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RESEARCH ARTICLE

A STUDY TO ASSESS THE EFFECTIVENESS OF FACILITATED TUCKING IN REDUCING THE PAIN RESPONSES DURING PAINFUL PROCEDURES AMONG NEONATES OF NICU AND POSTNATAL WARDS IN THE SELECTED HOSPITAL AT MANGALORE

¹Padmashree, ²Flavia Reshma Quadras, ³DivyaRani, R. and ^{4,*}Anoop Thampi

¹Srinivas Institute of Nursing Science, Valachil, Mangalore, India

²Assistant professor Department of Pediatric nursing Srinivas Institute of Nursing Science, Valachil, Mangalore, India

³College of Health Science, Bule Hora University, Bule Hora Ethiopia

⁴School of Nursing, College of Health Science, Mekelle University, Mekelle, Tigray, Ethiopia

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ABSTRACT

Background: The neonatal period is recognized as a brief, critical time that requires focused interventions. Neonates routinely undergo painful invasive procedures even after uncomplicated birth. Treating procedural pain has become a crucial part of neonatal care. In the past it was believed that neonates do not feel pain because of incomplete myelination of peripheral nerves. This is no longer believed to be true, because myelination is not necessary for pain perception. Hence Pain among neonates is often underestimated and untreated, producing untoward consequences. In one word assessment of pain in babies is a persistent, unresolved problem that has serious implications for effective management. **Objectives:** The objective of the study was to evaluate the effect of facilitated tucking in terms of variations in physiological and behavioural responses by comparing experimental and control group. **Method:** The data was collected from 50 neonates (experimental =25, control =25) of Srinivas hospital, Mukka. Experimental group neonates underwent routine procedure with facilitated tucking and control group neonates underwent routine procedure without facilitated tucking. **Result:** The mean NIPS score following the routine procedure with facilitated tucking was 1.60 with a standard error of 0.245 and the same following the routine procedure without facilitated tucking was 5.12 with a standard error of 0.279 The NIPS scores of these two procedures were compared by using unpaired t-test, which revealed that there is a statistically significant difference in NIPS score (mean difference 3.520) between them. The result also showed that there is no significant association between the physiological and behavioural changes with demographic variables. **Conclusion:** In conclusion, Facilitated tucking is an effective non-pharmacological measure to reduce procedural pain in neonates demonstrated by significantly lower NIPS scores.

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INTRODUCTION

Neonates undergo multitude of diagnostic and therapeutic procedures that are painful but medically necessary to their care such as heel prick, venepuncture, vaccination etc (Butt, 2000). Since repeated and sustained pain can have consequences for the neurological and behaviour-oriented development of the new born, the greatest attention needs to be paid to systematic pain management in neonates (Anand, 1996). Furthermore at present the nurses working in children's ward assisting for painful procedures carryout efficient safe and quick action in decreasing pain or discomfort and they are

following traditional methods of mothering such as use of tactile stimuli, holding, stroking, verbal stimuli and making soothing sounds etc. The ultimate aim of nursing is to keep the infants free from pain and other stressful stimuli as far as possible by advocating minimal handling protocol giving comfort by administering non pharmacological interventions (Ghai, 2001). Facilitated tucking is defined as the gentle positioning of an infant's arms and legs in a flexed, midline position close to the infant's body while the infant is in either a side-lying, supine, or prone position (Kelly, 2005; IASP, 1979). This technique provides the infant with support and the chance to control his or her own body. Positioning the infant in a tucked position allows the infant to gain a sense of postural security, promotes normal motor development, and aids in energy conservation (Simkin, 1992).

*Corresponding author: Anoop Thampi,

School of Nursing, College of Health Science, Mekelle University, Mekelle, Tigray, Ethiopia.

Facilitated tucking aids an infant's ability to use his or her own self-regulatory skills, such as hands to mouth and grasping or holding, so the infant can better cope with minor pain and stress (Dyke, 1993). Facilitated Tucking improves the emotional security and reduces the pain perception. The nurse or care givers can effectively implement facilitative tucking for reduction of pain in any setting as it is a very simple technique. Facilitated Tucking is also one of the simplest non pharmacological and cost effective technique simulating the condition of being in uterus (Coriff, 1995).

Need for the study: Every year four million babies die in the first month of life and a quarter of these take place in India. A package of essential new born care practices exists, which has a proven impact on reducing mortality, and can be implemented in low resource settings. However, childbirth and the neonatal period are culturally important times, during which there is strong adherence to traditional practices (Available from www.karnatakademographicprofile.com). Neonates in the Neonatal Intensive Care and postnatal wards experience a multiple, painful, tissue-damaging procedures daily. Pain among neonates is often underestimated and untreated, producing untoward consequences. Premature infants experienced an average of twelve painful procedures per day of hospitalization. In adequate assessment of pain in babies is a persistent, unresolved problem that has serious implications for effective management (Coleman et al., 2002). A randomized cross over study was conducted in Finland, to examine the effectiveness of Facilitated Tucking by parents in pain management during ET tube or pharyngeal suctioning of pre-term neonates. With one of their parents 20 pre-term infants participated in the study. Convincing sampling method was used. Heart rate and oxygen saturation were recorded. The neonates calmed down more quickly after "Facilitated tucking by parents". Facilitated tucking was preferred by nineteen out of twenty Parents during suctioning, venepuncture, vaccination, Heel stick procedures, etc. compared to control care. The study concluded that facilitated tucking by parents is an effective and safe pain management method (Anna et al., 2006).

Till today, there is lack of evidence available due to lesser number of trials, relatively small number of infants and questionable methodology in the area of implementation of non-pharmacological pain management, especially facilitated tucking. Hence more researches are needed determining the effectiveness of facilitated tucking in pain relief during painful procedures among neonates. This motivated the investigator to take up the study to find out the effect of facilitated tucking, which is a non-pharmacological pain intervention in reducing pain in neonates in NICU and postnatal ward.

Objectives of the study

The objectives of the study were to:

- To assess the physiological and behavioral responses of neonates with facilitated tucking during painful procedure in experimental group.
- To assess the physiological and behavioural responses of neonates without facilitated tucking during painful procedure in control group.
- To evaluate the effect of facilitated tucking in terms of variations in physiological and behavioural responses by comparing experimental and control group.

- To find an association between physiological and behavioural responses in experimental group and selected demographic variables.

Operational definitions: An operational definition represents how the researcher plans to measure the study variable (Talbot, 1995).

Effectiveness: In this study, it refers to the response of facilitated tucking in reducing the level of pain during painful procedures as manifested by significant reduction in post-test pain of neonates as measured by Neonatal infant pain scale.

Facilitated Tucking: In this study, Facilitated tucking is defined as the gentle positioning of an infant's arms and legs in a flexed, midline position close to the infant's body while the infant is in either a side-lying, supine, or prone position (Kelly, 2005; IASP Subcommittee on Taxonomy, 1979).

Pain: Pain is defined as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage (Coriff, 1995; Sharon, 2005).

Painful procedures: It refers to a procedure requiring insertion of an instrument or device into the body through the skin or a body orifice for diagnosis or treatment of infants. In this study procedure includes intravenous, intramuscular, subcutaneous, intradermal injections and Heel stick procedures.

Neonatal infant pain scale: In this study neonatal infant pain scale (NIPS) is a behavioural assessment tool for measurement of pain in preterm and full term neonates (Lawrence, 1993).

New born: The present study new born refers to the one born between 37 weeks and 42 weeks of gestation irrespective of birth weight and within the age of 28 days.

MATERIALS AND METHODS

The conceptual framework of the present study is based on General system theory of Bertalanffy, (1968). An evaluative approach is used in this study to assess the effectiveness of facilitated tucking in reducing the pain responses during painful procedures among neonate in NICU and postnatal wards. Non-randomized control group research design was used. Sample was selected by purposive sampling technique and was assigned to experimental and control group. Both groups were assessed prior to the procedure, during and after painful procedures by neonatal infant pain scale.

Non -Randomized control group research design		
PRE-TEST	TREATMENT	POST-TEST
Ex0 ₁	x	Ex0 ₂
Co0 ₁	--	Co0 ₂

Keys

- O1 - Pre-test in experimental and control group.
 X - Facilitated tucking in experimental group.
 O2 - Post-test in experimental and control group

Setting of the study: The present study was conducted at Srinivas hospital, mukka, Mangalore The institute is affiliated to Rajiv Gandhi University of Health Sciences, Bangalore, and Approved by Medical Council Of India, New Delhi.

Population: In the present study the population comprised of Neonates in the postnatal ward and NICU at Srinivas hospital, Mukka, Mangalore.

Sample and sample size: The present study was conducted among 40 (E=20, C=20) Neonates of postnatal ward and NICU at Srinivas hospital, Mukka, Mangalore.

Sampling technique: The sampling technique adopted for this study was purposive sampling. This method comprises the deliberate selection of sample units that conform to some pre-determined criteria. This involves selection of cases which the investigator judge as the most appropriate ones for the study.

Selection criteria

Inclusion Criteria

- Neonates in postnatal ward and NICU-
- Who are undergoing painful procedures
- Whose parents are willing to subject their neonate to Facilitated Tucking.
- Who do not receive paralytic, analgesic, or sedative medications within 48 hours

Exclusion Criteria

- With major congenital anomalies.
- Who had undergone surgical procedures
- Who are critically ill.

Procedure for data collection: Permission was obtained from the concerned authority and informed consent was taken from the parents of the neonates. Sample was selected by purposive sampling technique and was assigned to experimental and control group. Both groups were assessed prior to the procedure, during and after painful procedures by neonatal infant pain scale.

The data collection process was divided into two consecutive periods

- Baseline data collection
- Painful procedure

Instrumentation

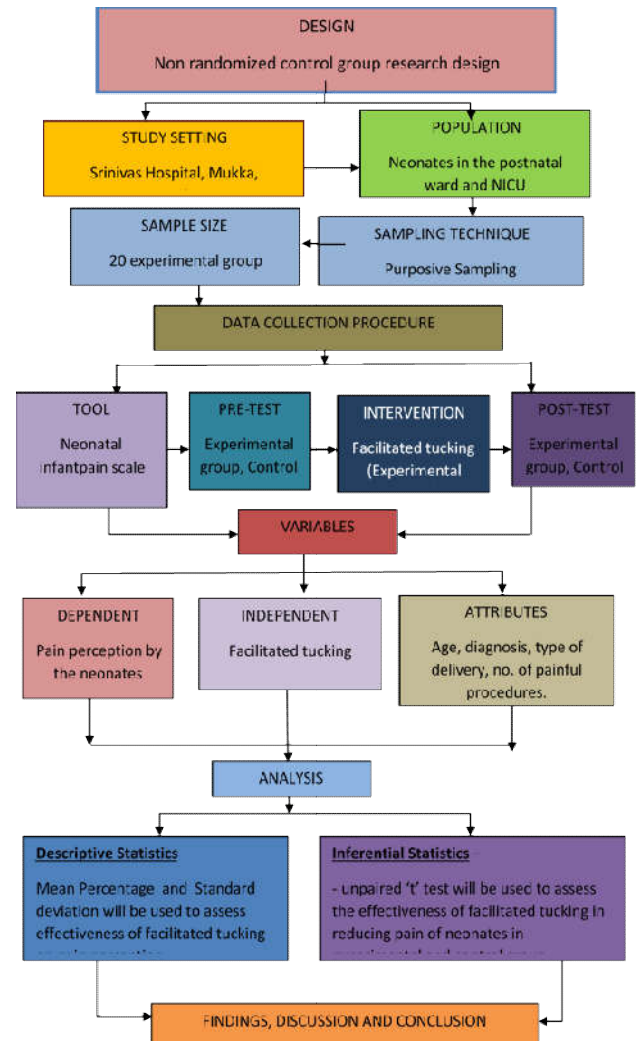
- Pulse oximeter
- The Neonatal Infant Pain Scale (NIPS) is a behavioural assessment tool for measurement of pain in preterm and full term neonates.

Indicators in NIPS

- Facial expression
- Cry
- Breathing pattern
- Movements of the arms
- Movements of the legs
- State of arousal
- NIPS Score = SUM (points for all 6 indicators)

Interpretation: Minimum score: 0 Maximum score: 7
Higher the score the greater the pain behaviour.

SCHEMATIC OUTLINE OF RESEARCH DESIGN



RESULTS

The study was aimed to assess the effectiveness of facilitated tucking in reducing the pain responses during painful procedures. The analysis and interpretation of the data of this study are based on the data collected through NIPS (neonatal infant pain scale) during routine painful procedures (n=40). The results were computed using descriptive and inferential statistics based on the objectives of the study

Description of Demographic Variables: The data analysis was done by using SPSS (v 16) for windows. The descriptive statistics were calculated for all the basic characteristics, where the mean and SD of chronological age, gestational age, birth weight, and head circumference of experimental group were 3.40 (2.257) in days, 38.25(1.585) in weeks, 2725.00(365.088) in grams, and 33.70(1.081) in cms. And mean chronological age, gestational age, birth weight, and head circumference of control group were 3.05(1.986) in days, 38.15(2.059) in weeks, 2857.50(424.969) in grams and 33.55(1.317) in cms for control group respectively

Description of Categorical Variables: Among the 20 infants in experimental group 11 were male and 9 were females; 15 infants had been delivered with cephalic presentation and 5 with breech presentation; and 20 were born as single; among 20 infants in control group 8 were male and 12 were females; 16 infants had been delivered with cephalic presentation and 4 with breech presentation; and 20 were born as single.

Table 1. Summary of Basic Characteristics (Continuous Variables)

Characteristics	Experimental group Mean (SD)	Control group Mean (SD)
Chronological age (in days)	3.40 (2.257)	3.05 (1.986)
Gestational age (in weeks)	38.25 (1.585)	38.15 (2.059)
Birth weight (in grams)	2725.00 (365.088)	2857.50 (424.969)
Head circumference (in cms)	33.70 (1.081)	33.55 (1.317)

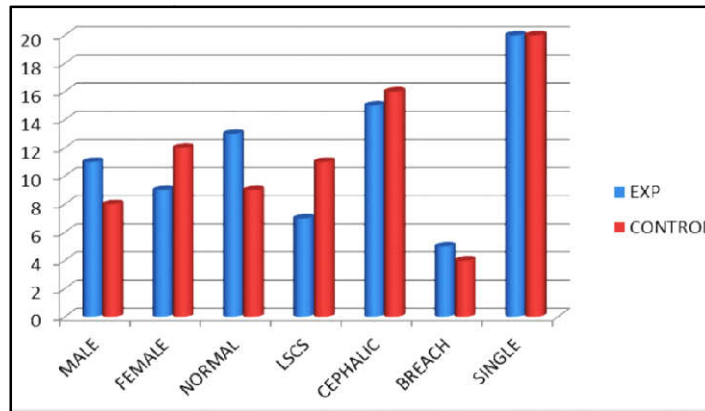


Figure 1. Basic Characteristics (Categorical Variables)

Table 2. Frequency of Infants for change in the Oxygen Saturation from baseline (Physiological variables)

Oxygen saturation minimum	Routine Procedure With Facilitated Tucking n (%)	Routine Procedure without Facilitated Tucking n (%)
0 % - 2.4 % decrease	12(60)	5(25)
2.5 % - 4.9 % decrease	6(30)	6(30)
5 % - 7.4 % decrease	1(5)	3(15)
≥ 7.5 % decrease	1(5)	6(30)



Figure 2. Frequency of infants for change in the heart rate from baseline during routine procedure in experimental and control group

Table 3. Frequency of Infants for change in the Behavioral Variables from baseline based on NIPS

Behavioral variables	Routine procedure with facilitated tucking n (%)	Routine procedure without facilitated tucking n (%)
Facial expression		
Relaxed	14(70)	4(20)
Grimace	6(30)	16(80)
Cry		
Relaxed	6(30)	2(10)
Whimper	11(55)	10(50)
Vigorous cry	3(15)	8(40)
Breathing pattern		
Relaxed	16(80)	5(25)
Change in Breathing	4(20)	15(75)
Arms		
Restrained	20(100)	2(10)
Released	0	2(10)
Flexed	0	8(40)
Extended	0	8(40)
Legs		
Restrained Released	20(100)	2(10)
Flexed	0	1(5)
Extended	0	9(45)
	0	8(40)
State of arousal	6(30)	3(15)
Sleeping	11(55)	5(25)
Awake Fussy	3(15)	12(60)

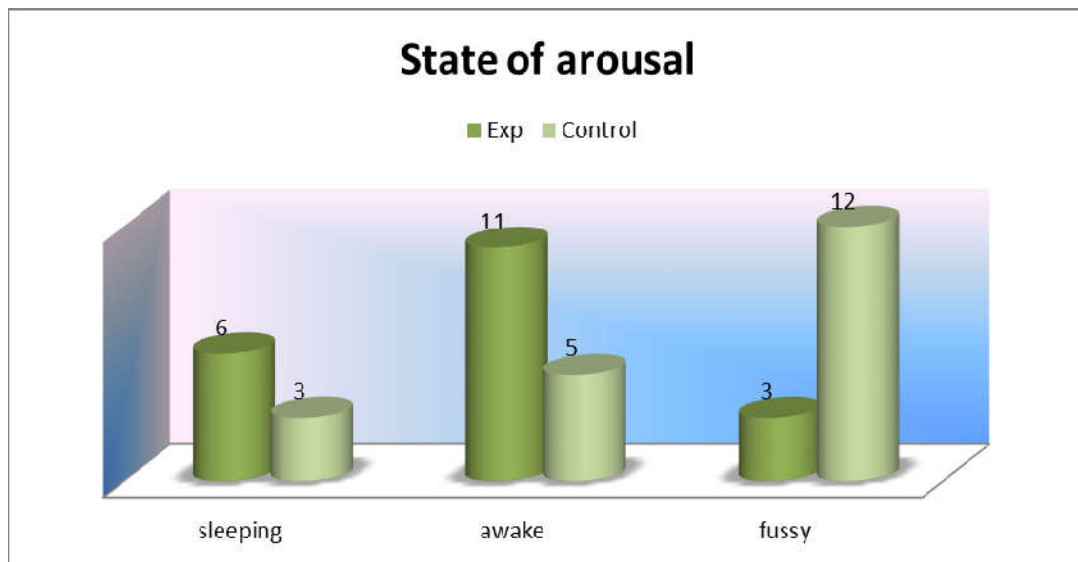


Table 6. NIPS Score between Routine procedure with and without Facilitated Tucking

Routine Procedure	NIPS Score			t Statistic	P Value el
	Mean	SD	Std. Error		
With Facilitated Tucking	1.55	1.191	0.266	8.736	0.000*
Without Facilitated Tucking	5.10	1.373	0.307		

NIPS: Neonatal Infant Pain scale; *P Value significant at 0.05 level

Routine Procedure	NIPS Score			Std. Error	t Statistic	P value inference
	Mean	SD	Mean difference			
With Facilitated Tucking	1.60	1.225	3.52	0.245	9.485	P<0.05*
Without Facilitated Tucking	5.12	1.394		0.279		

N=50 (n1 = 25, n2 = 25)

t₄₈=2.0106*P Value significant at 0.05 level NIPS: Neonatal Infant Pain scale;

Evaluation of physiological variables in experimental and control group:

While analyzing the change in heart rate from baseline, 9 and 8 infants had 0 – 4 beats/min increase in heart rate following routine procedure with facilitated tucking and without facilitated tucking respectively; heart rate increase of 5 – 14 beats/min was observed in 8 infants following routine procedure with facilitated tucking and the same change was observed in 4 infants following routine procedure without facilitated tucking; 2 infant following routine procedure with facilitated tucking and 6 infants following routine procedure without facilitated tucking had heart rate increase of 15 – 24 beats/min; heart rate was increased ≥ 25 beats/min in one infant following routine procedure with facilitated tucking and in 2 infants following routine procedure without facilitated tucking. Oxygen saturation change from baseline was analyzed for all the infants, where 12 infants following routine procedure with facilitated tucking and 5 infants following routine procedure without facilitated tucking had 0% - 24% decrease in SaO₂; SaO₂ had decreased to 2.5% - 4.9% in 6 infants following routine procedure with facilitated tucking and 6 infants following routine procedure without facilitated tucking; a decrease of 5% - 7.4 % was observed in 1 infants following routine procedure with facilitated tucking and in 3 infants following routine procedure without facilitated tucking; ≥ 7.5 % decrease was found in 0 infants following routine

procedure with facilitated tucking and in 6 infants following routine procedure without facilitated tucking.

Evaluation of Behavioral Responses of Neonates in Experimental and Control Group

Based on NIPS: Following routine procedure with facilitated tucking, the behavioral variable facial expression was relaxed for 14 neonates, grimace for 6 neonates, whereas in cry, there was no cry 6 neonates, whimper 11 neonates and vigorous cry in 3 neonates was observed and for the behavioral variable breathing pattern 16 neonates had relaxed and in 4 neonates there was change in breathing..

Testing of hypotheses

Section A: The mean pain score of neonates during invasive procedures will be significantly lesser in the experimental group than the neonates in the control group. The mean NIPS score following the routine procedure with facilitated tucking was 1.55(1.191) with a standard error of 0.266 and the same following the routine procedure without facilitated tucking was 5.10(1.373) with a standard error of 0.307 The NIPS scores of these two procedures were compared by using unpaired t-test, which revealed that there is a statistically significant difference

in NIPS score (mean difference 3.55) between them at $P < 0.05$ (Table 6, figure 6.1 and figure 6.2) and t value of 8.736..

Effectiveness of facilitated tucking

Significance of the difference between Routine procedure with and without Facilitated Tucking based on NIPS score:

The mean NIPS score following the routine procedure with facilitated tucking was 1.60(1.225) with a standard error of 0.245 and the same following the routine procedure without facilitated tucking was 5.12(1.394) with a standard error of 0.279. The NIPS scores of these two procedures were compared by using unpaired t-test, which revealed that there is a statistically significant difference between the responses of neonates with facilitated tucking and without facilitated tucking with a mean difference of 3.520. The calculated t value ($t=9.485$) was greater than the table value ($t_{48}=2.0106^*$) at 0.05 level of significance. Hence the null hypothesis H_{01} was rejected. Therefore it is concluded that Facilitated tucking is effective.

Association between physiological and behavioral responses in experimental group and selected demographic variables:

Chi square test was used to find the association between physiological responses (heart rate, oxygen saturation) and behavioral responses (NIPS scores) with selected demographic variables. Results indicated that there is no significance association between the physiological and behavioral responses and selected variables such as gestational age, chronological age, gender, type of delivery and presentation of baby at 0.05 level of significance.

DISCUSSION

The use of non-pharmacological interventions in pain management has remained a wide area of interest for health care professionals involved in neonatal care. Environmental methods to reduce pain and distress include adequate preparation of parent, child, a calm non-threatening environment, anticipation of and planning for each individual child's expected distress, and training of staff in promoting coping behaviors in infants (American Academy of Pediatrics Task Force on Pain in infants, 2001; Kelly, 2005). Non pharmacological approaches to pain management in infants include cognitive behavioral approaches like usage of pacifier, swaddling, facilitated tucking, touch, distraction, and music therapy. Complementary therapies are massage, sucrose solution and aromatherapy (Sharon Hill, 2005; Stefan et al., 2007; Chen, 2000; Poltorak, 2006; Beider, 2007; Tsao, 2005). The ultimate aim of nursing is to keep the infants free from pain and other stressful stimuli as far as possible by advocating minimal handling protocol giving comfort by administering non pharmacological interventions. The research for this study was performed in a NICU and postnatal ward that provided a nurturing atmosphere to both the infants and their families. The environment of this NICU was very quiet, calm, and dim. The nurses carefully timed care activities to occur when the infants were awake or in a more alert state. During the infant's care, the nurse was mindful of the infant's state; paced care according to the infant's autonomic, motor, and state reactions; and used facilitated tucking during care activities. The results from this preliminary investigation indicate that by incorporating facilitated tucking into routine care events, the pain levels of infants are significantly reduced. Infants have a decreased ability to maintain physiological flexion during stressful events; therefore, they are unable to be in a position

that would aid them in self-comforting strategies. A facilitated tucked position allowed the infants in this study to better maintain stability in their autonomic, motor, and state systems, demonstrated by significantly lower NIPS scores. In this study the mean score of experimental group is less than the control group and there is a mean difference of 3.520. The effectiveness was analyzed using unpaired t test which showed that the research hypothesis was accepted. Depicting that facilitated tucking helps in the reduction of pain during routine painful procedure. The present study also showed that there is no association between physiological and behavioral variables with demographic variables such as gestational age, chronological age, gender, type of delivery and presentation of baby at 0.05 level of significance.

Conclusion

The results from this preliminary investigation indicate that by incorporating facilitated tucking into routine care events, the stress levels of infants are significantly reduced. Infants have a decreased ability to maintain physiological flexion during stressful events; therefore, they are unable to be in a position that would aid them in self-comforting strategies. A facilitated tucked position allowed the infants in this study to better maintain stability in their autonomic, motor, and state systems, demonstrated by significantly lower NIPS scores. This study shows that Facilitated tucking is an effective non pharmacological pain management measure during routine neonatal care. Neonates are the most in need for appropriate assessment and management of procedural pain. Nurses and other staff members in the NICU and postnatal wards have the opportunity to provide a less stressful and more nurturing environment for infants born preterm and full term. This involves reducing the negative stressors of the NICU and postnatal ward environment, through care that supports the infant to be as stable and well organized as possible. One means of reducing stress in infants is by incorporating a second caregiver to provide facilitated tucking during routine care events. A similar study can be conducted using a larger sample. A similar study can be conducted with the different demographic characteristics. A follow-up study may be conducted to determine the effectiveness of the facilitated tucking in reduction of pain in neonates.

Implications of the study

The findings of the study have following implications in the areas of nursing service, nursing education and nursing research.

Implications of the present study in the nursing service:

Educational programs with effective teaching strategies will improve the knowledge of people. Nurses in their educative role must conduct educational programs among the mothers to improve their knowledge regarding facilitated tucking by parents during painful procedure. Once awareness is created in the society further step is easier. So the first step of creating awareness has to be done by the nurses through nursing practice.

Implications of the present study in nursing education:

The nursing curriculum is concerned with the preparation of future nurses who will play a major role in the preventive and promotive aspect of maternal and child health. The learning experience of the students should be given more emphasis on

use of non-pharmacological methods in reduction of pain and distress in neonates

Implications of the present study in nursing research: The findings of the present study can be utilized by nurse researchers in the future to conduct extensive studies regarding non-pharmacological methods of pain reduction specially about facilitated tucking. Further research can be conducted by the health personnel to create awareness about facilitated tucking in reduction of pain responses in neonates.

Limitations

- The sample size was small which interfered with the generalization of the findings.
- The study was limited to experimental group who met inclusion criteria.

Recommendations

- A similar study can be conducted using a larger sample.
- A similar study can be taken up with true experimental design.
- A similar study can be undertaken with a control group
- A follow-up study may be conducted to determine the effectiveness of the facilitated tucking in reduction of pain in neonates

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