

A Study to Assess the Effectiveness of Foot Massage on Pain and Physiological Parameters During Heel Lancing Among Term Neonates in a Selected Hospital at Odisha

Dipika Priyadarsini Nayak^{1*}, Abhilekha Biswal², Daisy Abraham³, Anu S. Thomas⁴

¹M.Sc. Nursing Final year, Department of Child Health Nursing, P.G. College of Nursing, Bhilai, India

²Principal, P.G. College of Nursing, Bhilai, India

³HoD, Department of Child Health Nursing, P.G. College of Nursing, Bhilai, India

⁴Associate Professor, Department of Child Health Nursing, P.G. College of Nursing, Bhilai, India

Abstract: Background: Pain is a common and a universal sensation for children and adult. Every child has his or her own perception of pain. Routine procedure like heel lancing is the most frequent painful medical procedure during neonatal period. A fundamental principle of medical care is “do not hurt” but “do not harm” since pain is harmful to children, the care givers are committed in preventing harm to their patients. Pain is a major source of distress for children and their families as well as health care providers. Foot massage technique is one of the methods which inhibit the transmission of pain along the ascending fibers by closing gate pathways during heel lancing. **Objectives:** 1. To assess the level of pain during heel lancing among term neonates in control group. 2. To assess the level of pain after foot massage during heel lancing among term neonates among experimental group. 3. To assess the physiological parameters after heel lancing among term neonates in control group. 4. To assess the physiological parameters after foot massage during heel lancing among term neonates in experimental group. 5. To find the correlation between level of pain and physiological parameters after foot massage during heel lancing among term neonates in experimental group. **Setting and Design:** A quantitative research approach with quasi - experimental research design was adopted for the study. 60 neonates were selected by purposive sampling as samples from NICU of Christian hospital Bissam cuttack Odisha. **Material and Methods:** For the present study the instrument used for data collection includes: 1. Structured questionnaire to assess the socio-demographic variables. 2. Neonatal/infant pain scale (NIPS) to assess level of pain during heel lancing. 3. Duration of cry to assess level of pain during heel lancing. 4. Portable neonatal/infant pulse oximetry to assess physiological parameters i.e., heart rate and oxygen saturation. **Results:** To evaluate the effectiveness of foot massage on duration of cry during heel lancing among term Neonates, un paired ‘t’ test was computed which shows that the calculated ‘t’ value is 3.32 at df 58 at the level of 0.05 significance which is greater than the table value. This depicts that there is a significant difference in the duration of cry between control group and experimental group. This indicated that the foot massage technique was effective on duration of cry during heel lancing among Neonates. To evaluate the effectiveness of foot massage on oxygen saturation after heel lancing among term neonates, unpaired ‘t’ test was computed which depicts that the

calculated ‘t’ value is -4.91 at df 58 at the level of 0.05 which is less than the table value. This depicts that there is no significant difference in the oxygen saturation between control group and experimental group. This shows that the foot massage technique was not effective on oxygen saturation during heel lancing among term neonates. Karl Pearson’s correlation co-efficient was computed which shows that there is significant correlation between neonatal infant pain score and heart rate. Statistical analysis interprets that the calculated ‘r’ value of experimental group is 0.06 which shows that there is moderately positive correlation between neonatal infant pain score and heart rate during heel lancing in neonates. Karl Pearson’s correlation co-efficient was computed which shows that there is significant correlation between neonatal infant pain score and oxygen saturation. Statistical analysis interprets that the calculated ‘r’ value of experimental group is -0.13 which shows that there is moderately negative correlation between neonatal infant pain score and oxygen saturation during heel lancing in neonates.

Keywords: foot massage technique, level of pain, physiological parameters, neonates.

1. Introduction

Every newborn infant experience painful and invasive procedures, because of the need for diagnostic, therapeutic, and sometimes preventive measures. From birth, babies experience pains such as vitamin K injections, vaccinations, circumcision, and heel sampling. (Hamidreza Khoshnezhad Ebrahimi et al. 2020) Pain management is especially important for neonates who are not able to verbally express their pain. The traditional view that neonates are not capable of perceiving pain has been refuted and there is now no doubt those neonates perceive pain. Although infants do not verbalize, they reveal their vulnerability to pain through specific pain behaviors and physiologic changes. The physiological indicators of pain include autonomic changes in the heart and respiratory rate, blood pressure, and oxygen saturation. (Mehrddad Mirzarahimi et al. 2013)

2. Material and Methods

Keeping in view, the objectives of study, the research design selected is a Quasi - experimental research design with post - test only with non - random assignment. The study is intended to reduce the level of pain, cry duration, normal heart rate and increase oxygen saturation. In this design, the subjects are not randomly selected instead; the subjects are taken according to the purpose of the study.

The tools used for data collection consisted of four sections Section A, Section B (Part-I and II) and Section C.

Section A: Socio-demographic variables consisted of 13 questions which deals with infant variables like age of the neonate, gender of the neonate, birth weight, birth order, postnatal age, age of mother, gravida of mother, place of delivery, religion of mother, type of family, area of residence, education of the mother and occupation of the mother.

Section B (Part-I): Neonatal/infant pain scale to assess level of pain, is a behavioral scale that measures the level of pain or distress in neonates and infants.

Section B (Part-II): Duration of cry to assess level of pain. Crying time was defined as the number of seconds the baby had distressed vocalization after heel lancing. Duration of cry between 0-10 seconds is scored 0, between 11-20 seconds is scored 1, between 21-30 seconds is scored 2 and 31 seconds and above is scored 3.

Section C: Portable pulse oximetry to assess heart rate and oxygen saturation Physiological parameters i.e., heart rate and oxygen saturation is measured through portable pulse oximetry which is assessed before and after heel lancing. The heart rate includes tachycardia (>160 bpm), bradycardia (< 90 bpm) and normal heart rate (90-160 bpm).

The oxygen saturation includes less than 90 % and more than 90 % level of oxygen.

3. Results and Discussion

Section – I: In relation to socio-demographic variables - In control group

In the neonatal variables the maximum neonates

- 14 (46.7 %) belonged to gestational age of 37weeks.
- 21 (70%) were boys.
- 9 (30%) had weight between 2501-3000gms.
- 18 (80%) were first born.
- 30 (100%) were in post-natal age between 1-7 days.

In maternal variables the maximum mothers

- 22 (73.3%) were in age group 18-25 years.
- 15 (50%) were primi gravida.
- 30 (100%) had hospital delivery.
- 26 (86.7%) belong to Hindu religion.
- 30 (100%) lived in joint families.
- 22 (73.3%) reside in rural area.
- 11 (36.7%) had high school education.
- 30 (100%) were home makers.

In experimental group

In the neonatal variables the maximum neonates

- 11 (36.7 %) belong to gestational age of 37weeks.

- 19 (63.3%) were boys.
- 10 (33.3%) had weight between 2501-3000gms.
- 21 (70%) were first born.
- 30 (100%) were in post-natal age between 1-7 days.

In maternal variables the maximum mothers

- 17 (56.7%) were in age group 18-25 years.
- 20 (66.7%) were primi gravida.
- 30 (100%) had hospital delivery.
- 27 (90%) belong to Hindu religion.
- 30 (100%) lived in joint family.
- 22 (73.3%) reside in rural area.
- 13 (43.3%) had high school education.
- 30 (100%) were home makers.

Section II: Assessment of level of pain during heel lancing among Neonates in control group and experimental group part – ii a) item wise distribution of subjects according to neonatal infant pain scale

- With regards to facial expression both experimental and control group had similar findings that is 30(100%) Neonates had grimace.
- In regards to cry, it was noted that while in control group 26(86.6%) cried vigorously, only 14(46.6%) Neonates cried vigorously in the experimental group.
- In regards to breathing pattern, in control group and experimental group 30 (100%) and 28(93.3%) Neonates had change in breathing respectively.
- In relation to arms, in control group and experimental group 22(73.3%) and 6(20%) had flexed or extended arms respectively.
- In relation to legs, in control group and experimental group 28(93.3%) and 14(46.6%) had flexed or extended legs respectively.
- In relation to state of arousal, in control group and experimental group 23(76.6%) and 3(10%) were fussy respectively.

Part-II b) Over all analysis to assess the neonatal infant pain score during heel lancing among Neonates in control group & experimental group

- With regard to Neonatal/infant pain score in control group, majority 20(66.7%) of the Neonates had severe pain whereas only 10(33.3%) had moderate pain without foot massage technique before heel lancing procedure.
- With regard to Neonatal/infant pain score in experimental group, majority 15(50%) of the Neonates had moderate pain, 13(43.3%) had severe pain and only 2(6.7%) had mild pain after foot massage during heel lancing procedure.
- In relation to duration of cry in control group, maximum 14(46.7%) of the Neonates had duration of cry of more than 31 seconds without foot massage technique before heel lancing procedure.
- In relation to duration of cry in experimental group, maximum 10(33.3%) of the Neonates had duration of cry between 11-20 seconds after foot massage during

Table 1

't' test analysis to assess the effectiveness of foot massage on Neonatal/infant pain score during heel lancing in Neonates

Parameter	Mean Score	Mean Difference	S.D.	Df	't' value	Inference
Neonatal/ Infant pain score in experimental group	4.07	2.26	1.59	58	6.65	Significant
Neonatal/Infant pain score in control group	6.33		0.99			

Table 2

Analysis to find out the correlation between Neonatal/infant pain score and heart rate after heel lancing in neonates

Group	Area	Mean	Correlation 'r'	Inference
Experimental group	Neonatal/Infant pain score	4.07	0.06	Moderately positive correlation
	Heart rate	127.8		

heel lancing procedure.

Section-III: Assessment of physiological parameters among neonates in control group and experimental group.

- With regard to heart rate in control group, maximum 21(70%) Neonates had normal heart rate (90-160bpm) without foot massage technique before heel lancing procedure.
- With regard to heart rate in experimental group, majority 28(93.3%) Neonates had normal heart rate (90-160 bpm) after foot massage during heel lancing procedure.
- In relation to oxygen saturation in control group, majority 15(50%) Neonates had oxygen saturation of $\geq 90\%$ without foot massage technique before heel lancing procedure.
- In relation to oxygen saturation in experimental group, majority 25(83.3%) Neonates had oxygen saturation of $\geq 90\%$ after foot massage during heel lancing procedure.

Section-IV: Evaluate the effectiveness of foot massage on physiological parameters after heel lancing in Neonates in experimental group using unpaired 't' test

The calculated 't' value in relation to heart rate was 1 which was not significant i.e., less than the table value (2.00) at 0.05 level of significance at $df = 58$ which showed that the foot massage technique had no effect on heart rate after heel lancing among Neonates.

In relation to oxygen saturation the computed 't' value was -4.91 which was not significant i.e., less than the table value (2.00) at 0.05 level of significance at $df = 58$ which showed that the foot massage technique had no effect on oxygen saturation after heel lancing among Neonates.

Section-V: Evaluate the effectiveness of foot massage on level of pain after heel lancing in Neonates in experimental group using unpaired 't' test

It was computed that 't' value in relation to neonatal / infant pain score was 6.65 which was significant i.e., greater than the table value (2.00) at 0.05 level of significance at $df = 58$ which showed that foot massage technique was effective in reducing the neonatal/infant pain score among Neonates during heel lancing procedure.

In relation to the duration of cry the computed 't' value was 3.32 which was significant i.e., greater than the table value (2.00) at 0.05 level of significance at $df = 58$ which showed that foot massage technique was effective in reducing the duration of cry among Neonates during heel lancing procedure.

Section-VI: Correlation between level of pain and physiological parameters after heel lancing in Neonates in experimental group

The present study showed that there is moderately positive correlation between Neonatal infant pain score and heart rate during heel lancing in Neonates as the calculated 'r' value of pain and heart tare was 0.06 which is $0 < r < 1$.

The present study revealed that there is moderately negative correlation between Neonatal infant pain score and oxygen saturation after heel lancing in Neonates as the calculated 'r' value between pain and oxygen saturation was -0.13 which is $-1 < r < 1$.

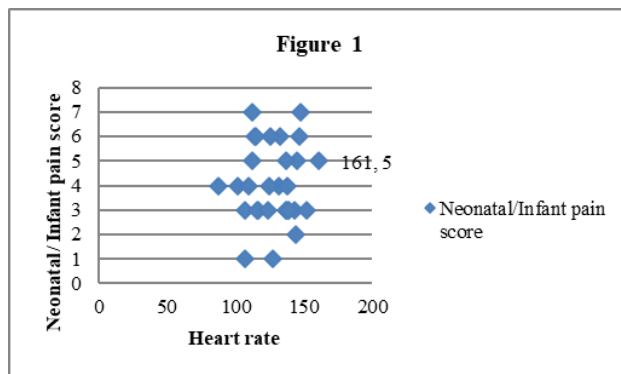


Fig. 1. Correlation between Neonatal infant pain score and heart rate

4. Implications

- Nurses can apply massage as it inhibits the transmission of pain along the ascending fibers by closing the gate or by activating the descending endogenous opioid and non-opioid pathways to decrease nociceptive transmission and reduce pain.
- Application of evidence-based practice related to foot massage technique in Neonates during heel lancing procedure should be applied in nursing practice which is non-pharmacological cost-effective method.

5. Conclusion

The un paired 't' test computed for neonatal/infant pain score was found to be significant as 't' value in relation to neonatal/ infant pain score was 6.65 i.e., greater than the table value (2.00) at 0.05 level of significance at $df = 58$ which showed that foot massage technique was effective in reducing the neonatal / infant pain score among Neonates during heel lancing procedure.

- The un paired 't' test computed for duration of cry was

found to be significant as the computed 't' value was 3.32 i.e., greater than the table value (2.00) at 0.05 level of significance at $df = 58$ which showed that foot massage technique was effective in reducing the duration of cry among Neonates during heel lancing procedure.

References

- [1] Ebtsam M, Ibrahim Shadia R. Effect of foot massage on pain responses to heel stick in preterm infants. *Medicine journal*. 2016.
- [2] Hamidreza Khoshnezhad Ebrahimi, Soroor Sohrabi, Shabahang Jafarnejad, Saeideh Iranmanesh, Somayeh Esmailian. Evaluation of the effect of massage by the mother on the pain of term infants after care measures. *Sys Rev Pharm* 2020;11(9):899-904.
- [3] Jana Chromá, Lucie Sikorová. Pain in neonates and possibilities of its non-pharmacological control. *Profese online*. 2013 Oct; 6(2).
- [4] Joshmi P.J, Marrykutty Matthew, Soja S.L. Effectiveness of abdominal massage on feeding tolerance and weight gain among preterm babies. *International journal of obstetrics, perinatal and neonatal nursing*. 2021 December; 7(2).
- [5] Mehrdad Mirzarahimi, Nasrin Mehmoush, Sahife Shahzadeh, Nasrin Samadi, Firouz Amani. Effect of nonnutritive sucking and leg massage on physiological and behavioral indicators of pain following heel blood sampling in term neonates. *International journal of advanced nursing studies*. 2013 Feb; 74-79.
- [6] Sisilia Leny Cahyani, Faldi Yaputra and I Putu Ekawidyadharmathe. Nurse' role in pain assessment and management of pediatric patient. *International journal of medical reviews and case reports*. 2018.
- [7] Sudha M., Kaleeswari S. Factors influencing exclusive breast feeding among mothers at selected urban area. *International journal of pediatric nursing*. 2020 December, 6(2).
- [8] Witt, N., Coynor, S., Edwards, C., & Bradshaw, H. (2016). *A Guide to Pain Assessment and Management in the Neonate*. *Current emergency and hospital medicine reports*, 4, 1–10.
- [9] Mangat, A. K., Oei, J. L., Chen, K., Quah-Smith, I., & Schmölzer, G. M. (2018). A Review of Non-Pharmacological Treatments for Pain Management in Newborn Infants. *Children (Basel, Switzerland)*, 5(10), 130.
- [10] Şadiye Dur, Serap Balcı, Assessing Neonatal Pain, Duration of Crying and Procedure Time following Use of Automatic or Manual Heel Lances: A Randomized Controlled Study, *Journal of Tropical Pediatrics*, Volume 64, Issue 6, December 2018, Pages 488–494.
- [11] Marsha Campbell-Yeo, Mats Eriksson, Britney Benoit. Assessment and Management of Pain in Preterm Infants: A Practice Update. *Children*. 2022; 9 (2):244.
- [12] Carl Britto, Jasmine, Suman P N Rao, Assessment of Neonatal Pain During Heel Prick: Lancet vs Needle—A Randomized Controlled Study, *Journal of Tropical Pediatrics*, Volume 63, Issue 5, October 2017, Pages 346–351.
- [13] Mohamed Sanaa G.Y, Elhamid Dabash Sohier A, Mohamed Rashad Hanan, Moselhi Eman A., "Comparison of pain response to vein puncture versus heel lance among preterm infants undergoing blood sampling," *Egyptian nursing journal*, vol. 16, no. 3, pp. 155-161, 2019.