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RESEARCH ARTICLE

A Study to Assess Effect of Foot Massage on Pain During Heel Lancing Among the Neonates in Neonatal Intensive Care Unit from Selected Hospitals of Sangli City

Mrs. Varda V. Sawardekar[1], Dr. Aparna Kale[2], Dr. Dhanraj Babu[3], Mrs. Manisha Kulkarni[4] and Mrs, Shaila Mathew[5]

[1]M. Sc Nursing Student (paediatric Nursing), Bharati Vidyapeeth (Deemed to be University, College of Nursing Sangli. Maharashtra, India 416414
[2]Professor, HOD Paediatric Nursing Department Bharati Vidyapeeth (Deemed to be University) College of Nursing Sangli. Maharashtra, India 416414
[3]Professor, Paediatric Nursing Department Bharati Vidyapeeth (Deemed to be University) College of Nursing Sangli. Maharashtra, India 416414
[4]Clinical Instructor, Paediatric Nursing Department Bharati Vidyapeeth (Deemed to be University) College of Nursing Sangli. Maharashtra, India 416414
[5]Assist Professor, Paediatric Nursing Department Bharati Vidyapeeth (Deemed to beUniversity) College of Nursing Sangli. Maharashtra, India 416414

*Corresponding Author
Mrs. Varda V. Sawardekar

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Abstract: Heel lancing is one of the most common procedures carried out during the neonatal period, yet it is also recognized as a source of considerable pain for newborns. This research employed a quantitative experimental approach, selecting 110 newborns through purposive sampling. The participants were evenly split into two groups: 55 in the experimental group and 55 in the control group. To evaluate pain levels, the Neonatal Facial Coding System (NFCS) was utilized. The study was guided by Wiedenbach's Prescriptive Theory, a situation-producing model that outlines purposeful actions aimed at achieving a specific outcome. This framework focused on essential elements such as the intended goal (central purpose), the recommended action (prescription), and influencing factors (realities). In the control group, 65% of the infants were male and 35% female, and no interventions were applied during the heel lance procedure. Conversely, in the experimental group, 60% were male and 40% female, and each infant received a foot massage before the procedure was performed. The results indicated a notable difference in pain response. Infants who received the foot massage reported a significantly lower average pain score of 1.9, while those in the control group had a mean score of 4.2. The statistical evaluation yielded a t-value of 8.9 and a p-value less than 0.005, confirming a statistically significant difference between the two groups. As a result of these findings, the null hypothesis was rejected, supporting the conclusion that foot massage is an effective intervention for reducing pain associated with heel lancing in neonates.

Keyword: Neonate, foot massage, heel lancing, pain.

INTRODUCTION

Pain in neonates, particularly those in the NICU or in the early days of life, is often unavoidable and frequently under-addressed. This is especially concerning for preterm infants, as unrelieved pain can result in adverse short- and long-term outcomes. Effective pain management requires careful assessment of the infant's condition, gestational age, and a clear distinction between acute and chronic pain types. Pharmacological treatments such as NMDA receptor antagonists, sedatives like propofol and ketamine, and opioids like morphine and fentanyl are commonly used for managing neonatal pain and stress [1].

Alongside pharmacologic methods, non-pharmacologic strategies like swaddling, breastfeeding, sweet solutions, skin-to-skin contact, non-nutritive sucking, and assisted tucking have shown to significantly reduce pain responses in neonates. Involving parents in these practices and providing nurses with appropriate training are vital to improving pain management in clinical settings. Minimizing behavioral and physiological responses to pain may also help prevent the long-term sensitization of pain pathways and protect the developing central nervous system [2].

Recent studies have highlighted the effectiveness of foot massage and reflexology as complementary methods to reduce procedural pain. Yilmaz and Kurt found that foot reflexology significantly reduced pain before heel lancing in neonates [3]. Other studies also showed that foot massage and acupressure performed by mothers prior to heel lancing increased infant comfort and reduced pain scores [4,5]. These findings support the integration of simple, non-invasive interventions in routine neonatal care and emphasize the key role of nurses in assessing and managing neonatal pain

MATERIALS AND METHODS:

This study employed a quantitative research methodology, utilizing a post-test-only experimental design involving two groups. The research was carried out in selected Neonatal Intensive Care Units (NICUs), with a total sample size of 110 neonates. Before initiating the study, ethical clearance was obtained from the Institutional Ethics Committee as well as formal permission from the hospital administrations. Additionally, written informed consent was acquired from the parents or legal guardians of all participating newborns.

Inclusion criteria consisted of neonates weighing

between 1.5 kg and 3.5 kg who were admitted to the NICU, and whose parents provided written consent. Exclusion criteria included critically ill neonates, preterm infants under sedation, and those who had received any analgesic medications within the previous 48 hours. The sample size of 110 neonates 55 each was determined through power analysis, and participants were selected using purposive sampling.

Procedure: After explaining the study and obtaining written consent from mothers, neonates meeting the inclusion criteria were enrolled. Standard hygiene protocols, including handwashing and hand prewarming, were followed before handling the babies. foot massage was administered for 3 minutes In the experimental group during heel lancing area using rubbing, kneading, and stroking techniques. Following this, heel lancing was performed by the bedside nurse using a pinpoint lancet for blood sampling, while the researcher observed and recorded the pain response using the Neonatal Facial Coding System (NFCS). In the control group, heel lancing was performed without any prior foot massage intervention.

Statistical Analysis: Data analysis was conducted in alignment with the study's objectives. Descriptive statistics—including frequency, percentage, mean, and standard deviation were used to summarize the data. To evaluate differences in pain scores between the control and experimental groups, an unpaired t-test was applied.

Table No.1: Frequency and percentage distribution of Gender in control and experimental group. n= 55+55=110

Gender	Control Group		Experimental Group	
	Frequency	Percentage	Frequency	Percentage
Male	36	65%	33	60%
Female	19	35%	22	40%
Total	55	100%	55	100%

Table No. 1: Depicts that 65% Male babies were in the control group and 60% in experimental group. Whereas among females 35% were in Control group & 40% in experimental group.

Table No. 2: Frequency and percentage distribution of weight in control and experimental group. n= 55+55=110

Weight (in kg)	Control group		Experimental group	
	Frequency	Percentage	Frequency	Percentage
1.5 – 2.5	31	56%	46	84%
2.5 - 3.5	24	44%	9	16%
Total	55	100%	55	100%

Table No.2 Depicts those babies with weight between 1.5 to 2.5kg from which 56% were in control group and 84% in experimental group. 44% of babies between 2.5 to 3.5kg were in control group and 16% were in experimental group.

Table No3. Comparison of Pain Score Between Experimental & Control group after foot massage

Group	Mean	S D	t-value	P-value
Control group	4.2909	1.44	8.98466	0.00001
Experimental group	1.9636	1.26		

Table 3 - Average pain score in the control group was 4.2 with a standard deviation of 1.44, while the experimental group had a lower mean score of 1.96 and a standard deviation of 1.26. The calculated t-value was 8.9, and the p-value was 0.00001, which is well below the significance threshold of 0.05. This indicates a statistically significant difference in pain levels between the two groups. The findings suggest that neonates who received a foot massage prior to heel lancing experienced a notable reduction in pain compared to those who did not receive the intervention. Therefore, the foot massage can be considered an effective method for minimizing procedural pain in neonates.

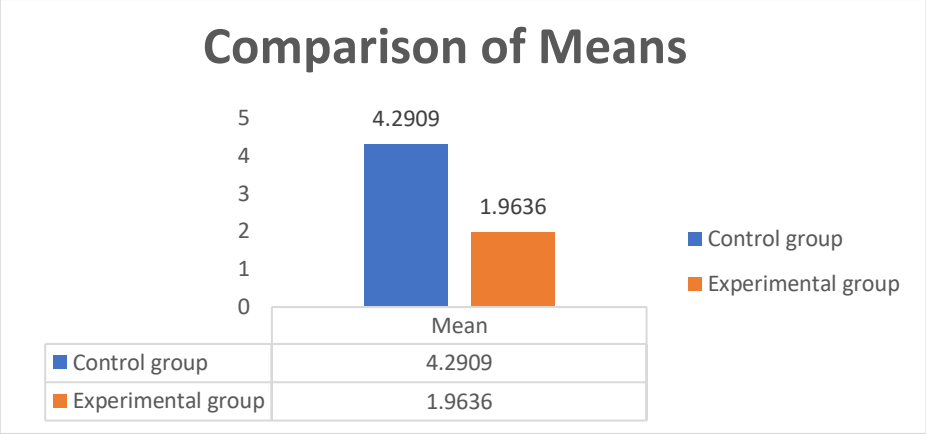

Figure No.1 Comparison of Pain Score Between Experimental & Control group after foot massage.

DISCUSSION:

Newborns in the NICU frequently undergo various painful procedures, such as heel lancing. Since neonates are unable to verbally communicate their pain, accurate assessment and effective pain management are essential. In clinical practice pain management involves both medication based and alternative, non-drug approaches. Repeated painful experiences during the neonatal period can have adverse effects on brain development and nervous system function. Non-pharmacological methods such as skin-to-skin contact, breastfeeding, non-nutritive sucking, nesting, and swaddling have demonstrated effectiveness in alleviating procedural pain in newborns. [6].

In terms of demographic data, a higher percentage of male infants was observed in both groups—65% in the control group and 60% in the experimental group. Regarding birth weight, 56% of neonates in the control group weighed between 1.5 and 2.5 kg, while in the experimental group, 84% fell within that weight range . When comparing pain scores between the two groups, the control group had an average pain score of 4.2, whereas the experimental group (who received foot massage) had a significantly lower mean score of 1.9. Statistical analysis using a t-test showed a t-value of 8.9 and a p-value of 0.00001, indicating a statistically significant reduction in pain due to the intervention. These findings align with previous research by Tuba Koç Özkan et al., which demonstrated the effectiveness of foot massage in reducing procedural pain in neonates [7]. Implications:

Nursing Practice: This study highlights the importance of incorporating foot massage as a simple, non-pharmacological intervention to reduce pain during procedures like heel lancing. Nurses in NICU settings should adopt this technique as part of routine care for both term and preterm infants.

Nursing Administration: Hospital administrators can use these findings to develop standard protocols and policies supporting the use of foot massage prior to heel lancing. Training sessions and in-service education should be conducted to equip staff nurses with the skills required for this technique. Handbooks detailing evidence-based non-pharmacological pain management also be developed for reference.

Nursing Education: Nurse educators can integrate foot massage techniques into clinical teaching, ensuring that student nurses understand its application and benefits. Demonstrations and supervised practice can help reinforce the use of this method during clinical placements.

Nursing Research: The results can be disseminated through journal publications, workshops, and conference presentations to raise awareness among NICU nurses and nursing students. Publishing the findings in both indexed and peer-reviewed journals can help establish a broader evidence base for foot massage as a pain-reducing intervention.

Recommendations:

Future research should consider utilizing a larger sample size to enhance the generalizability of the findings. Comparative studies could also be designed to assess the effectiveness of foot massage in relation to other non-pharmacological interventions, such as kangaroo care, swaddling, oral sucrose administration, and music therapy. Moreover, further investigation could focus on the influence of foot massage on physiological indicators such as heart rate and oxygen saturation levels.

CONCLUSION:

The findings of this study demonstrated that neonates who received a foot massage prior to heel lancing exhibited a significantly lower pain response, with a mean pain score of 1.96, in contrast to 4.2 in the group that did not receive the intervention. The statistical results, including a p-value of 0.00001, confirmed a highly significant difference between the two groups. As a result, the research hypothesis (H1) is accepted, affirming that foot massage is an effective strategy for reducing procedural pain in neonates undergoing heel

lancing.

Let me know if you want these sections adapted into a full research paper format or translated into another language.

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