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Comparison of analgesic effect of 24% sucrose and breastfeeding in neonates during venipuncture- A Comparative Study

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Abstract

Background: Emphasis on extensive study and research pertaining to neonatal pain management may emphatically reduce some of the adverse physiological and neurodevelopmental outcomes in neonates. Alleviation of pain is imperative for the overall wellbeing and improved physiological and neurological outcomes in neonates. **Objective:** To compare the analgesic effect of 24% Sucrose orally and breastfeeding in neonates during venipuncture. **Material And Methods:** 50 neonates in the Postnatal ward at KIMS Hospital, Bangalore, fulfilling the criteria were included in this study; These neonates were randomized into intervention groups (breast feeding, 24% sucrose). 2ml of sucrose solution was given to the baby by paladai 5 minutes before venipuncture and the other group of neonates were breastfed during venipuncture. The facial response, heart rate and oxygen saturation were monitored and recorded adhering to NIPS (Neonatal Infant Pain Scale). **Result:** Among 50 neonates, 25 of them were given 24% sucrose and 25 were breastfed. The study and analysis showed a significant lower score of Neonatal Infant Pain Scale (NIPS) in breastfed group (1.48) when compared to oral sucrose (2.08) at the end of 5 minutes. **Conclusion:** The findings of this study showed that breastfeeding caused reduction in pain compared to administering oral sucrose in neonates. Considering the fact that breastfeeding is a safe and free method accepted by mothers and health centre staff, it can be advised during painful procedures in order to reduce the infant's pain. It also facilitates a mother to strengthen a renewed mother-child bond. Besides this, breastfeeding also provides psychological benefits for mothers as they partake in the infant's care which does not invite any additional cost to the health care system.

Introduction: Pain is an undesirable sensation usually accompanied by tissue damage, which is now perceived to be felt even by neonates. The behavioral responses and physiological responses to acute pain are well characterized in newborns and used for pain assessments.

A lot of procedures can be contributing to pain in the neonatal population, including oro-gastric tube insertion, mechanical ventilation, repeated heel pricks for blood glucose monitoring, IV cannulations for blood sampling.

Behavioural responses during pain are Facial response such as brow bulge, eye squeeze, nasolabial furrow, horizontal mouth stretch, taut tongue

Body movement: reflex withdrawal, arching, Increased muscle tone.

Cry: presence, duration, pitch

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Increased heart rate and blood pressure. Decrease in heart rate variability (autonomic modulation), Tachypnea, Desaturation .[3]

Recent studies have shown that immaturity of the CNS preferentially affects descending inhibitory pathways which synapses in the dorsal horn of the spinal cord, which do not appear until the 32nd week of gestation, receptors and sensory nerves around the mouth appear as early as the 7th week of gestation.

Thus, the developmental immaturity of the CNS potentially makes the preterm / term neonate more, rather than less, likely to feel pain. (3)

Aim of the Study: To Compare the analgesic effect of 24% sucrose and breastfeeding in neonates during venipuncture

Methods

A comparative study was done in postnatal ward of KIMS, Bangalore. Neonates included will be all term and late preterm babies undergoing venipuncture procedures.

Written informed consent was taken. All neonates fulfilling the criteria were included in this study.

50 neonates were randomised into intervention groups (breast feeding (25), 24% sucrose (25)). 2 ml of sucrose solution was given to the baby by paladai 5 mins before the venipuncture procedure. Whereas venipuncture was done during breast feeding (after 5 mins of initiation).

The facial response, heart rate and oxygen saturation will be monitored and scored according to NIPS.

Table 1: Neonatal infant pain scale (NIPS)

Variable	Finding	Points
Facial expression	Relaxed (Restful face, neutral expression)	0
	Grimace(tight facial muscles, furrowed brow, chin, jaw)	1
Cry	No cry (Quiet, non crying)	0
	Whimper (Mild moaning, intermittent)	1
	Vigorous crying (Loud cream, shrill, continuous). If infant is intubated, score silent cry based on facial movement.	2
Breathing pattern	Relaxed (Usual pattern for the infant)	0
	Changes in breathing (Irregular, faster than usual, gagging, breath holding)	1
Arms	Relaxed (No muscular rigidity, Occasional random movements of arms)	
	Flexed/extened (Tens, straight arms, rigid and/or rapid extension, flexation)	
Legs	Relaxed (No muscular rigidity, occasional random leg movements)	0
	Flexed/Extended (Tense, Straight legs, rigid and/or rapid extension, flexion)	1
State of Arousal	Sleeping/ A wake (Quiet, peaceful, sleeping or alert and settled)	0
	Fussy (Alert, restless and thrashing)	1

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Heart Rate	Within 10% of baseline	0
	11-20% of baseline	1
	>20% of baseline	2
O_2 Saturation	No additional O_2 needed to maintain O_2 saturation	0
	Additional O_2 required to maintain O_2 required to maintain O_2 saturation	1

Pain Level	Intervention
0-2= Mild to no pain	None
3-4= Mild to moderate pain	Non-pharmacological intervention with a reassessment in 30 minutes
>4= severe pain	Non-pharmacological intervention and possibly a pharamacological intervention with reassessment in 30 minutes

Statistical Analysis

- Descriptive analysis of the outcome parameters were done using frequency and proportion for categorical variables
- Mann Whitney test was used to compare the mean heart rate and NIPS score between 2 groups at 1min and 5 mins
- Student paired t test was used to compare the mean oxygen saturation levels between 1 and 5 mins intervals in each group
- Level of significance was set at $p<0.05$.

Results

Table 1: Comparison of mean heart rate at 1 and 5 mins in each study group using Wilcoxon signed rank test

Group	Time	N	Mean	SD	Mean Diff	P-value
24% Sucrose	1 min	25	146.32	11.37	7.32	0.15
	5 mins	25	139.00	27.22		
Breast Feeding	1 min	25	150.48	11.75	2.24	0.04*
	5 mins	25	148.24	11.87		

Breastfeeding shows a lesser significant p value than 24% sucrose

Table 2: Comparison of mean oxygen saturation at 1 and 5 mins in each study group using student paired t test.

Group	Time	N	Mean	SD	Mean Diff	P-value
24% Sucrose	1 min	25	96.48	1.19	0.68	0.004*
	5 mins	25	95.80	1.00		
Breast Feeding	1 min	25	96.80	0.96	0.52	0.04*
	5 mins	25	96.28	0.89		

24% sucrose shows a lesser significant p value when compared to breast feeding.

Table 3: Comparison of mean NIPS score at 1 and 5 mins in each study group using Wilcoxon signed rank test

Group	Time	N	Mean	SD	Mean Diff	P-value
24% Sucrose	1 min	25	2.36	1.11	-0,68	0.11
	5 mins	25	3.04	1.34		

Breast Feeding	1 min	25	2.08	0.81	0.60	0.02*
	5 mins	25	1.48	1.05		

Breastfeeding shows a significantly lesser p value than 24% sucrose.

Discussion

Of the 50 neonates taken into the study **there was statistical significance** on comparing the following in 24% sucrose and breastfeeding:

1. Heart rate
2. Oxygen saturation.
3. Total NIPS score.

P value was noted to be lesser in 24% sucrose group on comparing oxygen saturation, but P value was noted to be lesser in breastfeeding group on comparing heart rate and total NIPS score.

But taking into consideration the NIPS score which monitored facial expression, cry, breathing patter, tone of arms, legs and oxygen saturation, the overall score holds a greater significance to compare the 2 factors, hence breastfeeding has a lesser significant p value than 24% sucrose.

From the above discussion breastfeeding deemed to be of better analgesic property considering skin-skin contact, mother-neonate bond, good sucking when compared to oral 24% sucrose solution.

Conclusion

In recent years, considerable advancements have been achieved in the treatment of pain in new-borns.

All NICU/ post natal ward patients will require an emphasis on pain prevention, repetitive pain evaluations, and evidence-based pain management regimens that include both non-pharmacologic and therapeutic approaches treatment options due to the significant immediate and long-term dire effects of pain, as well as for humanitarian grounds.

Use of conventional breastfeeding method to alleviate pain in neonates in the most risk free, cost beneficial way has been proved. Breast milk is as good as the internal milieu of the neonatal bodily composition, easily available, having more immunomodulatory substances, the naturally available amino acids that could also possibly aid in relieving pain in neonates as compared to commercially prepared solutions which are still artificial to the neonatal system.

Regardless of the fact that pain management strategies continue to fall short, future research should concentrate on systems-based exercise and knowledge transfer programs to improve pain management in NICUs, how to best assess pain, especially prolonged or chronic pain, and how to incorporate the many variables affecting pain found in modern neonatology, such as light, sound, touch, parental separation, thermal stress, and extrauterine malnutrition.

Maintaining an emphasis on new-born pain management research may help to mitigate some of the unfavourable foetal brain development observed in neonates.

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