A Quasi Experimental Study to Assess the Effectiveness of Facilitated Tucking on the Level of Pain Among Preterm Infants Undergoing Painful Procedures at Selected Hospitals, Chennai, South India

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Abstract

**Aim and objective:** To assess and compare the effectiveness of facilitated tucking on the level of pain among preterm infants undergoing painful procedures.

**Methodology:** A quantitative approach, quasi experimental post-test only design was adopted to assess the effectiveness of facilitated tucking on the level of pain among 60 preterm infants (30 in study and 30 in control group) undergoing painful procedures, who fulfilled the inclusion and exclusion criteria at Amma Hospital, Choolaimedu and Sir Ivan Stedeford Hospital, Ambattur, Chennai. The non-probability purposive sampling technique was used to select the samples. Facilitated tucking was performed on the preterm infants during the painful procedure and the level of pain was assessed after the procedure and interpreted using Premature Infant Pain Profile (PIPP) Scale.

**Results:** The study findings revealed that the post test pain mean score of preterm infants undergoing painful procedures in the study group was 3.2 with a standard deviation of 2.7 and post test pain mean score of preterm infants in the control group was 8.3 with a standard deviation of 4.8. The calculated ‘t’ value (-5.051) indicated that there was a high statistical significance in the post test pain mean score among the preterm infants undergoing painful procedures at p<0.001 level.

**Conclusion:** The result revealed that facilitated tucking was effective in reducing pain during painful procedures and can be practiced as a part of routine nursing care of preterm infants during painful procedures.

**Key words:** Facilitated tucking, level of pain, preterm infants, PIPP scale, painful procedure.
Introduction

Premature, Preemie or Preterm babies are the ones who are born before 37 completed weeks of gestation. They may look tiny and fragile but should not be underestimated because of their appearance. They start with their smaller foot prints, thereafter achieving a beautiful life with patience, love and tender care over a period of time.

Globally 15 million babies are born preterm every year. More than one in 10 births is born too early, according to Born Too Soon: the Global Action Report on Preterm Birth, released by World Health Organization in the year 2013. The report points out that India has the maximum number of births, out of which 3,519,100 of them are preterm. About 15 million babies are born preterm each year - that is more than one in ten babies worldwide. 60% of them are born in sub-Saharan Africa and South Asia \(^1\).

Pain is an acute stress that leads to disequilibrium in the physical, physiological, emotional and behavioral parameters to various degrees of severity. Preterm infants are unable to communicate pain verbally and hence, are commonly unrecognized and left untreated. In NICU, every preterm infant is exposed to a high number of painful procedures and interventions, of these 65% of the procedures is performed without pre and/or post anesthesia or analgesia. The immature peripheral and central nervous system of the preterm infant responds differently to pain, making these neurologically immature infants susceptible to long-term effects of pain \(^2\).

Heel prick is one of the most common procedures routinely performed in the newborn worldwide. Infants born preterm are repeatedly exposed to heel pricks every day, as part of their care in NICU. This acute, invasive and painful procedure is performed to obtain blood for routine screening and to measure serum bilirubin and glucose.

Healthcare providers must recognize, evaluate and use a variety of pain relief techniques in preterm infants to counter the potential for later complications. Every healthcare facility caring for preterm infants should implement an effective pain prevention program, which includes strategies for assessing pain routinely, minimizing the number of painful procedures, and effectively using nonpharmacologic interventions for the prevention of pain associated with routine minor procedures.

Significance and Need for the study

Pain is defined as an unpleasant sensory and emotional experience and preterm infants not only feel the pain, but also respond more intensively compared to term infants. The experience of pain is always subjective. Hence, verbalization of nociceptive sensations is the gold standard for assessment of pain. Since preterm infants cannot verbalize pain, the recognition and management of pain in preterm infants is still suboptimal in neonatal intensive care units \(^3\).

Zelenovic J, Rae A (2010) reported that preterm infants often have several sources of pain and discomfort as they face up to 400 painful procedures while they are being cared for in NICU. They found that the most common painful procedures performed daily include heel lancing, venepuncture, endotracheal intubation, suctioning, lumbar puncture and Retinopathy Of prematurity (ROP) screening \(^4\).

The heel prick procedure, is performed in the plantar surface of the heel where it is punctured by a lancet or a needle to a depth of 2-3 mm. This is the most common way of drawing blood
from newborn infants. Although the heel stick procedure is short in duration, it can affect behavioural and physiological responses such as facial expression, heart rate, respiratory rate, and oxygen saturation of the infants. The short-term effects may include feeding problems, parent-infant interaction dysfunction, and interruption of sleep wake cycles. Possible long-term effects of repeated heel sticks include impairments of neurodevelopment, learning, and memory\textsuperscript{[5]}.

Lina K.B, Bahia Abdallah M.H, Saadieh S, May K, Pascale N, Julianna B (2010) in a crosssectional study assessed the pain responses of 72 preterm infants to a heel stick procedure using the Premature Infant Pain Profile (PIPP) scale and found that sick premature infants were exposed to a variety of painful procedures and they manifest behavioral and physiological signs of pain in a single procedure\textsuperscript{[6]}.

Facilitated tucking is one of the simplest non-pharmacological and cost effective techniques simulating the condition of being in-utero. This makes the infant comfortable, more secure with controlled responses. It facilitates self-regulation by decreasing the physiological responses like prolonged heart rate elevation that contributes to the disequilibrium associated with pain and stress. Facilitated tucking improves the emotional security and reduces the pain perception\textsuperscript{[7]}.

Hopitaux de Paris (2014) assessed the intensity of pain among preterm infants using PIPP scores and studied the effectiveness of facilitated tucking during and after heel prick procedures and found that facilitated tucking is an effective comfort measure in attenuating a premature neonate’s physiological and behavioral responses to minor pain\textsuperscript{[8]}. Liaw JJ, et al., (2012) compared the effectiveness of two non-pharmacological pain-relief strategies (non-nutritive sucking and facilitated tucking) with routine care, during and after heel prick procedures and found that both non-nutritive sucking and facilitated tucking effectively reduced pain scores more than routine care, during heel-stick procedures\textsuperscript{[9]}.

The investigator, during her clinical experience, identified the physiological and behavioral response of preterm infants to various painful procedures. Such painful expressions of fragile neonates were not given much clinical importance and were rather pampered by unsterilized pacifiers and blind administration of sucrose solutions. Hence, the investigator had felt the need for a simple, cost effective, non-pharmacological nursing intervention to reduce pain and the underlying complications of unattended pain responses. The investigator adopted facilitated tucking as the comforting measure to reduce procedural pain that confines the preterm infant, and also prevents the long term consequences of repeated painful stimuli.

Objectives
1. To assess and compare the effectiveness of facilitated tucking on the level of pain among preterm infants undergoing painful procedures in study and control groups.
2. To associate the selected demographic variables with the post test pain mean score among preterm infants undergoing painful procedures in study and control groups.

Null hypotheses
\textbf{NH}_1- There is no significant difference between the level of pain among preterm infants in study and control groups at p <0.05 level.

\textbf{NH}_2- There is no significant association of the selected demographic variables with the post test pain mean score in study and control groups at p <0.05 level.
Materials and Methods

A quasi experimental post test only research design was adopted to assess the effectiveness of facilitated tucking on the level of pain among preterm infants undergoing painful procedures. The independent variable of this study was facilitated tucking and the dependent variable was level of pain while undergoing the painful procedure. The study was conducted in the NICU of Amma Hospital, Choolaimedu and Sir Ivan Stedeford Hospital, Ambattur, Chennai. The study population included preterm infants with 26-36 weeks of gestation undergoing painful procedures. The sample size consisted of 60 preterm infants (30 in study and 30 in control group) who fulfilled the inclusion and exclusion criteria and were selected by the non-probability purposive sampling technique. The tool used to assess the pain was PIPP scale which consisted of two parameters (Physiological indicator: heart rate, oxygen saturation level and Behavioural indicator: sleep/wake state, brow bulge, eye squeeze and nasolabial furrow). Analysis of data was done using descriptive and inferential statistics.

Ethical Consideration

Formal administrative approval was obtained from the International Collaborative Centre for Research (ICCR), The Principal, Omayal Achi College of Nursing, and from the Medical Directors, Neonatologist, Nursing Supervisor of Sir Ivan Stedeford Hospital, Ambattur, and Amma Hospital, Choolaimedu, Chennai. A special permission to record the facial expressions of the preterm infant after the painful procedure and assistance of the staff nurses at the NICU to record the video was also obtained from the medical directors of the institutions. The study was explained to caregivers and informed consent was obtained ensuring the purpose of video recording of facial expressions of their preterm infants. Confidentiality regarding the data was assured so as to get co-operation throughout the procedure of data collection.

Statistical Analysis

Statistical analysis was performed using the Statistical Package for Social Sciences Programme (SPSS) version 17.0. Descriptive statistics was used to describe the demographic variables. Unpaired ‘t’ test was used to compare the mean pain score between study and control groups. One way ANOVA was used to find the association of the demographic variables with the post test mean pain score in study and control groups.

Results

![Graph showing the assessment and comparison of post test level of pain among preterm infants undergoing painful procedure between the study and control groups.](image)

Figure 1: Assessment and comparison of post test level of pain among preterm infants undergoing painful procedure between the study and control groups.
The above figure shows that the preterm infants who were given the nursing intervention of facilitated tucking during the painful procedure experienced mild to moderate pain, while none of them experienced severe pain. However, preterm infants who underwent the hospital routine (verbal pampering) experienced mild to severe pain which depicts that facilitated tucking during painful procedures reduced the level of pain experienced by the preterm infants.

Table 1: Comparison of post test level of pain between study and control groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Unpaired “t” Test Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study</td>
<td>3.267</td>
<td>2.7409</td>
<td>“t” = -5.051 at p&lt;0.000***</td>
</tr>
<tr>
<td>Control</td>
<td>8.367</td>
<td>4.8029</td>
<td></td>
</tr>
</tbody>
</table>

The above table shows that the mean score of post test level of pain in preterm infants who underwent painful procedures, with facilitated tucking, was significantly less than mean score of post-test level of pain in the preterm infants who underwent painful procedure in the hospital routine (verbal pampering). The calculated unpaired “t” test value was -5.051, which was found to be highly statistically significant at p<0.001 level. This indicates that the preterm infants who were given the nursing intervention of facilitated tucking were comfortable; more secure with controlled responses and also had reduced pain during painful procedures.

The above figure shows that preterm infants experience less pain when breastfed than formula-fed or a combination of both feeds. Newly admitted preterm infants are highly sensitive to
painful procedures and experience more pain. Preterm infants who were stimulated externally before the painful procedure showed increased level of pain.

**Discussion**

The findings revealed that 27(90.0%) of the preterm infants experienced mild pain, 3(10.0%) experienced moderate pain and none of them experienced severe pain in the study group. Whereas 15(50.0%) of the preterm infants experienced mild pain, 8(26.7%) experienced moderate pain and 7(23.3%) experienced severe pain in the control group.

The post-test pain mean score in study group was 3.26 with the standard deviation 2.74, whereas the mean score of post test level of pain in the control group was 8.36, with the standard deviation 4.80. The calculated unpaired ‘t’ test value \( t = -5.051 \) was found to be highly statistically significant at \( p < 0.001 \) level. These values indicate that there was a reduction in the level of pain among preterm infants who received the nursing intervention of facilitated tucking compared to the preterm infants who were allowed to follow the hospital routine during the painful procedures. Hence the null hypothesis NH1 stated earlier, “There is no significant difference between the level of pain among preterm infant in study and control group at \( p < 0.05 \) level” was rejected.

**Lopez O, Subramanian P, Rahmat N, Chin Theam L, Chinna K, Rosli R. (2012)** in their Randomized Controlled crossover study assessed the effects of facilitated tucking on procedural pain in preterm neonates using PIPP scores. The results showed that most of the infants experienced severe pain during procedures without intervention but very few of them experienced severe procedural pain with intervention; it was concluded that the facilitated tucking position can be used as a safe non-pharmacological method of pain relief in preterm neonates \(^{10}\).

There was no association of the selected demographic variables with the post test mean score of pain among preterm infants undergoing painful procedures in the study group whereas the demographic variables such as type of feed before the painful procedure shows near significance, length of hospitalization and external stimuli before the painful procedure shows statistical significance in the control group.

Since breast milk has a natural analgesic effect, preterm infants who were fed with breast milk before half an hour experienced less pain; preterm infants who were fed with a combination of formula feed and breast milk had an insufficiency of meeting the energy needs, which subjected them to experience more pain than other infants.

Newly admitted preterm infants were very sensitive to noxious stimuli and experienced more pain than the preterm infants who stayed in the hospital for more than a day, as they had adapted themselves to repeated painful stimulus. Preterm infants who were hospitalized for more than 4 days were subjected to repeated skin breaking and life-saving procedures as part of routine care, contributing to increased perception of pain, as compared to other infants who had minimal hospital stay.

Preterm infants who were manipulated externally (by means of diaper changing, Non Invasive Blood Pressure monitoring, administration of injections, feeding) were awake/active before the painful procedure and experienced more pain than other preterm infants who were in quiet or sleep state.
Hence the null hypothesis NH2 stated earlier, “There is no significant association of the selected demographic variables with the post test mean score of pain” was accepted in the study group and rejected for the selected demographic variables such as type of feed before the painful procedure, length of hospitalization and external stimuli before the painful procedure in the control group at p <0.05 level.

Conclusion
The study was aimed to assess the effectiveness of facilitated tucking on the level of pain among preterm infants undergoing painful procedures. The findings revealed that there was a significant reduction in the level of pain in the study group who received facilitated tucking during painful procedures, when compared to the preterm infants who underwent hospital routines (t= -5.051) at p <0.001 level. Thus, the nursing intervention of facilitated tucking can be utilized by neonatal nursing professionals in their clinical practice to reduce the level of procedural pain in preterm infants at the NICU and Neonatal wards.

Contributors
RSG: Conceptualization of the study, collection, analysis of the data, writing the manuscript, finalized the manuscript and will act as the guarantor of the paper; RRP: Conceptualization of the study, analysis of the data, writing the manuscript, finalized the manuscript, edited and critically evaluated the manuscript; KS, CD: Edited and critically evaluated the manuscript.

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References


