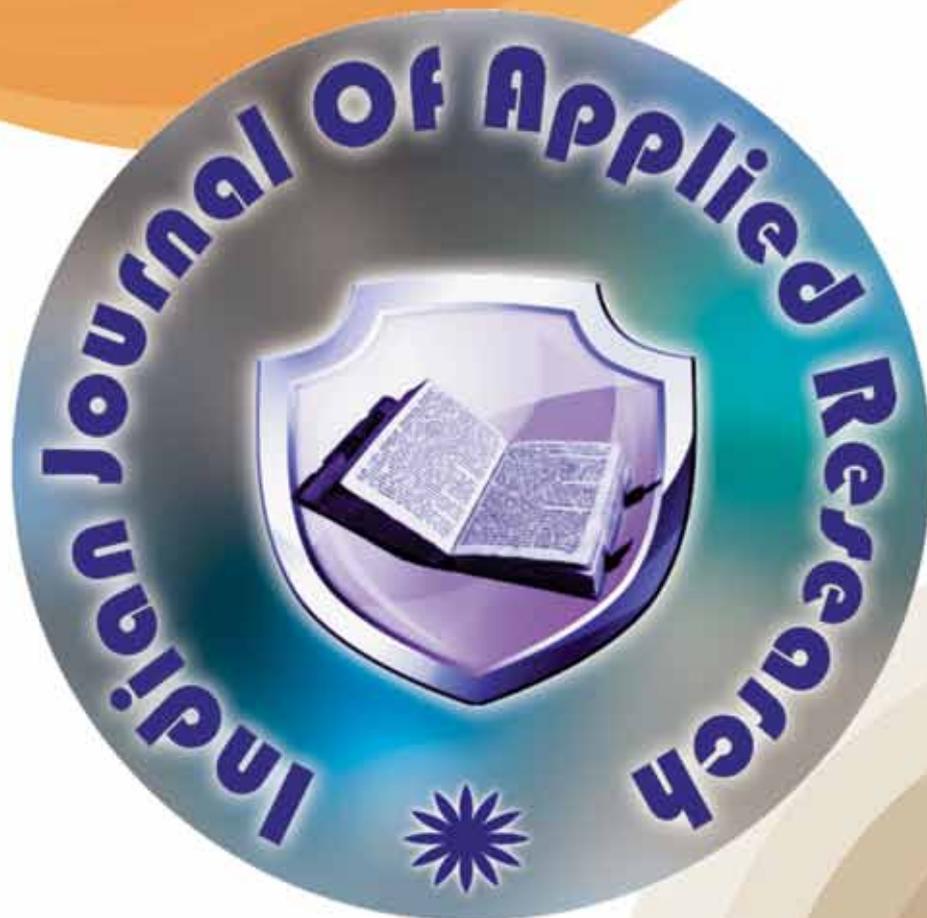


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Kangaroo mother care diminishes pain from heel lance in preterm neonates: A crossover trial

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ABSTRACT

Kangaroo mother care (KMC) has been shown to be effective in diminishing pain response to heel lance in full term neonates. The purpose of this study was to determine if KMC would also be efficacious in preterm neonates, as they may not have the endogenous mechanisms that could be evoked to decrease pain compared to full term neonates. Preterm neonates ($n = 31$) between 35 and 37 weeks gestational age in the preterm NICU in Child Trust Hospital, Chennai comprised the sample. A randomized crossover design was employed. In the experimental condition, the infants were held in KMC for 15 minutes prior to and throughout heel lance procedure. In the control condition, the infants were in prone position swaddled in a blanket in the incubator. The primary outcome was the Premature Infant Pain Profile (PIPP), which comprised three facial actions (brow bulge, eye squeeze & nasolabial furrow), maximum heart rate, and minimum oxygen saturation levels from baseline in 30-seconds blocks from heel lance. The secondary outcome was time to recover, defined as heart rate return to baseline. Continuous heart rate and oxygen saturation monitoring were recorded with event markers during the procedure and were subsequently analyzed. Frequency, percentage, standard deviation, ANOVA and paired t-test were employed to generate results. The findings showed no significant differences in gestational age, weight and previous exposure to invasive procedure between the kangaroo mother care and incubator care (conditions). The mean scores of pain perception were higher in the incubator care condition than in the kangaroo mother care condition. The interpretation was that the preterm neonates in the incubator care experienced increased level of pain. There was also significant difference in PIPP Scores between kangaroo mother care and incubator care condition on the dimensions of behavioural state, facial actions, heart rate maximum and oxygen saturation minimum with time duration at $p < .0001$ favoring KMC condition. It could be concluded that Preterm neonates appear to have endogenous mechanisms elicited through skin-to-skin maternal contact that decreases pain response, but not as powerfully as in full term neonates. The shorter recovery time in KMC is clinically important in helping to maintain homeostasis.

Keywords : kangaroo mother care, preterm neonates, heel lance, and pain, time duration

Introduction

Careful handling of preterm neonates is particularly challenging. By virtue of being born early, before 37 weeks of gestational age, the preterm neonate spends the first few weeks of life in the Neonatal Intensive Care Unit (NICU) where numerous noxious procedures form a part of the routine care. The most common painful procedures are heel lance and intravenous line insertions and topical anesthetics have been found to be not effective in preterm neonates. Sucrose has been repeatedly shown to be effective but frequently repeated doses of sucrose in the preterm neonate, while effective, may not be safe especially in younger infants. In previous studies behavioral methods of pain control such as non-nutritive sucking, simulated rocking, facilitated tucking, positioning have been tested with non-nutritive sucking having a significant effect, even in full term neonates. However, it is reported that mothers find loss of parental role and the pain that the infant experiences as being the most stressful aspects of having a child in the intensive care setting which led the investigator to explore means of involving mothers in providing comfort during painful events. Breast feeding was found to be effective, but thus far has only been reported to be used for pain control in full-term neonates. However, breastfeeding is difficult to establish for preterm neonates. Thus for the preterm group, skin-to-skin maternal contact, or Kangaroo Mother Care (KMC), would appear to be a method which would decrease pain response. Furthermore, it would provide mothers an opportunity to comfort their infant during painful procedures in a

technologically invasive environment.

Skin-to-skin contact by the mother, referred to as Kangaroo Mother Care (KMC), has been shown to be efficacious in reducing pain in three previous studies. The first, randomized controlled trial was conducted by Moore et al (2000) with full-term neonates who reported significant decrease in the crying and acceleration of heart rate. Gray et al (2000) conducted a study with full-term neonate's pain control with kangaroo mother care and found that there was a significant decrease in crying and heart rate acceleration. Another study conducted by Johnston et al (2003) on diminishing pain with kangaroo mother care in preterm neonates, with restricted age of 35-37 weeks gestational age, had significant decreases in scores of a multidimensional scale that also included behavioral and physiological components.

The present study was aimed to test if, kangaroo mother care could also be effective in decreasing pain response to routine heel lance in infants less than 37 weeks of gestational age.

MATERIALS AND METHODS:

A Quasi experimental - cross over design was adopted for the study. The study was conducted in preterm NICU in Child Trust Hospital, Chennai. Thirty one preterm neonates were selected using a simple random sampling technique. Ethical clearance was obtained from concerned authority. The data collection questionnaire consisted two parts: Part –I

comprised neonatal profile, items such as gestational week, weight, previous exposure to invasive procedures and Part-II consisted modified standardized tool on Premature Infant Pain Profile (PIPP). Premature Infant Pain Profile (PIPP) comprised of three facial actions, maximum heart rate and minimum oxygen saturation levels from baseline in 30-second blocks from heel lance. Data collection procedure was done by obtaining informed consent from the mothers. The following procedure was adopted for the data collection.

16 preterm neonates underwent KMC before the incubator condition and 15 preterm neonates underwent incubator condition before the KMC condition.

The heel lancing procedure included five phases. One minute of baseline was collected at the end of the 15 minutes in the assigned condition that is following 15 minutes of KMC or in incubator. The heel warming phase lasted 1 minute. The heel was then swabbed and lanced. Lancing was the point at which changes from baseline were determined and analyzed in 30 second blocks from that instant. An adhesive bandage was applied to the site immediately after blood was procured. This was the point that indicated the end of the blood sampling procedure. The return to baseline state was as the time from adhesive bandage application until baseline HR was achieved. Heart rate and transcutaneous oxygen saturation of the infant throughout the session was monitored by using pulse oxymeter. The continuous data were analyzed in allocated blocks of time and averaged for each phase of the procedure.

RESULTS:

The findings of the study are indicated in Tables – 1 & 2 and Figures 1-5.

Table-1: PIPP Scores in Kangaroo mother care and Incubator care

N= 31

PIPP Scores	Kangaroo mother care (KMC) (n=16)		Incubator care (IC) (n=15)		Paired t-test
	Mean	S.D	Mean	S.D	
Behavioral state					
30 sec	146.4	9.3	152.0	12.8	-2.20
60 sec	152.1	11.6	153.7	11.9	-0.11
90 sec	158.6	13.5	164.8	14.4	-2.43
120 sec	146.4	14.1	153.8	14.1	-1.44
Heart rate maximum					
30 sec	2.8	10.3	6.3	2.6	-2.59
60 sec	19.3	54.3	19.4	6.3	-0.60
90 sec	30	41.2	30.2	24.5	-3.43
120 sec	3.1	29.8	15.1	2.4	1.46
Oxygen saturation minimum					
30 sec	1.3	3.7	2.0	3.10	-2.00
60 sec	22.9	70.5	30	8.6	-1.12
90 sec	35.5	71.0	48.5	35.6	-1.24
120 sec	0.5	54.4	19.8	0.5	-1.71
Facial action					
30 sec	6.3	4.5	11.1	9.0	-0.77
60 sec	4.2	5.7	5.1	4.9	-0.95
90 sec	1.7	6.6	3.8	1.8	-0.07
120 sec	7.6	5.2	10.6	8.6	-3.59

Significant at p<0.0001.

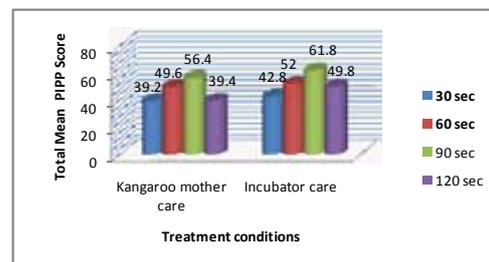
Table-2: Comparison of PIPP Scores between Kangaroo mother care and Incubator care on dimensions of time duration.

Dimensions	PIPP Scores				Paired t- test
	30 sec	60 sec	90 sec	120 sec	
Kangaroo mother care (n=16)	39.2	49.6	56.4	39.4	-0.12
Incubator care (n=15)	42.8	52.0	61.8	49.8	

Significant at p<0.0001.

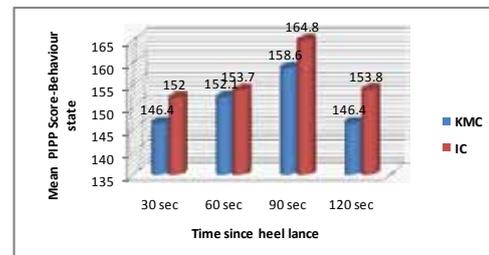
Table-1 The data indicated that the entire mean scores for all the dimensions in the Incubator care condition were higher than the kangaroo mother care condition and it was interpreted as, higher the score greater the pain behavior.

Figure:1 Comparison of PIPP Scores between Kangaroo mother care and Incubator care on dimensions with time duration.



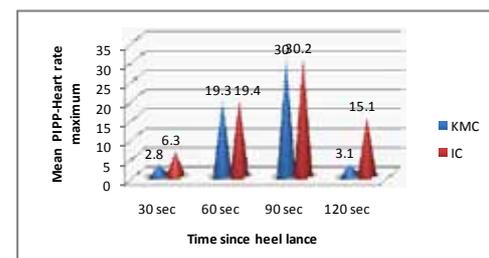
The data in Table -1 & Figure -1 indicated that there was a statistically significant difference in PIPP Scores between kangaroo mother care condition and incubator care condition on dimensions with time duration. The paired t-test values (-0.12 versus 1.37) showed statistically significant difference between the conditions.

Figure:2 Mean PIPP Scores on dimension of behaviour state of pre term neonates with Time Duration.



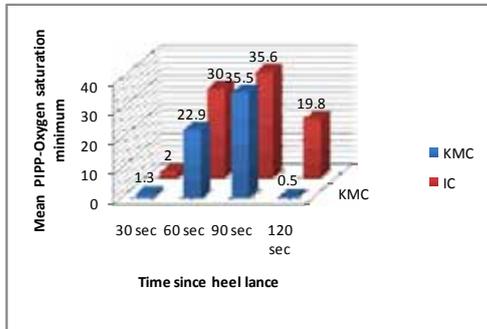
It could be seen from Figure-2 that the mean PIPP Scores on dimension of behaviour state of pre term neonates with time duration from the baseline in 30-second blocks from heel lance was statistically significant different in the mean PIPP scores on behaviour state of pre term neonates in kangaroo mother care from 30 sec block to the 120 sec as compared to the preterm neonate's who received incubator care condition.

Figure:3 Mean PIPP Score on dimension of Heart rate maximum of pre term neonates with Time Duration.



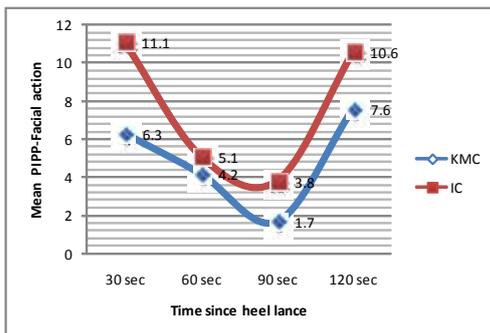
It could be noted that from Figure-3 there was statistically significant difference in the mean PIPP scores on Heart rate maximum at 30 sec and 120 sec between the conditions, whereas that was not different at 60 sec and 90 sec blocks because the invasive procedure was on process in both the conditions.

Figure:4 Mean PIPP Scores on dimension of Oxygen stauration minimum of pre term neonates with Time Duration.



It could be noted that from Figure-4 that there was statistically significant difference in the mean PIPP score on Oxygen stauration minimum at 30 sec and 120 sec between the conditions, whereas there was no difference at 60 sec and 90 sec blocks because the invasive procedure was on process in both the sessions.

Figure:5 Mean PIPP Score on dimension of Facial action of pre term neonates with Time Duration.



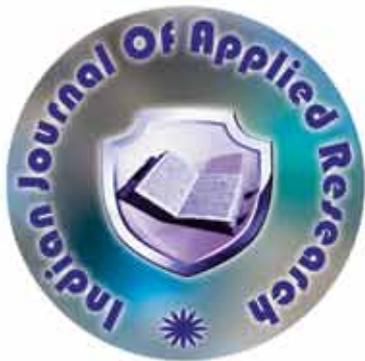
It could be noted that from Figure-5 that there was statistically significant difference in the mean PIPP score on Facial action of pre term in kangaroo mother care from 30 sec block to the 120 sec as compared to the preterm neonate's who received incubator care condition.

DISCUSSION:

There were no significant differences in gestational age, weight and previous exposure of invasive procedures in the preterm neonate's in both the conditions. The mean scores of pain perception for the outcomes between the conditions showed in incubator care condition were higher than in the kangaroo mother care condition. The interpretation was that the preterm neonates in the incubator care condition experienced increased level of pain. There was also statistically significant difference in PIPP Scores between kangaroo mother care and incubator care condition on the dimensions of behavioural state, facial actions, heart rate maximum and oxygen saturation minimum with time duration at $p < .0001$ favoring KMC condition.

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