

A Study to Assess the Effectiveness of Pre feeding and Swaddling on Pain Among Neonates During Invasive Procedure in Selected Hospital Bagalkot

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DOI: <https://doi.org/10.36347/sjams.2026.v14i04.023>

| Received: 11.02.2026 | Accepted: 13.04.2026 | Published: 17.04.2026

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Abstract

Original Research Article

Background: The birth of an infant is one of the most profound and emotional events in life. After months of anticipation, the neonate arrives, profoundly affecting parents and family members. In today's fast-paced world, ensuring a healthy newborn is paramount. However, neonates often undergo numerous painful procedures that, while improving survival rates, expose them to repeated pain with potential long-term consequences. Earlier beliefs that infants did not truly experience pain due to immature neurological development have been disproven. It is now recognized that neonates respond more intensely to pain than adults, and untreated pain can lead to lasting psycho-physiological effects. Effective pain management benefits the infant immediately and may prevent future complications. **Objectives:** (1) To determine pain levels among neonates during invasive procedures. (2) To evaluate the effectiveness of pre-feeding and swaddling in reducing pain. (3) To examine associations between pain scores and demographic variables in the experimental group. (4) To compare pain scores between experimental and control groups. **Methods:** An experimental study design was adopted, guided by the Gate Control Theory of Pain (Melzack & Wall, 1965). A post-test only control group design was used with 60 neonates admitted to neonatal intensive care units and postnatal wards in Bagalkot hospitals. Purposive sampling was employed, and pain was assessed using the standardized Neonatal Infant Pain Scale (NIPS). Data were analysed using descriptive and inferential statistics. **Results:** Of the 60 neonates studied, 50% were male and 50% female in the experimental group, while 60% were male and 40% female in the control group. Most neonates (74% experimental, 63% control) were aged 1–10 days. Caesarean deliveries accounted for 57% in the experimental group, whereas instrumental deliveries were more common in the control group (47%). Feeding types differed, with 60% of the experimental group receiving RT feeding compared to 50% in controls. Pain scores showed that 92.5% of neonates in the experimental group experienced mild to moderate pain, while 100% in the control group had moderate to severe pain. Statistical analysis confirmed a significant difference between groups ($t = 23.20$, $p < 0.001$). No significant associations were found with demographic variables. **Conclusion:** Pre-feeding and swaddling are effective non-pharmacological interventions to reduce neonatal pain during invasive procedures. Their use can minimize neurological damage and support healthy development.

Keywords: Pre-feeding, swaddling, pain, neonates, invasive procedure.

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INTRODUCTION

The neonatal period, defined as the first 28 days after birth, is a critical stage for growth and development. According to the World Health Organization, approximately 130 million neonates are born worldwide each year, while national statistics in Iran report nearly 1.2 million births annually. Environmental influences during this period profoundly affect brain development and determine future health outcomes [1]. Breast milk is universally recognized as the most natural and beneficial nourishment for infants. Early initiation of breastfeeding,

ideally within the first hour of birth, is strongly recommended by WHO, UNICEF, and WABA. Techniques such as the breast crawl, which utilize the newborn's instinctive behaviours, promote bonding and successful breastfeeding initiation [2]. Breastfeeding has also been shown to provide pain relief during minor procedures such as heel pricks or venipuncture. Unlike expressed breast milk given by syringe, direct breastfeeding reduces crying time and validated pain scores in full-term infants. Evidence in preterm infants remains limited, highlighting the need for further

Citation: Miss. Netravati & Daneshwari Hiremath. A Study to Assess the Effectiveness of Pre feeding and Swaddling on Pain Among Neonates During Invasive Procedure in Selected Hospital Bagalkot. Sch J App Med Sci, 2026 Apr 14(4): 575-579.

research [3]. Pain in neonates is now recognized as a complex perception involving behavioural and physiological responses. Repeated exposure to pain can lead to adverse neurodevelopmental outcomes. Both pharmacological methods (acetaminophen, sucrose, opioids) and non-pharmacological strategies (swaddling, holding, kangaroo care, music therapy) are used for analgesia [4]. Swaddling, in particular, is a simple, widely practiced intervention. It reduces stress, stabilizes heart rate and oxygen saturation, shortens crying duration, and improves sleep. Studies confirm its effectiveness in decreasing pain responses during procedures such as heel sticks [5]. Given the proven benefits, combining breastfeeding and swaddling offers safe, accessible strategies to relieve neonatal pain during routine intervention

MATERIALS AND METHODS

A quantitative evaluative approach was adopted to assess the effectiveness of pre-feeding and swaddling on pain among neonates during invasive procedures in a selected hospital at Bagalkot.

Study design: The study employed an experimental post-test only control group design.

- Experimental group (E): Received intervention (pre-feeding and swaddling).
- Control group (C): No intervention.
- Design schema:
 - R – E – X – O1
 - R – C – O1 (R = Randomization, X = Intervention, O1 = Post-test)

Setting of the study: The present study was conducted in neonatal intensive care unit and post-natal ward of selected hospitals of Bagalkot.

Variables:

- Independent variable: Pre-feeding and swaddling
- Dependent variable: Neonatal pain during invasive procedure
- Socio-demographic variables: Gestational age, age in days, gender, mode of delivery, type of feeding, birth weight, type of procedure, duration of hospital stay, medical diagnosis, birth order, Apgar score.

Tool Description

- Section I: Socio-demographic data.
- Section II: Neonatal Infant Pain Scale (NIPS) standardized behavioural tool with six parameters (facial expression, cry, breathing, arms, legs, arousal).
- Scoring: 0–7 points. Reliability and validity established (Cronbach's alpha 0.87–0.95).

Methods of Data Collection

- Permission obtained from hospital authority.
- Subjects selected per inclusion criteria; confidentiality assured.
- Written parental consent obtained.
- Purposive sampling technique applied.
- Baseline proforma collected.
- Experimental group: Pre-fed 5 minutes prior to invasive procedure and swaddled during procedure.
- Control group: No intervention.
- Post-test pain assessed using NIPS.

Statistical Analysis

Data were analysed using descriptive and inferential statistics.

- Descriptive statistics: Frequency, percentage, mean, and standard deviation used to summarize socio-demographic variables and pain scores.
- Inferential statistics: Unpaired t-test applied to compare mean pain scores between experimental and control groups. Chi-square test used to examine associations between socio-demographic variables and pain scores.
- Level of significance: $p < 0.05$ was considered statistically significant.

Ethical Clearance

Ethical approval was obtained from the Institutional Ethical Committee of B.V.V.S. Sajjalashree Institute of Nursing Sciences, Bagalkot, and clearance was submitted to RGUHS, Bangalore with the study synopsis. Permission was granted by the Medical Superintendent of S. Nijalingappa Medical College & HSK Hospital & Research Centre, Bagalkot. Written informed consent was obtained from parents, and privacy, confidentiality, and voluntary participation were ensured.

RESULT

Part I: Socio-Demographic Variables of Neonates

In both groups, the largest proportion (47%) were 35–37 weeks, while the smallest share was 41–42 weeks (23% experimental, 26% control). The majority were ≤ 10 days (74% experimental, 63% control). A smaller fraction was 11–20 days (23% each), and the least represented were 21–28 days (3% experimental, 13% control). The experimental group had an equal distribution of males and females (50% each). In the control group, males formed the higher proportion (60%) compared to females (40%). Cesarean births were more frequent in the experimental group (57%), while instrumental deliveries were more common in the control group (46.6%). Normal deliveries were less frequent (30% experimental, 16.6% control). In the experimental group, the majority received RT feeding (60%) and the minority were breastfed (40%). In the control group,

feeding types were equally balanced (50% each). The experimental group had more neonates in the moderately low birth weight category (36.6%) and fewer in the very low birth weight group (3.3%). In the control group, the largest proportion were 2100–2500 g (43%), while the smaller fraction was very low birth weight (10%). Heel pricks were equally distributed in both groups. IV procedures were slightly higher in the control group, while blood draws were slightly more frequent in the experimental group. Most neonates in both groups stayed 1–10 days. Longer stays (21–28 days) were more prevalent in the control group, suggesting slower recovery compared to the experimental group. RDS was the most common diagnosis (50% experimental, 47% control). Hyperbilirubinemia was more frequent in the

control group (33% vs. 23%), while prematurity was the least represented (27% experimental, 20% control). Second-born neonates formed the largest proportion (50% experimental, 43% control). First-born were the smallest group (20% each). Third-born were more common in the control group (37% vs. 30%). At 1 minute, the control group had a higher proportion with satisfactory scores (47%) compared to the experimental group (37%). At 5 minutes, the majority improved in the experimental group (63%), while a smaller share improved in the control group (53%).

Part II: Description of the Pain score among neonates during invasive procedures.

Table 1: Frequency & Percentage distribution of Subjects in the Experimental and Control group based on Level of Pain during Invasive Procedures N=60

Pain level	Scores	Experimental group		Control group	
		F	%	F	%
No Pain	0 - 2	11	37%	0	0
Moderate pain	3 - 4	18	60%	2	7%
Severe pain	>4	1	3%	28	93%
		30	100%	30	100%

The experimental group had a significantly higher percentage of neonates experiencing no pain (37%) compared to the control group (0%). The control group had a higher percentage of neonates experiencing

severe pain (93%) compared to the experimental group (3%). The experimental group had a higher percentage of neonates experiencing moderate pain (60%) compared to the control group (7%).

Table 2: Mean, Median & Standard deviation of pain Score of Subjects in Experimental and Control group during Invasive Procedure N=60

Group	Experimental Group	Control Group
Mean	2.76	5.76
Median	3	6
Standard deviation	0.81	0.89

The data in the Table 2 depicts that the mean (\bar{x}) and median (M) of pain scores of experimental groups ($\bar{x}_1=2.76$, M=3) were significantly lower than the pain scores of control group ($\bar{x}_2=5.76$, M=6)

Part III: Description of the effectiveness of pre-feeding and swaddling on pain among the neonates during invasive procedures.

This section deals with the significance of difference between the pain scores of the experimental group and the control group. The null hypothesis formulated was H_0 : There is no significant difference in the pain scores among neonates between the experimental and the control group. To find out the difference between pain scores among neonates between the experimental group and the control group, unpaired 't' test was used.

Table 3: Unpaired 't' test showing difference between the Pain Scores of Experimental and Control group Subjects N=60

Group	Mean score	Standard deviation	Mean difference	t = value
E	2.76	0.8172	3	13.51
C	5.76	0.8976	3	

$t_{(58)} = 2.002$, $p < 0.005$; significant E-experimental group C-Control group

Data in the table 3. shows that the mean pain scores of the experimental group (2.76) is less than the mean pain score of control group (5.76) and the calculated t-value by unpaired 't' test ($t = 13.51$) is more than the t-table value ($t_{58} = 2.002$). Thus, the null

hypothesis (H_{01}) was rejected & the research hypothesis (H_1) was accepted that is, after performing pre-feeding and swaddling, the pain among neonates during invasive procedures was reduced.

Part iv: association of pain score with the selected demographic variables of the experimental group

The selected demographic variables. To test the level of significant association, the following null hypothesis was stated:

Ho₂: There is no significant association of the pain scores of the neonate in the experimental group with the selected demographic variables at 0.05 level of significance.

Table 4: Association between level of pain with selected socio demographic variables in Experimental group

Socio demographic variables	Chi square	df	Table value	P value	Inference
Gestational age	2.4451	2	5.991	0.2945	Not significant
Gender	3.9147	2	5.991	0.1412	Not significant
Age in days	0.554	1	3.841	0.4567	Not significant
Mode of delivery	2.5755	2	5.991	0.2767	Not significant
Type of feeding	0.353	1	3.841	0.55524	Not significant
Birth weight	6.813	3	7.815	0.0781	Not significant
Type of procedure	2.111	2	5.991	0.3480	Not significant
Duration of stay in Hospital	4.575	2	5.991	0.1015	Not significant
Medical diagnosis	5.158	2	5.991	0.0758	Not significant
Birth Order	6.163*	2	5.991	0.0459	significant
APGAR Score	2.167	1	3.841	0.1410	Not significant

Table 5: Association between level of pain with selected socio demographic variables in Control group

Socio demographic variables	Chi square	df	Table value	P value	Inference
Gestational age	3.008	2	5.991	0.222	Not significant
Gender	2.1091	2	5.991	0.398	Not significant
Age in days	1.851	1	3.841	0.173	Not significant
Mode of delivery	2.945	2	5.991	0.223	Not significant
Type of feeding	0.5	1	3.841	1	Not significant
Birth weight	2.938	3	7.815	0.3916	Not significant
Type of procedure	3.224	2	5.991	0.2231	Not significant
Duration of stay in Hospital	2.42	2	5.991	0.2982	Not significant
Medical diagnosis	3.267	2	5.991	0.1952	Not significant
Birth Order	1.168	2	5.991	0.5577	Not significant
APGAR Score	2.167	1	3.841	0.1410	Not significant

The data presented in Table 5. showed that there is no significant association of post-test pain score with Gestational age ($X^2=3.008$, $P = 0.222$), Gender ($X^2=2.1091$, $P=0.398$) Age in days ($X^2=1.851$, $P=0.173$), Mode of delivery ($X^2=2.949$, $P=0.223$), Type of feeding ($X^2=0.5$, $P=1$) Birth weight ($X^2=2.938$, $P=0.3916$), Type of procedure ($X^2=3.224$, $P=0.2231$), Duration of stay in hospital ($X^2=2.42$, $P=0.2982$), Birth order ($X^2=1.168$, $P=0.5577$), Apgar score ($X^2=2.167$, $P=0.1410$). So, the researcher failed to reject the null hypothesis (Ho₂). Hence there is no significant association of the post-test pain scores of the neonate in the experimental group with the selected demographic variables. Thus it is proved that there is no association of the demographic variables under the study with the pain scores in the control group and pre-feeding and swaddling was effective in reducing pain response.

DISCUSSION

Part I: Description of the demographic variables of the neonates.

In this study, most neonates undergoing invasive procedures were within 10 days of age, with a

balanced gender ratio in the experimental group and a slight male predominance in the control group. Blood draw was the most common procedure, while heel prick was least frequent. These findings align with Elena Uga *et al.*, (2008), who also reported equal gender distribution and a predominance of neonates within 10 days of life, though their cohort consisted exclusively of healthy term newborns. The inclusion of preterm neonates and variation in procedural types distinguishes the present study, underscoring differences in clinical context while confirming similar demographic patterns.

Part II: Description of pain score among neonates during invasive procedures

In this study, 60 neonates aged 1–28 days undergoing invasive procedures were assessed. Most in the experimental group (60%) experienced mild to moderate pain, while nearly all in the control group (93%) had moderate to severe pain. Comparable findings were reported by Mathai S, Natrajan N, and Rajalakshmi NR (2005) in a randomized trial of 104 term neonates in Pune. Using the Douleur Aigue du Nouveau-né (DAN) score, they demonstrated that non-nutritive sucking with

a pacifier was more effective than expressed breast milk, distilled water, or sucrose (20%) in reducing heel prick pain. Together, these results highlight the value of non-pharmacological interventions in minimizing procedural pain in neonates.

Part III: Effectiveness of pre-feeding and swaddling on pain in neonates

In this study, 60 neonates aged 1–28 days were assessed. The mean pain score in the experimental group (2.76) was significantly lower than in the control group (5.76), with the calculated t -value ($t_{58} = 13.51$) exceeding the table value ($t_{58} = 2.002$). This confirms that pre-feeding and swaddling effectively reduced pain during invasive procedures. Similarly, Codipietro *et al.*, (Pediatrics, 2008) reported lower pain scores in neonates breastfed during heel lance compared to those given oral sucrose, with statistical analysis showing significant differences favoring breastfeeding. Both studies demonstrate that simple non-pharmacological interventions can significantly reduce procedural pain in neonates.

Part IV: Association of pain scores of subjects with selected demographic variable

The present study found no significant association between post-test pain scores and gestational age, gender, age in days, mode of delivery, type of feeding, birth weight, type of procedure, hospital stay, medical diagnosis, birth order, or APGAR score at the 0.05 level of significance ($\chi^2(3) = 3.841$, $p > 0.05$). Similarly, a study in São Paulo reported significant differences in mean NFCS and NIPS scores across study periods ($p < 0.000001$), but no significant interaction between gestational age and gender. A randomized study in Pune also showed no significant association between pain and birth weight, procedure type, sex, or gestational age. These findings are consistent, indicating that neonatal pain responses are not significantly influenced by demographic or perinatal variables.

CONCLUSION

The mean pain score was significantly lower in the experimental group (2.76 ± 0.81 , median = 3) compared to the control group (5.76 ± 0.89 , median = 6), with an unpaired t -value of 13.51 ($p < 0.005$), confirming that pre-feeding and swaddling effectively reduced neonatal pain during invasive procedures.

ACKNOWLEDGEMENTS

I thank the anonymous referees for their useful suggestion. The heart is full and the words are few to express my sincere gratitude towards those helping hands.

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