

## Effectiveness of Facilitated Tucking Verses Kangaroo Mother Care on Heel Stick Procedure in Terms of Physiological Parameters and Pain in Preterm Babies

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### Abstract

**Background:** Maternal and neonatal health is the current focus of central and state government as well as various funding organizations. Very frequently painful procedures including invasive therapeutic and diagnostic procedures are being carried out on Preterm babies admitted in nursery. Heel lances or Heel sticks is considered one of these repeated performed painful procedures. There are various adverse effects of pharmacological analgesia and dreadful outcome in later period of life of a neonate. So there is a need to find an alternative non-pharmacological intervention which can be deployed during the painful procedure related to invasive therapeutic and diagnostic procedures. As India is a resource challenged country, non pharmacological interventions can practically be employed on neonates admitted in NICU during routine painful procedures. Pain management by Non-pharmacologic interventions in neonates is a crucial area of research. As there are very few researches conducted on comparison between facilitated tucking and kangaroo mother care so we have taken this study to compare the effectiveness of Facilitated tucking verses Kangaroo Mother Care (KMC) on the physiological parameter and pain associated with heel stick procedure in preterm babies admitted in NICU of selected hospital, Delhi.

**Material and Methods:** The study design was multiple treatment posttest control group design. The participants were divided into three groups, i.e., two experimental and one control group (30 preterm babies each). Experimental Group 1 was given facilitated tucking, 2 min prior to heel stick procedure and continued for 5 min after the heel stick procedure i.e., total 8 minute of facilitated tucking was provided to the babies. In second group, KMC was given for 15 min prior to the heel stick and continued for 5 min after the heel stick procedure i.e., total 21 minute of Kangaroo mother care was provided to the babies. Control group provided with routine procedure i.e., no intervention. The samples for this study were selected by non-probability purposive sampling technique. Pain is assessed by using the 'Preterm Infant Pain Scale' and physiological parameters are assessed by Monet 7 pulse oximeter. Post- test Observation of physiological parameter and pain was taken three times: immediately, 2 min, 5 min after heel stick procedure for all the groups.

**Result:** Based on the major findings, derived ANOVA and pos hoc test, it was concluded that both Facilitated tucking and KMC were found to reduce level of pain in preterm babies undergoing heel stick procedure. But kangaroo mother care was more effective in reducing pain. Kangaroo mother care was also effective in maintaining of the baseline heart rate compared to facilitated tucking or control group.

**Conclusion:** Facilitated tucking having lesser effect on pain compared to kangaroo mother care can also administered to preterm for reducing pain during heel stick procedure. But Facilitated tucking can successfully be used independently as non-pharmacological method of pain if KMC cannot be provided during pain procedure.

**Keywords:** Facilitated tucking, Kangaroo mother care, Physiological parameters, pain, heel stick.

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### I. Introduction

A preterm neonate is one whose birth is before 37 weeks of gestation. These babies are known as preemies<sup>1</sup>. Child birth is one of the most emotional and impactful event that can occur in mother's lifetime. Baby born as preterm, is a difficult time for parents as well as family members. The emotional reaction of parents having preterm babies is different from that of full-term baby's parents. In particular, an unpredicted preterm delivery or early birth can create negative impact on both the parent<sup>2</sup>.

Birth asphyxia, prematurity, and neonatal sepsis were the leading causes of neonatal mortality<sup>3</sup>. Every year, approximately, 15 million babies are born preterm every year, and these rates are increasing every year. In India it corresponds to about 3.5 million. One of the leading causes of death among children born under 5 years

of age preterm birth complications. Many of these deaths could be prevented with latest and cost-effective interventions<sup>4</sup>.

‘Preterm and sick full-term neonates are routinely subjected to many (6832 to 42,413) invasive diagnostic and therapeutic procedures with an average of 7.5–17.3 per neonate per day, which are associated with pain’<sup>5</sup>.

Worldwide, in neonatal intensive care unit, pain management is one of the major concerns. The most frequently performed procedures are venipuncture, heel lance, suctioning, and insertion of peripheral venous catheter. Preterm babies are unable to communicate their pain which cause negating in care and management of pain reduction in them by healthcare workers<sup>5</sup>.

Expression of pain in pre-term and term newborn both is a very little understood event. Preterm babies who get admitted NICU are likely to undergo procedural stress and pain. Painful procedures without any interventions can cause physical and psychological complications, leading hypertension, hypoxemia, tachycardia, a rise of heart rate variability, and of intracranial pressure<sup>6</sup>. The nervous system of neonates is very immature as it undergoes major developmental changes. Painful procedures in neonates may lead to neuro-developmental changes, particularly in the preterm neonates<sup>7</sup>.

There are various adverse effects of pharmacological analgesia and dreadful outcome in later period of life of a neonate. So there is a need to find an alternative non-pharmacological intervention which can be deployed during the painful procedure related to invasive therapeutic and diagnostic procedures. Various researches have shown that non-pharmacological interventions which include skin-to-skin contactor Kangaroo mother care, facilitated tucking, non-nutritive sucking, breastfeeding, oral administration of glucose/sucrose and swaddling are effective in reducing procedural pain, considered safe and cost effective. Nurses, Doctors and other healthcare teams member should get acquainted with all these interventions and use them more frequently and effectively in Neonatal Intensive Care Unit during daily routines painful procedures, so that newborns can receive quality and more human care<sup>8</sup>.

Pain is considered as a real event by Nurses; however, there is a lack in both knowledge and skills of nurse in assessment and management of painful procedure in newborn admitted in NICU. It is necessary to implement knowledge and skill about non pharmacological intervention during painful procedures to all the healthcare team members taking care of preterm neonates in order for the better outcome of the neonates in their later life also.<sup>9</sup>

## **II. Objectives of the Study**

1. To compare the physiological parameters among preterm babies undergoing heel stick procedure during and after administration of facilitated tucking, kangaroo mother and routine care in terms of Heart rate and Oxygen saturation.
2. To compare the level of pain among preterm babies undergoing heel stick procedure during and after administration of facilitated tucking, kangaroo mother care and routine care.

## **III. Assumption**

Preterm experience will experience some kind of pain and change in physiological parameter during heel stick procedure. Facilitated tucking will be able reduce the pain and bring changes in the physiological parameter than no intervention during heel stick procedure. Kangaroo mother care will promotes stability of heart and experience respiratory function and decrease pain. Tools PIPP scale and structured tool for assessing physiological parameter will be able to measure the level of pain and physiological parameter.

## **IV. Hypothesis**

- 1)  $H_1$ : There will be significant difference in mean post-test heart rate of preterm babies undergoing heel stick procedure in Facilitated tucking, KMC and control group.
- 2)  $H_{01}$ : There will be no significant difference in mean post-test heart rate of preterm babies undergoing heel stick procedure in Facilitated tucking, KMC and control group.
- 3)  $H_2$ : There will be significant difference in mean post-test oxygen saturation score of preterm babies undergoing heel stick procedure in Facilitated tucking, KMC and control group.
- 4)  $H_{02}$ : There will be no significant difference in mean post-test oxygen saturation of preterm babies undergoing heel stick procedure in Facilitated tucking, KMC and control group.
- 5)  $H_3$ : There will be significant difference in mean post-test pain score of preterm babies undergoing heel stick procedure in Facilitated tucking, KMC and control group.
- 6)  $H_{03}$ : There will be no significant difference in mean post-test pain score of preterm babies undergoing heel stick procedure in Facilitated tucking, KMC and control group.

## V. Material and Method

The study was conducted, among preterm babies admitted in NICU at in Safdurjung Hospital, New Delhi.

**Study Design:** The Multiple treatment posttest control group design was used to conduct the study.

**Location:** Neonatal Intensive Care Unit at in Safdurjung Hospital, Delhi.

**Study Duration:** December 2016 to January 2017.

**Sample Size:** Totally 90 samples were included in the study

Group 1= 30 preterm neonates with Facilitated tucking as intervention during heel stick procedure

Group 2 =30preterm neonates with KMC and 30 as intervention during heel stick procedure

Control group = 30preterm neonates with routine care i.e. no interventions were provided during heel stick procedure.

**Sampling Technique:** The samples were selected by non-probability purposive sampling with random assignment.

### Sampling Criteria

Sample consists of preterm babies who undergo heel stick procedure and admitted in the NICU of the selected hospital of Delhi. Willingness of parents of the subject in the study

2. Admitted in NICU of selected hospital of Delhi.
3. Between 28-36 wks. of gestation requiring heel stick procedure
4. APGAR score >6 at 5min
5. Within 15 days of birth
6. Breathing unassisted
7. Not having major congenital abnormality
8. Non-use of tranquilizers or sedatives and anti-convulsion during last 24 hours.

**Ethical Consideration:** The permission to conduct the study was obtained from research ethical committee of Safdurjung Hospital, Delhi, before the data collection.

### Data collection tool and technique

After written informed consent was obtained, the demographic data was obtained from record analysis. The record analysis included gestational age, weight, APGAR score and type of feeding. Structured observation tool will be used for collecting data regarding physiological parameter and standardized rating pain scale is used for collecting data on pain. After collecting the demographic data, Experimental Group 1 was given facilitated tucking, in which baby was kept in side lying or supine position and arms and legs are kept flexed in midline position near to the neonate body, which was provided 2 min prior to heel stick procedure and continued for 5 min after the heel stick procedure i.e., total 8 minute of facilitated tucking was provided to the babies. In second group, KMC was given for 15 min prior to the heel stick and continued for 5 min after the heel stick procedure i.e., total 21 minute of Kangaroo mother care was provided to the babies. Control group provided with routine procedure i.e., no intervention. Post- test Observation of physiological parameter and pain was taken three times: immediately, 2 min, 5 min after heel stick procedure for all the groups. The heel stick procedure was carried out by same nursing officer who was posted in NICU. Physiological parameters were assessed by Monet 7 pulse oximeter in a structured observation schedule. Pain was assessed by using the Preterm Infant Pain Scale (PIPP).

### Description of the Tool

1. **Section I:**This section consists of Demographic variable like Age, sex, gestational age, birth weight, type of feeding of the Neonates
2. **Section II:-** Structured Observation Schedule for physiological parameter for collecting baby's physiological parameters i.e., heart rate and saturation of oxygen using .
3. **Section III:** Standardized rating Scale -Premature infant pain profile (PIPP)  
The Premature Infant Pain Profile (PIPP) consists of three behavioral (facial actions: brow bulge, eye squeeze, and nasolabial furrow); two physiological (heart rate and oxygen saturation) indicators, and 2 contextual [gestational age (GA) and behavioural state] variables that modify pain. There are total 7 items. Scoring has been categorized in the following manner:

**Table 1:** Determining severity of pain

SL. NO.	SCORE	INTERPRETATION
1.	0-6	Indicate the infant has minimal or no pain
2.	7-12	Indicate slight to moderate pain
3.	>12	Indicate Severe pain

**Description of the Intervention**

1) Facilitated tucking: ‘A method of soothing premature infants during postnatal care. It involves holding the infant’s arms and the legs in flexed position close to the midline of the torso’. In this facilitated tucking researches left hand will be on the baby’s head and right hand will tuck lower limbs inside the belly of the baby. Facilitated tucking started 2 min prior to the heel stick Procedure and continued until calm baby (total 8 min).

c) Kangaroo mother care: ‘Kangaroo Mother Care, sometimes called skin-to-skin care, is a technique of newborn care where babies are kept skin-to-skin with a parent, typically their mother. It is most commonly used for low birth-weight and preterm babies’. In this study it means skin to skin, chest to chest, upright placement of infant between maternal breast wearing only a napkin, cap and socks for Fifteen minutes prior to the procedure and throughout the procedure (21 min) and then for 1 hr. as routine care of preterm babies.

**Statistical analysis**

Data was analyzed using SPSS version 20 (SPSS Inc., Chicago, IL). ANOVA was used to ascertain the significance of differences between mean values of three groups (FT, KMC, Control Group) and three variables (Heart rate, SPO<sub>2</sub>, and Pain scores). In addition, Post Hoc test was used to check the effectiveness of one intervention over other. The level *P* < 0.05 was considered as the cutoff value or significance

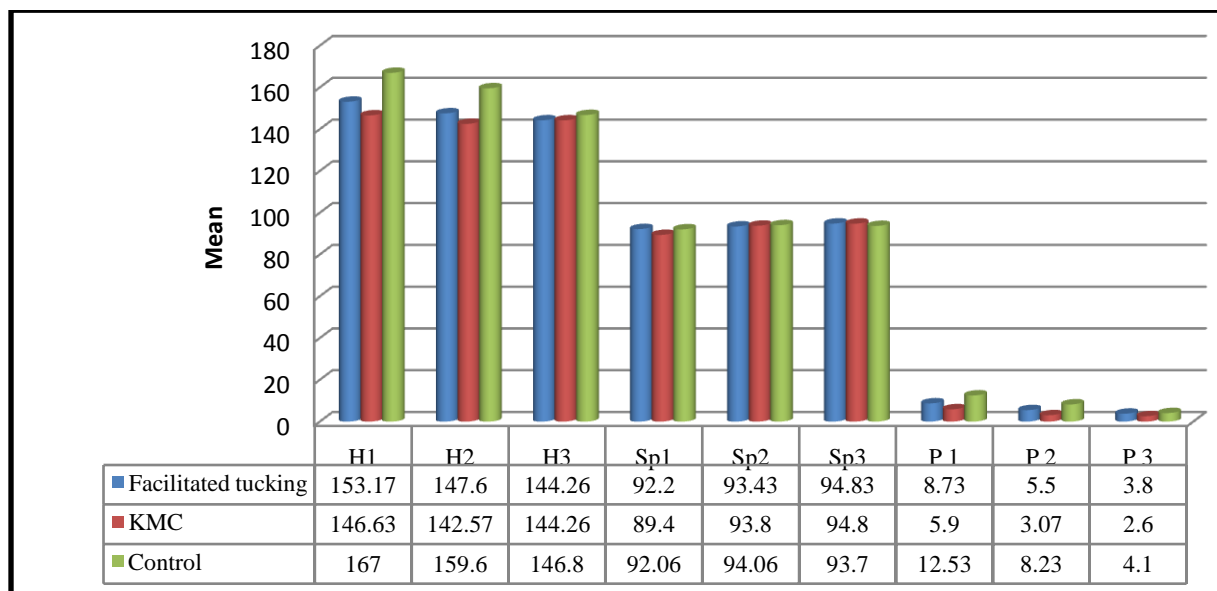
**VI. Results**

Table 2 showed that the ‘F’ value for post test of heart rate (12.81) and pain (73.45) is significantly different for KMC and Facilitated tucking and control group as it is more than the table value. This table also shows that there was no significant difference in post test of oxygen saturation as ‘F’ (0.26) value for oxygen saturation is less than the table value. Hence null hypothesis H<sub>01</sub> and H<sub>03</sub> are Rejected and null hypothesis H<sub>02</sub> is accepted

**Table 2:** Mean, standard deviation and ‘F’ (ANOVA) value for Post test of Physiological parameters and pain during and after heel stick procedure in preterm babies

<i>N=90</i>						
	Time Intervals	Facilitated tucking	KMC	Control	F value	p Value
<b>Mean Heart rate(SD±)</b>	0 min after procedure (H1)	153.17 (10.07 )	146.63 (11.49)	167 (14.72)	12.81*	0.001
	2 min after procedure (H2)	147.6 (10.49)	142.57 (10.12)	159.6 (13.05)		
	5 min after procedure (H3)	144.26 (10.61)	144.26 (10.612)	146.8 (10.74)		
<b>Mean SpO2 (SD±)</b>	0 min after procedure (Sp1)	92.2 (2.78)	89.4 (2.45)	92.06 (2.44)	0.26NS	0.803
	2 min after procedure (Sp2)	93.43 (1.88)	93.8 (2.33)	94.06 (1.91)		
	5 min after procedure (Sp3)	94.83 (2.33)	94.8 (2.40)	93.7 (11.63)		
<b>Mean PIPP (SD±)</b>	0 min after procedure (P 1)	8.73 (2.033)	5.9 (1.72)	12.53 (1.83)	73.45*	0.0003
	2 min after procedure (P 2)	5.5 (2.38)	3.07 (1.31)	8.23 (2.18)		
	5 min after procedure (P3)	3.8 (1.75)	2.6 (1.04)	4.1 (1.81)		

\* Significant at 0.05 level, <sup>NS</sup> Not significant at 0.05 level



**Figure 1:** Mean value for Post test of Physiological parameters and pain during and after heel stick procedure in preterm babies

For confirming effectiveness of one intervention over other intervention post hoc test (for multiple comparisons) was carried out.

**Table 3:** Mean difference and ‘p’ value (Post Hoc test) for comparison of heart rate of preterm babies undergoing heel stick procedure during facilitated tucking, KMC and in the control group

**N=90**

Group	Comparison Group	Mean Difference	Standard Error	‘p’ Value
Facilitated Tucking	KMC	3.45 <sup>NS</sup>	2.770	.216
	Control	-6.92*	2.770	.014
Kmc	Facilitated Tucking	-3.45 <sup>NS</sup>	2.770	.216
	Control	-10.37*	2.770	.000
Control	Facilitated Tucking	6.92*	2.770	.014
	KMC	10.37*	2.770	.000

\* significant at 0.05 level, <sup>NS</sup> Not significant at 0.05 level

Table 3 showed that Facilitated tucking and KMC had no difference in maintaining heart rate as suggested from mean difference ( $\pm 3.45$ ) which is less than the ‘p’ value but individually both are effective in reducing the heart rate when compared to control group in a given time period which is suggestive from mean difference and ‘p’ value i.e., for Facilitated tucking and control were  $\pm 6.97$  and 0.14 respectively and mean difference and ‘p’ for KMC and control group was  $\pm 10.37$  and 0.000.

**Table 4:** Mean difference and ‘p’ value (Post Hoc test) for comparison of pain for preterm babies undergoing heel stick procedure during facilitated tucking, KMC and in the control group

**N=90**

Group	Comparison Group	Mean Difference	Standard Error	‘p’ Value
Facilitated Tucking	KMC	2.16*	.366	.000
	Control	2.28*	.366	.000
Kmc	Facilitated Tucking	-2.16*	.366	.000
	Control	-4.43*	.366	.000
Control	Facilitated Tucking	2.28*	.366	.000
	KMC	4.43*	.366	.000

\* significant at 0.05 level

Table 4 shows Facilitated tucking and KMC was had difference in reducing pain as suggested from mean difference ( $\pm 2.16$ ) which was more than the ‘p’ (0.000) value. Also individually both are effective in reducing the pain compared to control group in a given time period which was suggestive from mean difference and ‘p’ value i.e., for Facilitated tucking and control is  $\pm 2.28^*$  and 0.14 respectively and mean difference and ‘p’ value for KMC and control group  $\pm 4.43$  and 0.00 respectively. In terms of pain management, Facilitated tucking and KMC had significant difference. As mean difference of KMC over Facilitated tucking ( $-2.16$ ) is less than

mean difference of Facilitated tucking over KMC (2.16). This shows that KMC was more effective in maintaining the pain level in preterm babies undergoing heel stick procedure compared to Facilitated tucking. Table 5 is showing frequency percentage distribution of sample characteristics of three different groups of preterm babies undergoing heel stick procedure

**Table No. 5:** Frequency and percentage Distribution of Demographic Variables

N=90

S. No.	Sample Characteristics (Record Analysis)	Experimental Group 1 (n= 30)		Experimental Group 2 (n=30)		Control Group (n=30)		Total	Total %
		f	%	f	%	f	%		
<b>1.</b>	<b>Age Of Neonates In Days</b>								
a.	1st day-5th day	15	50	15	50	14	46.67	44	48.87
b.	6th day-10th day	9	30	11	36.67	12	40	32	35.57
c.	11th day- 15th day	6	20	4	13.33	4	13.33	14	15.56
<b>2.</b>	<b>Sex of the baby</b>								
a.	Male	17	56.67	14	46.67	13	43.33	44	48.88
b.	Female	13	43.33	16	53.33	17	56.667	46	51.12
<b>3.</b>	<b>Gestational Age</b>								
a.	28-30 wks	5	16.67	12	40	9	30	26	28.89
b.	31-33 wks	17	56.67	11	36.67	15	50	43	47.78
c.	34- 36wks	8	26.67	7	23.33	6	20	21	23.33
<b>4.</b>	<b>Birth Weight</b>								
a.	1.0 - 1.5 KG	12	40	15	50	15	50	42	46.67
b.	1.6-2.0 KG	14	46.67	13	43.33	13	43.33	40	44.44
c.	2.1-2.5 KG	4	13.33	2	6.67	2	6.67	8	8.89
<b>5.</b>	<b>Apgar Score At 5min Of Birth</b>								
a.	SCORE 5-7	10	33.33	12	40	9	30	31	34.44
b.	SCORE 8-10	20	66.67	18	60	21	70	59	65.56
<b>6.</b>	<b>Type Of The Feeding</b>								
a.	Expressed Breast Feeding/ Breat Feeding	17	56.67	16	53.33	18	60	51	56.67
b.	Formula Feed	7	23.33	9	30	7	23.33	23	25.56
c.	I V Fluids	6	20	5	16.67	5	16.67	16	17.77

### VII. Discussion

Based on the major findings, derived ANOVA and pos hoc test, it was concluded that Kangaroo mother care was more effective compared to Facilitated tucking and routine care (control group) in reducing pain during heel stick produces in preterm babies. Both Kangaroo mother care and Facilitated tucking were also effective in maintaining of the baseline heart rate compared to control group but there was no significant difference between kangaroo mother care and Facilitated tucking in maintaining baseline heart rate. Also, it was concluded that there was no significant difference in mean post-test oxygen saturation score of preterm babies undergoing heel stick procedure in Facilitated tucking, KMC and control group.

This was consistent with the findings of a study that was to conducted to check whether facilitated tucking can be used as an effective intervention for acute pain relief or not. It was found that facilitated tucking was an be an effective intervention and the health care workers were required to successfully implement such a resource efficient intervention in routine care.<sup>10</sup>

A similar study was conducted in which 40 preterm babies (20 in two different groups) were included. One group was provided with Kangaroo care as an intervention and a control condition during heel-stick. The researcher concluded that KMC is an effective method. In a nursery, interventions during painful procedure in the preterm infants' help in maintaining base line heart rate and oxygen saturation and are needed to be implement<sup>11</sup>.

### **VIII. Conclusion**

On the basis of present study following conclusion were drawn. The heel stick procedure can be carried out during kangaroo mother care as it is a routine procedure for preterm. It is also simple and an inexpensive technique. Facilitated tucking having lesser effect on pain compared to kangaroo mother care can also administered to preterm for reducing pain during heel stick procedure. Nurses make important decision regarding application non pharmacological therapeutic interventions for improvement in level of pain and selected physiological parameter.

### **IX. Recommendations**

On the basis of the findings of the study, the following recommendations are offered for the future

- This study can be replicated on a large group of sample to validate the findings and to make generalizations.
- A separate research can be done based on two different intervention (either facilitated tucking or kangaroo mother care)
- A comparative study can be take up on same intervention in different setting
- The study can be take up on other procedural pain that occur in NICU
- Facilitated tucking can also be done on newborn.
- Effectiveness of procedural guidelines can be assessed
- Comparative study can be done in private and government setting.

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