

Interventions for Reducing Stress and Pain in Newborns: A Study at Neonatal Intensive Care Unit of a Tertiary Care Hospital in Kolkata

Dr. Sandip Sen¹, Dr. Anjan Kumar Das^{2*}, Dr. Snigdha Samanta³, Dr. Naveen Geddam⁴

¹Associate Professor, Department of Paediatrics, Dr. B. C. Roy Post Graduate Institute of Paediatric Sciences, 111 Narkeldanga Main Road, Kolkata 54, West Bengal, India

²Assistant Professor, Department of Paediatrics, Dr. B. C. Roy Post Graduate Institute of Paediatric Sciences, 111 Narkeldanga Main Road, Kolkata 54, West Bengal, India

³Senior Resident, Department of Paediatrics, Dr. B. C. Roy Post Graduate Institute of Paediatric Sciences, 111 Narkeldanga Main Road, Kolkata 54, West Bengal, India

⁴Post Graduate Trainee, Department of Paediatrics, Dr. B. C. Roy Post Graduate Institute of Paediatric Sciences, 111 Narkeldanga Main Road, Kolkata 54, West Bengal, India

DOI: [10.36348/sjmpps.2019.v05i08.011](https://doi.org/10.36348/sjmpps.2019.v05i08.011)

| Received: 20.08.2019 | Accepted: 27.08.2019 | Published: 30.08.2019

*Corresponding author: Dr. Anjan Kumar Das

Abstract

Background: This study was undertaken in a tertiary care teaching hospital in Kolkata to comparatively analyse the non-pharmacological supportive care interventions for reducing stress and pain in preterm and term newborns. **Methodology:** A prospective observational study conducted on 100 newborns of gestational age 34 weeks and above who weighed more than 1.5kg admitted in NICU at the Department of Paediatrics, of Dr B C Roy Post Graduate Institute of Paediatric Sciences, Kolkata, India from January 2018- December 2018. All the patients experienced moderately painful heel lance procedure and comparative analysis of four non-pharmacological supportive care interventions namely swaddling, facilitative tucking, kangaroo mother care (KMC) and non-nutritional sucking (NNS) for reducing stress and pain were studied using Premature Infant Pain Profile (PIPP)scales. **Results:** Present study had 52% female newborns. 69% were term babies with a mean weight of 2.59kg. Non-pharmacological supportive care interventions significantly (p -value < 0.001) reduce stress and pain in preterm and term newborns. Mean PIPP score was statistically significantly lower with each intervention; swaddling (4.27), facilitative tucking (3.43), KMC (1.84) and NNS (0.78) as compared with control (7.21). Non-nutritional sucking followed by Kangaroo mother care, facilitative tucking and swaddling were effective in reducing pain and stress in that order. **Conclusion:** Non-nutritive sucking, a non-pharmacological supportive care intervention is significantly effective and the best intervention in reducing stress and pain in preterm and term newborns. **Keywords:** Neonate Pain, NICU, Non-Nutritive Sucking, PIPP.

Copyright © 2019: This is an open-access article distributed under the terms of the Creative Commons Attribution license which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use (Non-Commercial, or CC-BY-NC) provided the original author and source are credited.

INTRODUCTION

Stress due to pain is a common phenomenon in critically ill neonate. Stress is due to both environment and various lifesaving yet painful procedures. Infants, including new born babies, experience pain similarly and probably more intensely than older children and adults [1]. Many studies [1-5] have been done busting the myth that newborns do not experience pain due to assumed immaturity of pain pathway. Prevention of pain in neonates should be the goal of all the care givers, on an average a neonate in NICU experiences 7-16 painful procedures per each day of hospitalization [4, 6].

Inadequately managed pain from repetitive painful events during the critical period of brain development can compromise neuronal and synaptic organization permanently [7]. Therefore, preventing or

minimizing pain associated experience and its immediate and long-term is of paramount importance to development and quality of life in these vulnerable neonates. Interventions used to reduce pain management in this study are:

- Swaddling
- Facilitated tucking
- Kangaroo mother care (KMC)
- Non-nutritional sucking (NNS)

Swaddling (sometimes called bundling) is close wrapping of an infant, usually with a light cloth and the head exposed. Although swaddling styles vary across cultures, benefits are observed include improvements in neuromuscular development for very low birth weight infants, reduced physiologic and behavioural distress among premature infants, and

improved calming and sleep for infants with neonatal abstinence syndrome [8].

Facilitated tucking (hand swaddling) consists of placing hand on baby's head or back and extremities flexed and contained close to trunk where an infant is not restricted but can move as needed [9]. It is also known as containment.

Kangaroo mother care (KMC) or Skin-to-Skin holding is a technique in which infant is placed and held against caregiver's bare chest wrapped in a cloth [9]. Baby is clad only in diaper and held in frog-leg position with head turned to one side, provider is in a reclining position supporting baby's bottom.

Non-Nutritive sucking (NNS) is use of a pacifier or non-lactating nipple (after expressing breast milk) is placed in the newborns mouth to suck.

The primary outcome was studied using the *Premature Infant Pain Profile (PIPP)* scores. The PIPP is a reliable and valid measure of acute pain in infants with numerous positive validation studies. There is substantial support for the use of the PIPP as an effective outcome measure in pain intervention studies in infants [10]. The PIPP consists of 3 behavioural (facial actions: brow bulge, eye squeeze, and nasolabial furrow) and 2 physiological (heart rate and oxygen saturation) indicators, and 2 contextual [gestational age (GA) and behavioural state] variables that modify pain. The scores are totalled so that with the seven components scores can range from 0–21, and a difference of two points between conditions can be considered clinically important.

MATERIAL AND METHODOLOGY

A prospective observational study conducted on 100 stable neonates (above 34 weeks, weighing more than 1.5 kg requiring more than four heel-stick procedures a day and able to suck) admitted in NICU at the Department of Paediatrics, of Dr B C Roy Post Graduate Institute of Paediatric Sciences Kolkata, India from January 2018- December 2018 were recruited in this study after attaining informed consent from the parents.

All the babies experienced moderately painful procedure by heel lance and comparative analysis of four non-pharmacological supportive care interventions namely swaddling, facilitative tucking, kangaroo mother care (KMC) and non-nutritional sucking (NNS) for reducing stress and pain in the neonate were studied using *Premature Infant Pain Profile (PIPP)* scales. First heel lance was considered as control and each intervention was applied in a random way on subsequent heel lance and the PIPP scores were recorded after 30 seconds of intervention.

Statistical Analysis

The data was entered into case proforma and converted into an electronic database using Microsoft Excel 2016. The statistical software SPSS version 20.0 has been used for the analysis. ANOVA is applied to compare the four interventions.

RESULTS

Out of 100 new-borns studied during this period composed of 52 female and 48 males. Present study consisted of 69 term (>37weeks) babies and 31 preterm (34-36 weeks) babies with standard deviation of 1.87 weeks. 60% of the babies were ≥ 2.500 kg, 38% in between 2.000 – 2.499 kg and two of them in between 1.500- 1.999 kg. The mean weight of the study population is 2.590 kg with standard deviation of 0.39 kg.

Mean PIPP score after application of non-pharmacological intervention swaddling is 4.27 (SD 0.75), facilitated tucking 3.43 (SD 0.76), KMC is 1.84 (SD 0.84) and NNS is 0.78 (SD 0.70) compared against mean PIPP score of control which is 7.21 (SD 1.75).

All the four non pharmacological interventions applied in this study were found to have significantly reduced pain and stress with a p-value of < 0.001.

When comparison is made among these four interventions, NNS followed by KMC, facilitated tucking and swaddling were effective in reduction of pain and stress experienced by the neonates in that order.

Table-1: Comparison of Non-Pharmacological Interventions with Control

| | Mean | Standard deviation |
|------------------------------|------|--------------------|
| CONTROL | 7.21 | 1.75 |
| SWADDLING | 4.27 | 0.75 |
| FACILITATED TUCKING | 3.43 | 0.76 |
| KANGAROO MOTHER CARE | 1.84 | 0.84 |
| NON-NUTRITIVE SUCKING | 0.78 | 0.70 |

DISCUSSION

For over a long period there was a belief that neonates experience less than children and adults but many studies [1-5] conducted proved that this theory is

wrong, rather the neuroplasticity of new born brain and obnoxious stimuli had deleterious effect in the later life. So, the target of all the new born caregivers are to

minimize or prevent the stress experienced by the newborn to maximum possible extent.

New born care has seen an enormous change in the last decade which increased the survival rate of neonates following any perinatal insult. During this period of care, neonate undergoes various painful yet life saving procedures. Neonatal pain management is increasingly gaining popularity in this current situation of new born care. This study emphasized on the non-pharmacological interventions in the neonatal pain management and confirmed that these interventions are significantly effective in pain management.

Johnston CC *et al.*, [11] study shows KMC as effective intervention in preterm neonate pain management. Liaw JJ *et al.*, [12] studies showed NNS and facilitative tucking as an intervention in pain reduction and showed significant results. Axelin A *et al.*, [13] study showed facilitated tucking is effective in preterm babies.

All these findings were observed in this study. This study made a comparison among the four interventions and found out that the NNS is the most effective among them. The above-mentioned studies have made their findings in preterm neonates alone but this study included term infants as well and showed the results.

CONCLUSION

Neonatal pain management should be dealt with utmost care. Target of all the new born caregivers should direct to minimize or prevent the stress experienced by the new born to maximum possible extent. Every health care facility should implement an effective pain- preventive program. Non-nutritive sucking is most effective in neonatal (term and preterm) pain management followed by KMC, facilitated tucking and swaddling.

What this Study Adds

- There are major gaps in our knowledge regarding most effective way to manage neonatal pain.
- This study is one of its kind which compared four different non-pharmacological interventions.
- Non-nutritive sucking is more effective than Kangaroo mother care, facilitative tucking and swaddling in that order.

Limitation of Study: Single enter study

Funding: None

Conflict of Interest: None declared

Ethical Approval: The study was approved by the Institutional Ethics Committee and Institutional scientific committee.

REFERENCES

1. Mathew, P. J., & Mathew, J. L. (2003). Assessment and management of pain in infants. *Postgraduate Medical Journal*, 79(934), 438-443.
2. Nimbalkar, S., Sinojia, A., & Dongara, A. (2012). Reduction of neonatal pain following administration of 25% lingual dextrose: a randomized control trial. *Journal of tropical pediatrics*, 59(3), 223-225.
3. Nimbalkar, S. M., Chaudhary, N. S., Gadhavi, K. V., & Phatak, A. (2013). Kangaroo mother care in reducing pain in preterm neonates on heel prick. *The Indian Journal of Pediatrics*, 80(1), 6-10.
4. Dionysakopoulou, C., Giannakopoulou, M., Lianou, L., Bozas, E., Zannikos, K., & Matziou, V. (2018). Validation of Greek versions of the neonatal infant pain scale and premature infant pain profile in neonatal intensive care unit. *Pain Management Nursing*, 19(3), 313-319.
5. Grunau, R. E. (2013). Neonatal pain in very preterm infants: long-term effects on brain, neurodevelopment and pain reactivity. *Rambam Maimonides medical journal*, 4(4).
6. Carbajal, R., Rousset, A., Danan, C., Coquery, S., Nolent, P., Ducrocq, S., ... & Lenclen, R. (2008). Epidemiology and treatment of painful procedures in neonates in intensive care units. *Jama*, 300(1), 60-70.
7. Bartocci, M., Bergqvist, L. L., Lagercrantz, H., & Anand, K. J. S. (2006). Pain activates cortical areas in the preterm newborn brain. *Pain*, 122(1-2), 109-117.
8. Pease, A. S., Fleming, P. J., Hauck, F. R., Moon, R. Y., Horne, R. S., L'Hoir, M. P., ... & Blair, P. S. (2016). Swaddling and the risk of sudden infant death syndrome: a meta-analysis. *Pediatrics*, 137(6), e20153275.
9. Spruill, C., & LaBrecque, M. (2017). Preventing and Treating Pain and Stress Among Infants in the newborn Intensive Care Unit. In: Cloherty and Stark's Manual of Neonatal care. 8th ed. India: Wolters Kluwer; 1022-1042.
10. Stevens, B., Johnston, C., Taddio, A., Gibbins, S., & Yamada, J. (2010). The premature infant pain profile: evaluation 13 years after development. *The Clinical journal of pain*, 26(9), 813-830.
11. Johnston, C. C., Filion, F., Campbell-Yeo, M., Goulet, C., Bell, L., McNaughton, K., ... & Walker, C. D. (2008). Kangaroo mother care diminishes pain from heel lance in very preterm neonates: a crossover trial. *BMC pediatrics*, 8(1), 13.
12. Liaw, J. J., Yang, L., Wang, K. W. K., Chen, C. M., Chang, Y. C., & Yin, T. (2012). Non-nutritive sucking and facilitated tucking relieve preterm infant pain during heel-stick procedures: a

- prospective, randomised controlled crossover trial. *International journal of nursing studies*, 49(3), 300-309.
13. Axelin, A., Salanterä, S., & Lehtonen, L. (2006). 'Facilitated tucking by parents' in pain management of preterm infants—a randomized crossover trial. *Early human development*, 82(4), 241-247.