milk smell, prone position, and giving a pacifier made of sterile gloves are effective in reducing the pain and stress of newborns during the venipuncture procedure. Non-pharmacological methods such as smelling breast milk, prone position, and giving a pacifier/dummy are recommended to reduce pain and stress among term neonates during interventional procedures.

Keywords: Breast milk smell, giving pacifier/dummy, pain, prone position, stress, term neonates

Introduction

Newborn infants who encounter health problems in the first days of their life are referred to a Neonatal Intensive Care Unit (NICU) service in order to receive the necessary medical care and treatment (1). Neonatal hyperbilirubinemia is a common cause of readmission for newborn infants to hospital after early discharge (2,3). A high frequency of neonatal hyperbilirubinemia continues to be seen, both globally as well as in Turkey, and therefore remains an important public health problem (4). Neonatal hyperbilirubinemia is defined as a general yellow coloring of the sclera and skin in newborn infants. About 60% of infants born in the term period and around 80% of pre-term infants develop hyperbilirubinemia in the first days of life; hyperbilirubinemia requiring

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Received: 24.09.2021 **Accepted:** 23.11.2021

treatment develops among just 5-6% of these infants (5,6).

Newborn infants undergo many painful and stressful practices during hospitalization in intensive care units (heel prick, arterial catheter application, venous intervention, newborn examination, lumbar puncture, dressing change, intermuscular (IM) injection, gavage tube insertion, postural drainage, stitch removal, circumcision etc.) (7-9). Such painful interventions faced by newborns and being in this environment cause stress and this can negatively affect the sensitivity, experiences, behaviors, and clinics of these infants (9,10). Newborn infants can experience physiological, metabolic, and behavioral problems as a result of suffering from such pain. These problems include excessive protein consumption, fluid-electrolyte imbalance, sepsis due to a weakened immune system, metabolic acidosis, pulmonary-cardiac failure, and death (1). Reducing or stopping pain and stress plays an important role in increasing the quality of life, decreasing any side effects that might occur, and shortening the duration of the hospital stay (11).

Although the absence of any verbal response among these newborns makes it difficult to identify pain when it is being assessed, the presence of behavioral responses for the expression of pain makes it easier for clinicians to understand when the newborn is experiencing pain (12). In addition, the degree of pain and response to treatment in the newborn can be determined by observing physiological, hormonal, and metabolic changes (9). The purpose of pain management of newborn infants is to reduce the pain felt by newborns during painful interventions such as vaccination and venipuncture. Various methods are used by nurses to reduce pain, including family centered care, and individualized developmental care, as well as pharmacological and non-pharmacological methods (13).

When conducting pain-reduction methods in infants using a pain scale in interventional applications for newborns, a care plan must first be created by each unit using non-pharmacological and pharmacological methods and the necessary applications for reducing pain should be applied to each newborn (14). It has been discovered that non-pharmacological methods, such as changing the infant's lying position (if there is no reflux or surgical contraindication), a noiseless environment, massage, giving breast milk, giving a pacifier/dummy, listening to classical music, kangaroo care, cuddling, swaying, giving sucrose, or speaking in a calm tone of voice to the infants are effective in reducing pain (15-21). In those studies conducted by nurses, it was determined that non-pharmacological methods were effective in reducing pain and stress among newborns (14-16,19-23). In addition, non-pharmacological methods are advantageous because they are easier to apply, inexpensive, and entail no side effects (1,11,24,25).

Neonatal nurses who spend the most time with newborns, and who take care of these newborns, should be able to identify and take steps to reduce the stress and pain of the infant, minimize stimuli, and independently apply appropriate non-pharmacological methods to each infant. Reducing and eliminating pain is one of the goals of nursing care. Nurses have an important role in relieving pain by making infants comfortable (9,20,23). It is important that nurses have sufficient knowledge, skills, and experience of pain among infants and children (20,23).

This study was conducted via as a randomized controlled trial in order to determine the effect of non-pharmacological methods (giving a pacifier/dummy, breast milk smell, prone position) used during venipuncture on the reduction of neonatal stress and pain among term neonates who were being monitored after being diagnosed with hyperbilirubinemia.

Materials and Methods

Design

This study was conducted as a randomized controlled trial.

Participants

The study population comprised 264 term neonates who had been diagnosed with hyperbilirubinemia and who were hospitalized at the NICU of a university education and research hospital. In consideration of previous studies in the literature, it was planned that the number of term neonates that should comprise the study sample was 20 infants per group, with a total number of participants in the sample being determined as 80. Power analysis was then performed on the sample number, and the power was found to be 0.99 with α=0.05. Within the study sample, the hospitalized term neonates were randomly distributed to the different groups by writing the initials of their mother's name and surname on a piece of paper and drawing lots. An equal number of term neonates were selected for each group.

Inclusion criteria: Term neonates with a birth weight over 1,800 grams, a gestational age of 37 weeks or longer, less than 28 postnatal days, who could tolerate nutrients given in an external way, who had been admitted to the NICU with a diagnosis of hyperbilirubinemia, and who had

not received medical treatment other than the appropriate vitamin supplements were included in this study.

Instruments

Mother-Infant Assessment Form (MIAF)

This form, prepared by the researcher using the literature, consists of 28 questions containing descriptive information about the term neonates and their parents. The answers to these questions were collected from each patient's file, by using the nurse observation form, and by conducting face-to-face interviews with the patient's parents.

Interference Follow-up Form (IFF)

This form was prepared by the researchers after reviewing the literature and was completed using the patient information file, the nurse observation form, and this study's data collection tools.

Neonatal Stress Assessment Form (NSAF)

The Neonatal Stress Scale was developed by Ceylan and Bolışık (26) with the consideration that it would help the assessment of stress among those infants hospitalized at an NICU, and in consideration of the care plans nurses might make regarding stress in infants. The form items can be subdivided into eight subgroups. These subgroups comprise a total of 24 items to which three different responses are given according to a Likert-type including facial expression, body color, respiration, activity level, consolability, muscle tone, extremities, and posture. In regard to scoring, each subgroup is rated between 0-2 points; a minimum of 0 points and a maximum of 16 points are obtainable from all the scale responses. The assessment of the scale is carried out through observation. The fact that the infant exhibits only one of the behaviors in each field involved in the scale is sufficient for scoring. Higher scores indicate higher stress levels (16).

Premature Infant Pain Profile-Revised (PIPP-R)

The infants' pain levels were assessed based on the total score obtained from the PIPP-R. The highest possible score obtainable from the scale is 21 for preterm infants and 18 for term infants. As stated by Stevens et al. (27), if the overall PIPP-R score is 0-6 points, the pain level is determined as mild; if it is 7-12 points, the pain level is moderate; and if it is 13-21 points, the pain level is severe. The validity and reliability study of the Turkish version of the PIPP-R was conducted by Taplak and Bayat (28). An important revision was made to the scale so that it could also be applied to term neonates (28).

Pre-application

Pre-application of the data collection tools was performed with term neonates having a gestational age of 37-40 weeks, having been assigned to one of the four following groups: breast milk smell group, prone position group, false pacifier/dummy group, or the control group in the NICU. These neonates were not included the research sample.

Application

The data used in the present study were collected within a period of 7 months between 18.10.2018 and 10.05.2019. The study data and infants who met the criteria for inclusion in this study were selected, and the MIAF was filled out. The information in this form was obtained through face-to-face interviews, the nurse observation form, and patients' files. After the parents of the term neonates had given their written informed consent, a nurse working at the clinic assigned each term neonate into the aforementioned four groups using a simple randomization method.

At least half an hour before the procedure, all the term neonates' diapers were changed so that they were clean. All the term neonates were fed. In order to prevent heat loss in the term neonates and to ensure all the term neonates were subject to equal conditions, the procedure was carried out under a radiant heat source and without clothes.

On the day of the application, no painful procedure was applied to the term neonates at least half an hour before and half an hour after the blood-collection procedure. Five minutes before the procedure, the physical findings relating to the term neonates whose blood was to be collected were measured using the same instruments, and their vital signs [Heart rate (HR), oxygen saturation (SpO_2), body temperature, and respiratory rate] were measured using a pulse oximeter.

Venous venipuncture procedure was conducted on those term neonates who had been hospitalized with a diagnosis of hyperbilirubinemia; this procedure was conducted every morning, regardless of the present study.

- The term neonates involved in the breast milk group were made to smell 2 mL of breast milk dropped on a sterile sponge during the procedure.
- The term neonates involved in the prone position group were moved to the prone position during the procedure.
- The term neonates involved in the pacifier/dummy group were given a false pacifier/dummy made from sterile gloves.

• The term neonates in the control group were not subject to any application, and were subjected to the routine venipuncture procedure.

During venipuncture, attention was paid to ensure that the needle thickness (green: 0.80x38 mm) used was the same for all term neonates. Blood was collected from the right hand of all the term neonates. Before, during, and after the procedure, the blood-collection process was video-recorded so that it could be assessed using the PIPP-R scale and the neonatal stress assessment scale. During this process, the camera view covered the entire body. Pain and stress assessments of the term neonates were performed 5 minutes before, during, and 5 minutes after the procedure. Physical and vital signs were measured again 5 minutes after the venipuncture procedure.

Analysis of Video Camera Recordings of the Blood-collection Process

The process of venipuncture from the term neonates was recorded with a video camera. These images were then deciphered by three blind observers, and the pain and stress assessments of the infants at the time of the procedure were made. The video camera images of the term neonates were assessed by three specialists (two academic doctors in the field of Pediatric Nursing and a neonatology specialist) according to the PIPP-R scale and NSAF.

Ethical rules were followed during this research process. For this research, approval was obtained from the Interventional Clinical Research Ethics Committee of Nevşehir Hacı Bektaş Veli University, and written permission was obtained by the Provincial Health Directorate. The parents of the term neonates who were planned for inclusion in this study were verbally informed about the purpose of the study and the methods that were to be applied within the scope of this research. Written consent was obtained from the parents of all those term neonates who participated in this study.

Data Analysis

Data obtained from the present study were assessed using IBM SPSS Statistics 22 (Statistical Package for the Social Sciences for Windows) and Med Calc statistical package programs. The post-study power analysis of the PIPP-R scale used in this study was α=0.05 and its power was 0.99. While assessing those data collected in accordance with the purpose of this research, variance homogeneity was tested by the Levene test; One-Way analysis of variance (ANOVA) was used to compare the means of quantitative variables, for comparisons among more than two groups, Tukey's test for multiple comparisons; and chi-square test was used for the analyses of the relationships between categorical variables. The differences of HR, SpO_2, respiratory rate, body temperature, stress scale, and pain scale variables between the study groups (the breast milk smell, prone position, pacifier/dummy, and control groups) and the measurement times (before, during, and after the procedure) were tested by two-way analysis of variance (Figure 1).

Results

The research findings were then interpreted and the statistical results were calculated. It was determined that the groups were homogeneous in terms of the descriptive characteristics of the families of those infants included in this study. No statistically significant relationship was found between the variables of the infants in the breast milk smell, pacifier/dummy, prone position, and control groups (Table I).

When the HR and SpO_2 of the term infants included in this study were compared before, during and after the procedure, it was found that average heart rate increased the most among members of the control group during the procedure. While the average heart rate after the procedure decreased in all groups, compared with pre-procedure average heart rate, the heart rate increased in the control group.

When comparing the oxygen saturation measurements during the procedure, a statistically significant difference was found between the pacifier/dummy group and the control group ($p<0.05$), and the highest average saturation was found for the pacifier/dummy group (95.15±4.04), while the lowest average saturation was found for the control group (85.70±9.96). On comparison of the oxygen saturation measurement after the procedure, a statistically significant difference was found between the control group (96.85±1.18) and the breast milk smell (98.10±0.97), pacifier/dummy (98.00±0.92) and prone position (98.05±0.83) groups ($p<0.05$) (Table II).

Upon comparison of the average respiratory rate and body temperature of the term infants involved in this study, a statistically significant difference was found between the average respiratory rates of the neonates who were given pacifiers/dummies ($p=0.018$) and who were in the prone position, and those in the control group, according to the multiple comparison test, depending on the groups ($p=0.006$). The average respiratory rate of those neonates who were given a pacifier/dummy or who were moved into

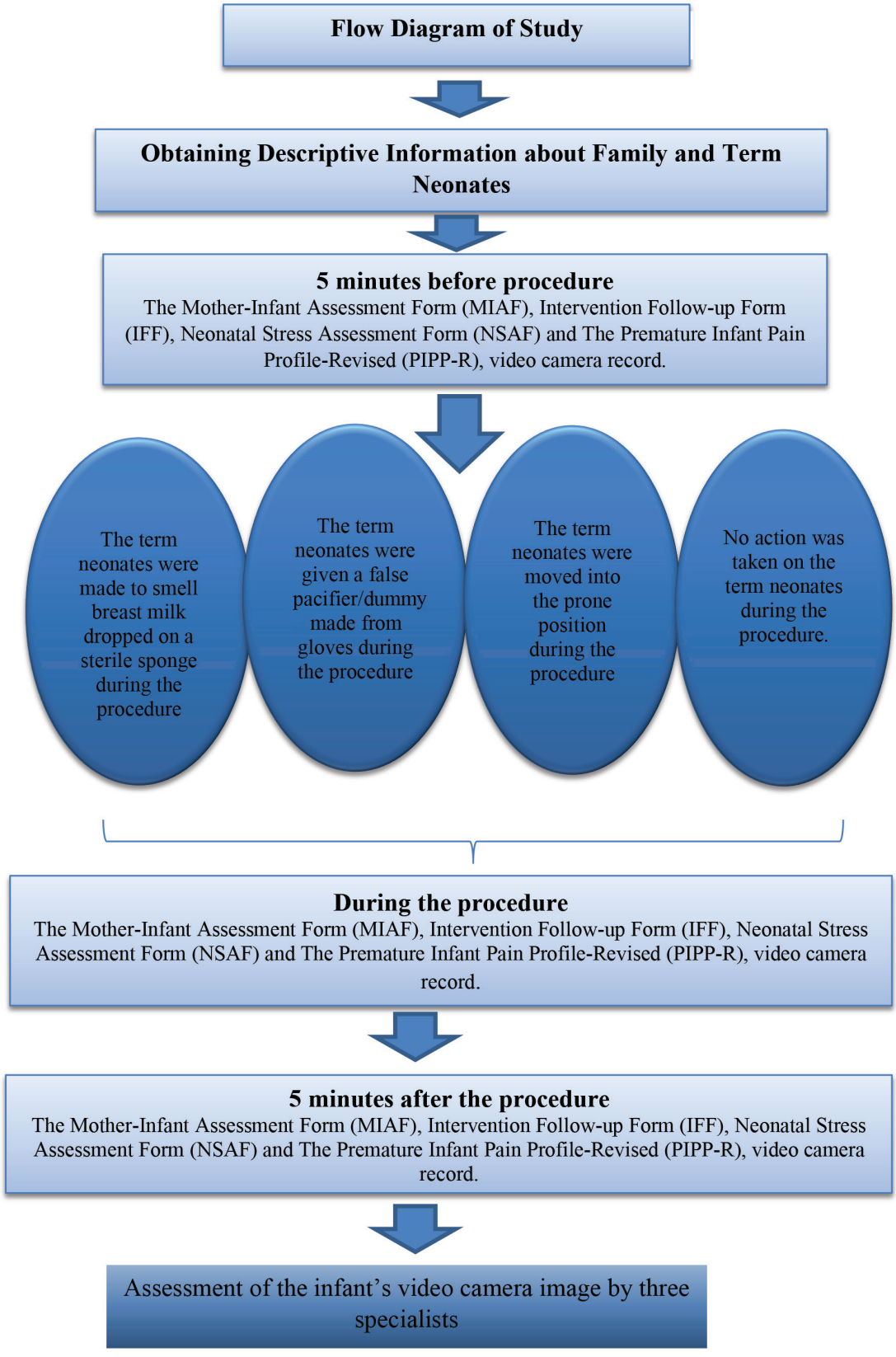

Figure 1. CONSORT flow diagram

the prone position was lower than that of the control group (Table III).

It was seen that the average pain scores of those term neonates to whom the methods of breast milk smell, prone position, and pacifier/dummy were applied were less than that of the term neonates in the control group during and after the procedure ($p<0.001$). A statistically significant difference was found between the average stress scores of the control group and the breast milk smell ($p=0.018$), pacifier/dummy ($p=0.001$), and prone position ($p<0.001$) groups during the procedure (Table IV).

Discussion

Newborn infants who are referred to the NICU in order to receive the necessary medical care and treatment due to health problems during the first days following their birth undergo many painful and stressful practices (7,10). The developmental stage is crucial for non-pharmacologic treatment in children (29). Pediatric nurses should use effective methods to reduce the negative effects of pain in children (13). The level of pain and stress experienced by infants should be determined by using valid and reliable scales, and necessary procedures should be performed in order to reduce pain and stress (25). Nurses play the most important role in regard to these applications.

In this study, the effects of the prone position, pacifier/dummy, and breast milk smell on the stress and pain experienced among term neonates were investigated. In the present study, the mean heart rate scores of the term infants in all groups (breast milk smell, pacifier/dummy, prone position, and control groups) that were determined during the procedure were higher than those determined

Table I. Descriptive characteristics of infants

Descriptive characteristics	Breast milk group (n=20)		Pacifier/dummy group (n=20)		Prone position group (n=20)		Control group (n=20)		χ^2	p-value
	n	%	n	%	n	%	n	%		
Gender										
Female Male	7 13	35.0 65.0	10 10	50.0 50.0	11 9	55.0 45.0	11 9	55.0 45.0	2.151	0.542
Height at birth										
Below 46 cm Above 46 cm	0 20	0 100.0	2 18	10.0 90.0	3 17	15.0 85.0	0 20	0 100.0	5.760	0.124
Height at the time of blood collection										
Below 46 cm Above 46 cm	0 20	0 100.0	2 18	10.0 90.0	3 17	15.0 85.0	0 20	0 100.0	5.760	0.124
Head circumference at birth										
Below 33 cm 33-37 37 cm or above	1 18 1	5.0 90.0 5.0	2 18 0	10.0 90.0 0	0 20 0	0 100.0 0	0 20 0	0 100.0 0	6.877	0.332
Head circumference at the time of blood collection										
Below 33 cm 33-37 37 cm or above	1 18 1	5.0 90.0 5.0	2 18 0	10.0 90.0 0	0 20 0	0 100.0 0	0 20 0	0 100.0 0	6.877	0.332
Nutritional status										
Breast milk Formula TPN	20 0 0	100.0 0 0	17 3 0	85.0 15.0 0	19 1 0	95.0 5.0 0	20 0 0	100.0 0 0	6.316	0.097
Length of hospital stay										
1 day 2 days More than 2 days	14 6 0	70.0 30.0 0	16 2 2	80.0 10.0 10.0	17 1 2	85.0 5.0 10.0	17 3 0	85.0 15.0 0	11.708	0.230

χ^2: Chi square test

before and after the procedure ($p<0.05$). Furthermore, while the heart rate means of the term infants in the breast milk smell, pacifier/dummy, and prone position groups that were determined after the procedure decreased, they were found to increase in the control group. During the procedure, the greatest increase in mean heart rate was

Table II. HR and SpO_2 values of term infants participating in the study before, during, and after the procedure

Groups	Time	HR		SPO_2	
		X ± SD	Med. (Min.-Max.)	X ± SD	Med. (Min.-Max.)
Breast milk smell	Before the procedure	137.45±14.44	136 (113-169)	96.90±1.48	97 (94-99)
	During the procedure	175.05±25.18	170 (132-224)	88.70±8.65	92 (74-99)
	After the procedure	130.15±24.38	124 (110-228)	98.10±0.97	98 (96-99)
Pacifier/ dummy	Before the procedure	147.30±15.61	150 (120-169)	97.05±1.23	97 (94-99)
	During the procedure	163.30±21.61	159 (135-208)	95.15±4.04	96 (85-99)
	After the procedure	124.85±9.77	120 (113-144)	98.00±0.92	98 (96-99)
Prone position	Before the procedure	141.95±17.98	139.50 (116-168)	96.70±1.75	97 (92-99)
	During the procedure	161.70±20.23	162.50 (119-190)	91.15±8.16	94.50 (72-99)
	After the procedure	123.25±11.58	120 (110-148)	98.05±0.83	98 (96-99)
Control group	Before the procedure	130.45±13.45	126.5 (112-156)	97.80±0.77	98 (96-99)
	During the procedure	178.70±21.90	174 (146-224)	85.70±9.96	88 (69-99)
	After the procedure	138.60±14.25	133 (120-174)	96.85±1.18	97 (94-99)
Test	**Time** **Time + group** **Group**	F 129.006 5.196 1.236	p-value **<0.001** **<0.001** 0.302	F 64.082 4.935 4.939	p-value **<0.001** **<0.001** 0.003

HR: Hazard ratio, SD: Standard deviation, Min.: Minimum, Max.: Maximum, Med.: Median

Table III. Respiratory rate and body temperature of the term infants participating in the study before, during and after the procedure

Groups	Time	Respiratory rate		Body temperature	
		X ± SD	Med. (Min.-Max.)	X ± SD	Med. (Min.-Max.)
Breast milk smell	Before the procedure	48.65±2.39	48 (44-56)	36.65±0.14	36.65 (36.40-36.90)
	During the procedure	49.60±2.48	48 (46-54)	36.64±0.14	36.70 (36.10-36.80)
	After the procedure	47.10±1.89	48 (44-52)	36.66±0.11	36.70 (36.40-36.80)
Pacifier/ dummy	Before the procedure	48.10 2.38	48 (44-52)	36.64±0.19	36.65 (36.30-36.90)
	During the procedure	48.10±3.14	48 (40-52)	36.63±0.15	36.60 (36.30-36.90)
	After the procedure	47.00±1.15	48 (44-48)	36.59±0.13	36.60 (36.30-36.80)
Prone position	Before the procedure	47.10±1.77	48 (44-50)	36.62±0.17	36.70 (36.30-36.90)
	During the procedure	49.30±3.51	48 (44-56)	36.63±0.13	36.60 (36.40-36.90)
	After the procedure	46.20±2.33	46 (44-50)	36.59±0.15	36.50 (36.30-36.90)
Control group	Before the procedure	47.20±2.46	48 (44-52)	36.62±0.15	36.60 (36.40-37.00)
	During the procedure	51.80±3.37	52 (48-58)	36.71±0.13	36.70 (36.40-37.00)
	After the procedure	49.20±2.28	49 (44-54)	36.72±0.17	36.75 (36.40-37.00)
Test	**Time** **Time + group** **Group**	F 24.118 4.731 4.802	p-value **<0.001** **<0.001** 0.004	F 0.720 1.982 1.586	p-value **0.482** **0.075** 0.200

SD: Standard deviation, Min.: Minimum, Max.: Maximum, Med.: Median

seen in the control group. Peyrovi et al. (30) determined that the HR of their study's fetal-position group during a painful procedure applied to a newborn was significantly lower than that of the control group. Likewise, in the study by Bayat et al. (16), where the researchers examined the effects of aromatherapy, music therapy, and vibration applications on the stress and behaviors of term neonates, the authors concluded that the newborns' heart rates decreased during the aromatherapy, music therapy and vibration applications, while it increased for those in the control group. Liaw et al. (31) investigated the effect of the use of pacifiers/dummies or sucrose on physiological parameters among term neonates who were subject to a hepatitis vaccination; they concluded that the increase in heart rate and respiratory rate was less in both groups compared with those of the control group. Similar to that study, the present research revealed a statistically significant difference ($p<0.05$) between the pacifier/dummy and the control group when comparing SpO_2 measurements during the procedure; the highest average SpO_2 (95.15±4.04) was obtained in the pacifier/dummy group, and the lowest SpO_2 (85.70±9.96) was obtained in the control group. When SpO_2 measurements after the procedure were compared, a statistically significant difference was found between the control group (96.85±1.18) and the breast milk smell (98.10±0.97), pacifier/dummy (98.00±0.92), and prone position (98.05±0.83) groups ($p<0.05$). Çakı's (32) study, which examined the effects of massage and music therapy on neonatal stress and behavior, found that the term neonates in their study's massage, white noise, and control groups had a decreased peak heart rate and increased SpO_2 after the study.

In the present study, the respiratory rate of the term neonates in all groups other than the pacifier/dummy group increased during the procedure when compared with the respiratory rate 5 minutes before the procedure; the greatest increase was seen in the control group. In all groups (breast milk smell, pacifier/dummy, prone position, and control groups), the respiratory rate after the procedure decreased when compared with the average respiratory rate during the procedure. It was determined that the average respiratory rate per minute of those infants in the pacifier/dummy group ($p=0.018$) and those in the prone position group ($p=0.006$) was lower than the average respiratory rate per minute of those in the control group. This study concluded that most of the non-pharmacological methods used reduced crying and respiratory rate, and regulated SpO_2 after the application (25).

In this study, interventions for pain reduction did not have a significant effect on body temperature ($p>0.05$). Similarly, in the study in which Taplak and Erdem (19) examined the effect of breast milk and sucrose on reducing

Table IV. Average stress and pain scores, of the term infants participating in the study before, during and after the procedure

Groups	Time	Stress scale		Pain scale	
		X ± SD	Med. (Min.-Max.)	X ± SD	Med. (Min.-Max.)
Breast milk smell	Before the procedure	6.85±3.50	6 (2-13)	5.85±2.74	5.50 (2-11)
	During the procedure	5.80±3.99	5 (0-12)	6.80±4.66	5.50 (1-13)
	After the procedure	1.60±1.67	1 (0-7)	3.05±1.70	3 (0-7)
Pacifier/dummy	Before the procedure	5.80±4.09	5.50 (0-12)	4.80±2.84	4.50 (1-12)
	During the procedure	4.55±3.10	5 (0-10)	5.10±2.99	5 (0-10)
	After the procedure	2.35±2.25	2 (0-7)	2.75±1.55	2 (1-8)
Prone position	Before the procedure	4.95±3.86	5 (0-13)	5.05±1.99	5 (3-9)
	During the procedure	5.75±3.63	6 (0-12)	6.05±4.35	5.50 (0-15)
	After the procedure	0.60±1.19	0 (0-5)	3.30±1.13	3 (1-6)
Control group	Before the procedure	2.65±2.81	2 (0-11)	5.20±2.57	5 (1-11)
	During the procedure	10.80±3.71	12 (1-14)	12.00±3.91	14 (1-15)
	After the procedure	6.40±4.83	7.50 (0-14)	8.55±4.11	8 (2-15)
Test	**Time** **Time + group** **Group**	F 27.816 11.004 8.421	p-value **<0.001** **<0.001** **<0.001**	F 19.633 5.657 29.185	p-value **<0.001** **<0.001** **<0.001**

SD: Standard deviation, Min.: Minimum, Max.: Maximum, Med.: Median

pain in retinopathy of prematurity (ROP) examination, it was found that there was no change in body temperature before and after the procedure among the infants in all three groups.

As stated by Stevens et al. (27), the average PIPP-R scores indicate the pain levels of newborns as follows: 0-6 points as mild, 7-12 as moderate, and 13-21 as severe. While there was no significant relationship between the pain levels of the study groups (breast milk smell, pacifier/dummy, and prone position groups) compared to the control group before the procedure ($p=0.699$), a statistically significant relationship was found between these both during ($p<0.001$) and after the procedure ($p<0.001$). Although there was no significant difference in pain intensity between all groups before the procedure, the least pain intensity during the procedure was seen among those infants in the pacifier/dummy group, followed by those in the prone position group, those in the breast milk smell group, and finally those in the control group. The lowest pain intensity after the procedure was seen among those infants in the prone position group, which was followed by the breast milk smell group, the pacifier/dummy group, and finally the control group. Rosali et al. (33) found that administering expressed breast milk to premature infants during ROP screening reduced pain both during and after the procedure. Alemdar and Tüfekci (34) found that the intervention of smelling amniotic fluid is one that can be used in order to reduce pain and stress of preterm infants during peripheral cannulation.

In the present study, the infants' average pain scores during the procedure increased in all groups. The highest increase was seen in the control group, which was found to be higher than the average pain scores of all the other study groups at all times (before, during and after the procedure). In all the study groups, the average pain score after the procedure was found to be lower than the average pain score during the procedure, with only the average pain score in the control group being higher after the procedure was applied. According to this result, it can be deduced that the pain of infants in the control group continued after the procedure. It can be seen that these non-pharmacological methods applied to infants in the study groups are effective in reducing pain. Nishitani et al. (35) examined pain in infants by having the infants smell their mother's milk, formula, and another individual's breast milk in term infants during a heel prick procedure. They found that the breast milk smell of the infant's own mother was more effective than that of another mother's milk, and that the infants felt less pain than others as a result (35). It was reported in a study carried out by Akcan and Polat (22) that using the smells of lavender, breast milk and amniotic fluid is an effective method in reducing pain during invasive procedures in term neonates. Likewise, a study conducted by Jebreili et al. (36) comparing the effect of breast milk smell and the smell of vanilla on reducing the response of premature infants to pain during and after venous venipuncture collection revealed that both smells calmed infants. In addition, it was found that breast milk smell still calmed infants at the end of sampling, and therefore it was concluded that it was more effective than the smell of vanilla.

In this study, the mean stress scores of those infants who were made to smell breast milk and given a pacifier/dummy decreased both during and after the procedure. Although the mean stress scores increased during the procedure among those infants in the prone position and control groups, the increase in the control group was higher than that of the prone position group. Among those infants in the prone position group, the mean stress score after the procedure decreased to almost zero. It was seen that the stress level of term neonates on whom the methods of smelling breast milk, being moved into the prone position, and being given a pacifier/dummy were applied was lower than that of the term neonates in the control group both during and after the procedure. Furthermore, it is stated that early kangaroo care was also effective on newborns' comfort behavior during invasive interventions, and that kangaroo care reduced pain and stress (37). In their study investigating the effect of certain positions of the newborn without any invasive procedure on the salivary cortisol level, Cândia et al. (38) propounded that the prone position significantly reduced salivary cortisol levels and respiratory rates and that, as a result, there was a link between the prone position and decreased stress among preterm neonates. Bayat et al. (16) examined the effects of aromatherapy, music therapy, and vibration applications on the stress and behaviors of newborns and concluded that these practices positively affect the behavior of preterm newborns by reducing their stress.

According to the findings of this study, non-pharmacological methods, rather than pharmacological methods, should be used in order to reduce pain and stress in infants. In pain management, non-pharmacological methods can be effective in simple invasive procedures because they are practical, inexpensive, simple and time saving without involving complications (15,39,40). When used together with pharmacological methods, they also increase the effect of these pharmacological methods (25).

In addition, the involvement of the infant's family when using non-pharmacological methods as part of this care strengthens the bond between the infant and their family (41,42).

Conclusion

It can be seen that non-pharmacological methods applied in the response groups are effective in reducing pain. Furthermore, the stress levels of term neonates on whom the methods of smelling breast milk, being moved into the prone position, and being given a pacifier/dummy were applied were lower than those of the term neonates in the control group during and after the procedure. Additionally, no statistically significant difference was found between these methods in terms of reducing the pain and stress of infants during the venipuncture process ($p>0.05$).

Ethics

Ethics Committee Approval: Ethics committee approval was received for this study from the Nevşehir Hacı Bektaş Veli University (date and number: 23.09.2018 and 20814).

Informed Consent: Informed written consent was obtained from the mothers participating in the study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: D.E., Design: D.E., Supervision: D.E., N.G.B., Resources: F.Ö., Data Collection and/or Processing: F.Ö., Analysis and/or Interpretation: F.Ö., D.E., Literature Search: F.Ö., D.E., Writing: D.E., Critical Review: D.E., N.G.B.

Conflict of Interest: The authors declared that there were no conflicts of interest.

Financial Disclosure: The authors declared that this study has received no financial support.

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