Original Article

The Effect of Tub Bathing on the Newborns' Pain: A Randomized Clinical Trial

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Abstract

Background: Removal of the pain in the newborns will possibly accelerate adaptation to the outside world and recovery process. The use of water for medical treatment is probably as old as mankind. Use of water in various forms and in various temperatures can produce different effects on different system of the body
Purpose: To compare the tub bathing and non-bathing newborns in terms of the pain, oxygen saturation and state of vital signs.
Methods: A randomized controlled trial. This study was conducted in the a newborn intensive care unit in the Turkey with 35 tub bathing, 35 control newborns.
The measurements were made 10 minutes before the bath and 15th, 30th and 60th minutes after the bathing.
Results: It was discovered that there is a difference between the tub bathing newborns and the control group in the measurements at 15th (2st time) minute after the bath in terms of heart rate (p=.045), and systolic blood pressure (p=.015). Respiration was also different at 2nd (p=.042) and 3rd (p=.017) time measurements. The difference regarding the state of pain of tub bathing newborns and control newborns were detected as 1st time (p=.220), 2nd time(p=.000), 3rd time (p=.000) and 4th time (p=.009).
Conclusions: Tub bathing can be safely applied to relieving/reducing the mild and moderate pain of newborns.

Key Words: Tub Bathing; Pain; Newborn; Vital Signs; NICU; Nursing

Introduction

Bathing which is one of the newborns' skin care practices is applied in the newborn intensive care units, mostly with the purpose of removing wastes and harmful substance on the surface of the skin, providing aesthetic appearance, and reducing the colonization of microorganisms (Bryanton et al., 2004; Lee 2002).

Newborns that are born as a premature and mature can stay in the newborn intensive care units from a few weeks to a month with the aim of intensive caring and treatment. During that process, newborns can be exposed to many painful operations; catheter application, venipuncture, aspirations, gavage tube insertion etc. (Spence, 2010). Newborns are more sensitive to pain due to their insufficiently matured pain mechanisms (Akcan & Polat, 2017). Severe and long-lasting pain that arises as a result of interventions on newborns leads to behavioral stress and physiological imbalances (Lima & Carmo, 2010; Asadi-Noghabi et al., 2014). If pain in this period is not alleviated or eliminated via effective interventions, it may lead to neurological and behavioral disorders in future periods (Akcan & Polat, 2017; Valeri, Liisa, Linhares, 2015).

The removal of the pain in the newborns will possibly accelerate adaptation to the outside world and recovery process. Removing the pain is one the most crucial indicators of nursing care quality. To remove the pain of the newborns,

nurses use pharmacological methods as well as non-pharmacological techniques. Non-pharmacological methods are methods such as breastfeeding, massage, kangaroo care, listening to music, incension, positioning, posture, reduction of environmental stimuli, giving sucrose (Carbajal, 2005; Cignacco, 2007; Yilmaz & Arikan, 2011). Baby bath in the newborns is effective in reducing or eliminating the pain as a result of direct effect of heat on both the nerve endings and the pain- transmitting nerve resulting in reducing the strain, increasing pain threshold and causing endorphin release (Bartocci,2006).

In spite of the relaxing effect of warm water, nurses working in newborn intensive care units have a dilemma about the type of bathing (wiping or water), cleaners that they will use, and the frequency of bathing, and this point is among the debated discussions (Bryanton et al., 2004; Peters, 1998). Many studies have been conducted in the literature about the effects of bathing type and frequency on skin flora in premature and term newborns, effects of bathing time on physiological and behavioral responses, the effects of cleaners used in the bathroom on skin infection and the effect of bathing on the protective functions of skin (Blume-Peytavi, 2009; Franck, Quinn, Zahr, 2000; Garcia Bartels, 2009; Medves &O'Brien, 2004; Taheri, Fakhraee, Sotoudeh, 2007; Varda & Behnke, 2000).

There is no standard application for preterm or term babies in newborn intensive care units in our country and the bathing is usually made as sponge bathing and in some newborn intensive care units as tub bathing. In the newborn intensive care unit where this work was conducted, if the condition of the term and preterm newborns is stable, the tub bathing is done routinely. The observations we made in this clinic showed that the newborn having tub bathing felt relieved. This study was conducted with the aim of testing the difference between the pain of the newborns who had tub bathing and those who did not have.

Methods

Design and Sample

This study was performed as a randomized controlled experimental study in the newborn intensive care unit of Elazig Province Training and Research Hospital in the east of Turkey. The intensive care unit of the hospital where the study was conducted is a fully equipped intensive care unit with 40 incubators and 15 respirators.

Ethical approval was granted by the Firat University Scientific Research and Publication Ethics Board (Ethics committee approval number:2016/8-18). Moreover, institutional permission was obtained before the study. All the parents were informed about the structure, aim, and procedure of the study. All parents signed the informed volunteer consent form. Eligibility criteria for inclusion in this study are listed in Box 1. Hospitalized infants were screened for eligibility weekly by the secondary investigator, between March 2015 and January 2016 and eligible neonatal with parents present were approached for study enrollment. 70 newborns complying with the study criteria were reached. The newborns were included in the study by randomization. There were no losses or exclusions after randomization as this was done. In randomization, after the nam

es of the newborns who were written and put in an envelope, they were divided into the experimental and control groups. Thus, 35 newborns were included in the experimental group, while 35 were included in the control group.

Instruments

Newborn Vital Signs Assessment Form

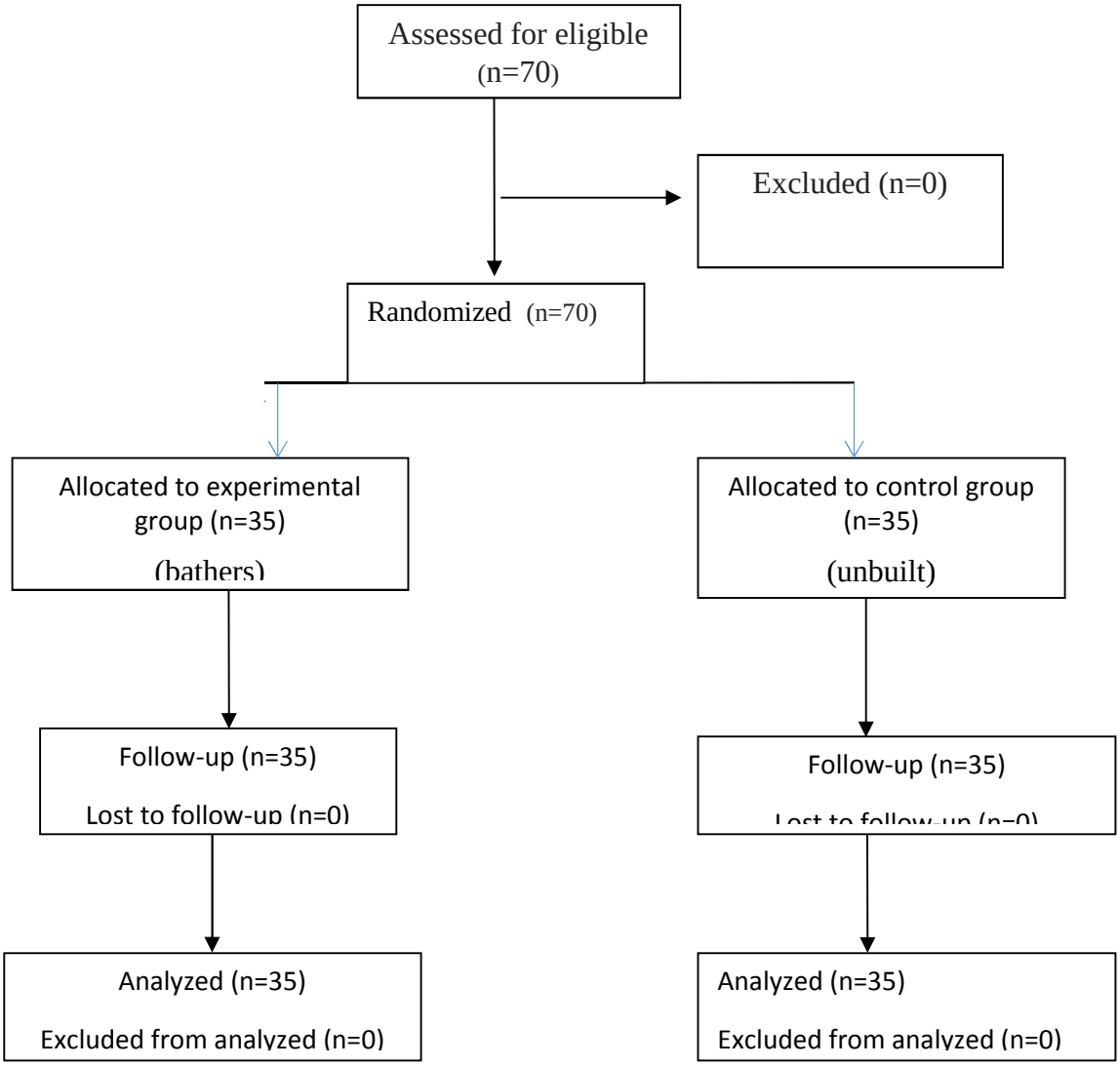
It was developed by the researchers to evaluate the experimental and control group's body temperature, heart rate, respiratory, blood pressure and oxygen saturation.

Neonatal Infant Pain Scale (NIPS)

It was developed by Lawrance et al (1993), and validity and reliability work in Turkey were done by Akdovan and Yildirim (1999) on the scale developed to measure preterm and term newborns' pain level; neonatal facial expression, crying state, breathing pattern, arms, legs and alertness status are assessed. On the scale, the crying state is given a score between 0-2, while each parameter is given a score between 0-1. The total score on the scale is between 0-7, and as the score increases, the severity of the pain increases (Motta Gde, Schardosim , Cunha, 2015)

Box 1. Eligibility and Exclusion Criteria	
Eligibility Criteria	Exclusion Criteria
The state of the newborn is stable (no tachycardia, bradycardia, tachypnea, bradypnea, hypothermia and convulsion) Oxygen saturation is between 85-95%	Dermatological problem Congenital anomaly Risk of intracranial hemorrhage Neurological anomaly
Birth weight is 1000 gr or more	
Gestation age is 28 wks or more	
No narcotics or sedatives in previous 24 h	
Neonatal infant pain scale is at least 2 points or more	

Figure 1



Participant flowchart

Table 1 .Phases and Definitions of the Tub Bath

Phase I:, The newborn was removed electrodes, diaper; settle down all tubes or intravenous lines. The newborn was taken from the incubator, wrapped in a warm compress and was quickly taken under medium flowing water whose temperature was previously calibrated.
Phase II: The newborn's whole body firstly held under the warm water and after the baby's head was washed with shampoo, the baby's face and eyes were washed with warm water. With the shampooed soft bath puff, first the chest, then back region, arms, legs and genital area were cleaned with the puff. This was done in 2-3 minutes.
Phase III: The cleaned newborn was wrapped in a warm towel and quickly taken to its incubator. Following this, it was dried and the wet towel was immediately thrown.

Table 1: Demographic Characteristics of the Newborns (n=70)

	Shower Bathing Group		Control Group		Statistic	
	(n= 35)	%	(n=35)	%	X^2	p
Gender					0.914	.0339
Female	13	37.14	18	51.43		
Male	22	62.86	17	48.57		
BirthWeight (grams)					22.114	1.000
1000-1500	5	14.29	8	22.86		
1500-2000	11	31.43	5	14.29		
2000-2500	5	14.29	5	14.29		
2500-3000	5	14.29	6	17.14		
>3000	9	25.70	11	31.42		
Medical Diagnosis					3.800	.150
Congenital Pneumonia	11	31.43	11	31.43		
Respiratory Distress	14	40.00	11	31.43		
Premature	10	28.57	13	37.14		
Current Weight					6.171	1.000
1000-1500	6	17.14	5	14.29		
1500-2000	10	28.57	8	22.85		
2000-2500	6	17.14	7	20.00		
2500-3000	7	20.00	5	14.29		
>3000	6	17.14	10	28.57		
Birth Week					25.086	.074
28-32	5	14.29	10	28.57		
32-34	7	20.00	5	14.29		
34-36	7	20.00	6	17.14		
36-40	16	45.71	14	40.00		

Table 2: The Comparison of Pain of the Newborns

	Shower bathing group (n= 35)		Control group (n= 35)		Statistic	
NIPS scale	X	SS	X	SS	t	p
1st time	3.43	1.68	1.70	1.70	1.23	.220
2nd time	.97	1.35	1.55	1.55	5.00	.000
3rd time	.51	1.05	1.33	1.33	6.28	.000
4th time	.73	1.11	1.63	1.63	2.70	.009

Table 3: The Comparison of Vital Signs and Oxygen Saturation of the Newborns

	Shower-bathing (n=35)		Control Group (n= 35)		Statistic	
Vital Signs	X	SS	X	SS	t	p
Heart Rate						
1st time	145.12	14.29	149.37	14.35	1.226	.225
2nd time	142.58	13.18	149.58	15.35	2.044	.045
3rd time	143 12	12.83	146.24	12.25	1.012	.315
4th time	144.61	12.78	148.13	11.46	1.186	.240
Body Temperature						
1st time	37.24	3.65	36.66	.40	.842	.403
2nd time	36.50	.76	36.52	.31	.145	.885
3rd time	37.36	4.59	36.76	.32	.700	.486
4th time	36.55	.92	36.78	.25	1.272	.208
Respiratory						
1st time	56.19	8.55	54.31	5.67	1.035	.304
2nd time	50.97	4.40	53.51	5.84	2.074	.042
3rd time	50.82	3.99	53.93	5.33	2.782	.017
4th time	51.14	3.53	52.75	11.04	.876	.384
Systolic Blood Pressure						
1st time	67.68	11.11	65.82	10.97	.692	.492
2nd time	69.24	10.68	63.00	9.85	2.48	.015
3rd time	67.87	10.33	66.27	10.77	.628	.532
4th time	68.02	10.95	65.72	10.30	.887	.378
Diastole Blood Pressure						
1st time	39.36	11.07	39.75	8.09	.163	.871
2nd time	40.65	9.28	39.93	8.05	.341	.734

3rd time	39.00	10.72	41.79	10.06	1.100	.275
4th time	43.24	10.22	41.62	10.31	.652	.517
Oxygen Saturation						
1st time	93.39	11.35	95.89	2.25	2.57	.062
2nd time	95.14	2.24	95.00	2.97	.235	.815
3rd time	95.17	2.57	95.62	1.76	.814	.418
4th time	95.92	2.06	95.86	1.72	.138	.891

The bathing procedures were done between 22:00-24:00 at night because the unit was quiet, calm and circulation was less. The newborn's control group has not applied any bathing, and their measurements were made at the same time as the experimental group.

The bathing procedures were application by the second researcher. This researcher is a woman, who has an experienced on of neonatal nursing and with a degree PhD.

Statistical Analysis

The data which were obtained in the study were evaluated in the computer ambience by using the SPSS 17. The average and standard deviation were used to define quantitative data while numbers and percentages tests were used to define qualitative data. "Chi Square" test was used to test the difference between groups of qualitative factors (sexuality, birth weight, current weight, medical diagnosis and birth week). In the research, "t-test" was used in independent groups to compare the experimental and control groups' average vital signs, oxygen saturation and pain scale level. Repeated measures one-way variance analysis was used to determine measures' changing according to the time (1st, 2nd, 3rd, and 4th time) by taking both groups as an independent. In the research, $p < 0.05$ was accepted as statistically important. Whether the data regarding the quantitative variables have a normal distribution was determined by Shapiro Wilk normality test ($p>0.05$).

Results

Experimental and control group newborns' descriptive features are given in Table 1. In the study, it was found out that there are not any differences between the experimental and control group newborns' birth weight, birth week and medical diagnosis ($p > 0.05$) but there is between their genders ($p < 0.05$).

In the study conducted by Lawrence et al., Cronbach's alpha value of the scale was found to be .95. In the current study, Cronbach's alpha was determined as 78.

Pain level of all the newborns in the experimental and control group who were evaluated ten minutes before tub bathing (1st time). Later, the newborn was diapered and vital signs, oxygen saturation, and pain status were evaluated. The evaluation process was conducted at the first 15th minutes (2nd time), 30th minutes (3rd time), and 1st hour (4th time). Heart rate and respiratory rate were monitored continuously with a cardiorespiratory monitor and SpO2 was measured with a pulse oximeter. The process of experimental and control group newborns' evaluation was done by second researcher.

Procedures

Pain level of all the newborns in the experimental and control group who were evaluated ten minutes before tub bathing (1st time). Then, the newborns in the tub bathing group were prepared for this process (Table 1).

Before the bath, 2 soft towels, diaper, disposable soft bath puff that will be used in the bathroom and baby shampoo approved by the hospital were prepared. A quiet and calm environment was prepared by arranging the temperature of the newborn intensive care unit (NICU) as 24-25 °C and the temperature of the water as 37-38°C. Immediately after the temperature of the incubator was increased by 4-5 degrees (Dagoglu & Gorak, 2002). The difference between state of pain of newborns who took tub bathing and who did not take tub bathing was not statistically

significant at first time (p = .220), but it was determined that the difference among second time (p = .000), third time (p=.000) and fourth time (p =.009) was determined statistically to be important **(Table 2).**

When the experimental and control group newborns' average of heart beat rates are compared, it was determined a statistically significant difference at second time. When the difference between experimental and control group newborns' average of body temperature are compared, was determined to be insignificant. The difference between the average of the respiration rate of newborns who were took tub bathing and those who did not take, second time (p=.042) and third time (p=.007) is statistically significant. When the experimental and control group newborns' average of Systolic Blood Pressure are compared, was determined to be statistically significant the difference at second time. When the difference between experimental and control group newborns' average of Diastole Blood Pressure are compared, was determined to be insignificant **(Table 3).**

When the experimental and control group newborns' oxygen saturation' score averages were compared, the difference between was determined to be statistically insignificant. According to the study, NIPPS pain scale (F=4.136, p = .000), respiration (F=4.722, p=.000), oxygen saturation (F=4.136, p=.000) and body temperature (F=6.632, p=.000), were found significant in the group comparison of newborns in the tub bathing group. No difference has detected in other measurements. It was found that the difference between the body temperature (F = 4.991, p = .021) and oxygen saturation (F = 6.952, p = .05) in the group comparison of the control group newborns. No difference was found in other measurements.

Discussion

In newborn intensive care units, preterm and term newborns suffer and get stressed because of the crowded, foreign environment, excess noise and light in addition to the newborn's examination, taking blood, catheter etc. applications. In this investigation, it was identified that in both experimental and control group, newborns had moderate pain at first measurements according to Neonatal Infant Pain Scale (NIPS) and that the difference between pain scale means was not significant. In the second, third and fourth time measurements, it was determined that pain level in the tub bathing group significantly reduced compared to non-bathed group and the difference was statistically significant. These results show that the pain of the newborn's experimental group reduces after the tub bathing (Mooventhan & Nivethitha, 2014; Bender et al., 2005).

Baby bath in the newborns is effective in reducing or eliminating the pain as a result of direct effect of heat on both the nerve endings and the pain- transmitting nerve resulting in reducing the strain, increasing pain threshold and causing endorphin release (Bartocci et al., 2006). There is are a limited number of studies in the literature on the effect of water bathing on the pain of newborn (Bryanton et al., 2004; Lee 2002). Bryanton et al. (2004) had bathed 102 newborns randomly in a Tub bathing (n=51) or sponge bathing (n=52). It was detected that newborns who were bathed in tub bathing behave in a more easygoing manner and the satisfaction levels of their mothers were higher (Bryanton et al., 2004). In another study, 618 babies were separated into two groups by the non-randomized method. The babies in the first group were bathed at 37degrees Celsius water temperature in a tub bathing and the ones in the second group were sponge bathing at the same water temperature. It was explored that the babies who had wiping cried much more than the ones who had a bath in the bathtub (Hylen.et al., 1983).

Pain-related physiological changes in a newborn include; heart rate, respiratory rate, blood pressure and changes in the blood oxygen and carbon dioxide levels (Meloet al., 2014). Therefore, this study monitored the life signs and oxygen saturations in newborns.

It was discovered that there is a difference between the tub bathing newborns and the control group in the measurements at 15th minute after the bath in terms of heart rate, and systolic blood pressure. Respiration was also different at 2nd and 3rd time measurements. Bathing is usually a stressful experience for a newborn. Hence, an increase in heart rate during bathing and in the first minutes of bathing is an expected response. In contrast, in the studies in which the measurements after bathing was done later it was detected that the heart rate was

stabilized (Bryanton et al., 2004; Lavender et al., 2013).

In a study exploring the effect of newborn bathing on the vital signs, respiration rate was found higher in the early period measurements after the bath (10th min) (Lavender et al., 2013).We found out that the difference between the oxygen saturation of the control group newborns who took water-bathing and who did not take bath in all the measurements was not significant in this study. While it is indicated that the bath type makes a difference in oxygen saturation in some studies investigating the effects of newborn bathing on oxygen saturation (Tapia-Rombo, Morales-Mora, Álvarez-Vázquez , 2002), in another study it is reported that it do not make any difference in oxygen saturation (Lee, 2002).

Newborns are prone to hypothermia because of the reasons such as thinness of the skin, wide body surface, low brown fat deposits, and low protection mechanisms (Lavender et al., 2013). Increasing the temperature of the incubator before the bath, arranging the bath water's temperature appropriately and putting the newborn back to the incubator by drying him or her right after the bath to do the bathing process without the newborn experiencing cold stress are crucial to ensure thermoregulation. When the body temperatures of newborns who were taken tub bathing and the ones who did not have shower were compared in this study, it was determined that the difference between all the measurements before and after the bath was not significant. There are many studies in the literature investigating the effects of the bath type applied to the newborn on the body temperature (Bryanton et al., 2004; Loring et al., 2012; Edraki et al., 2014). In one of these studies, the difference between the body temperature of late preterm infant in tub bath (n= 50) and sponge bathing (n= 50) was examined, that were measured 10 and 30 minutes after the bath. Infants who were tub bathed experienced significantly less variability in body temperature (Loring et al., 2012).

Limitations of the study

The researchers were able to reach a small number of newborns that were suitable for the study criteria. As the parents of some newborns were not at the hospital, those could not be included in the study. Because of hospital policies, parents were not able to participate in the bathing process.

Conclusion

According to the results of the study, it was discovered that tub bathing is effective in relieving/reducing the mild and moderate pain of newborns. In this study, it was also explored that there is a difference in the control group in the measurements at the 15th minute after the bath in terms of heart beat rate, respiration and systolic blood pressure of the newborns who had taken tub bathing, and there is no difference in the other time measurements.

Recommendation

According to the results obtained from this study the following recommendations are provided.

1.Newborn nurses should be informed about the effects of tub bathing on pain

2.Newborn nurses should apply tub bathing for suitable newborns in order to alleviate the pain of newborns with mild and moderate pain

3. Newborn nurses should develop standards for the form and frequency of bathing babies

4. Hospital administrators should provide suitable conditions at newborn intensive care units for baby baths

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