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# A comparative study to assess the efficacy of topical application of 2% lignocaine gel and emla cream on pain levels during venepuncture in schoolage children in a tertiary care hospital

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#### Abstract

Introduction: Simple venous access procedures are a major source of pain and distress for children receiving medical care. When pediatric pain is inadequately managed, it can result in both physical and psychological consequences. This study was conducted to evaluate whether 2% lignocaine gel is as effective as emla cream—a proven strategy—in reducing pain during venepuncture in children. Methods & materials: a true experimental design was adopted for the study. A total of 60 children aged 6-9 years were randomly selected using a random number table. Participants were allocated into two groups: the experimental group received 2% lignocaine gel, and the control group received emla cream, using a lottery method. Triple blinding was employed to eliminate outcome bias. Pain levels were assessed using the wong-baker FACES Pain rating scale within one minute of the procedure. Results: the subjects in both groups were homogeneous with respect to selected sociodemographic variables. There was no statistically significant difference in mean pain scores between the experimental group  $(2.67 \pm 1.688)$  and the control group  $(2.73 \pm 1.688)$  at the 5% level of significance. **Discussion:**A study conducted by bahorski et al. (2015), which compared the effectiveness of lignocaine, distraction, and the buzzy device during venepuncture in children aged 18 months to 17 years, found that both mechanical vibration and topical anesthetics were equally effective, regardless of age or sex. These findings support the results of the present study. Conclusion: The study concludes that 2% lignocaine gel is as effective as emla cream in reducing pain during venepuncture in children.

Keywords: Pain, children, venepuncture, wong-baker faces pain rating scale



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#### Introduction

The declaration of montreal by the international pain summit asserts that access to pain management is a fundamental human right. The perception of pain in pediatric patients is multifaceted, involving physiological, psychological, behavioral, and developmental factors. Despite its prevalence and the persistence of related myths, pain in infants, children, and adolescents is often underestimated and undertreated. Effective pediatric care demands a developmentally appropriate approach to pain management. Venepuncture is among the most commonly performed outpatient procedures in children, with approximately 50% experiencing significant distress during the process. Pain management is a critical component of nursing care and a core responsibility of pediatric nurses. However, several barriers still hinder the routine implementation of pain-free venepuncture in children. These include the prolonged application time of some topical anesthetics, high cost, limited availability, lack of awareness, and time constraints. Lignocaine hydrochloride, a cost-effective, readily available, and skin-friendly local anesthetic, has shown potential in reducing the intensity of pain when applied at the venepuncture site prior to cannulation.

#### **Objectives**

1. To assess the level of pain experienced by children in the experimental (2% lignocaine gel) and control (emla cream) groups during venepuncture.

2. To compare the effectiveness of 2% lignocaine gel and emla cream in reducing pain levels during venepuncture in school-aged children.

#### Hypotheses

- •H<sub>01</sub> (null hypothesis): there is no significant difference in pain levels among school-aged children during venepuncture following the topical application of 2% lignocaine gel and emla cream.
- •H<sub>11</sub> (alternative hypothesis): there is a significant difference in pain levels among school-aged children during venepuncture following the topical application of 2% lignocaine gel and emla cream.

**Ethical-Considerations**: Formal approval was obtained from the institutional ethics committee (iec) prior to the commencement of the study. Informed assent was secured from the participants and their guardians after providing a detailed explanation of the procedure and ensuring voluntary participation in both groups.



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**Review of literature:** The researcher conducted an extensive review of literature using various primary sources, including peer-reviewed journals, clinical studies, and evidence-based practice

guidelines. The majority of the reviewed studies focused on interventions aimed at reducing procedural pain in pediatric patients. These interventions included non-pharmacological methods such as distraction techniques (e.g., virtual reality, toys, music therapy), breastfeeding in infants, and pharmacological approaches like the application of emla cream and different forms of lignocaine, including 10% lignocaine solution, lignocaine spray, and gel formulations.Several studies highlighted the effectiveness of emla cream in reducing needle-related pain, while others explored the comparative benefits of readily available alternatives like lignocaine gel. The review also included studies evaluating the wong-baker faces pain rating scale, confirming its reliability and validity in assessing pain levels among school-aged children. This comprehensive literature review enabled the researcher to identify existing gaps in practice, refine the research problem, and adopt a methodology that ensures accurate data collection and analysis to meet the study's objectives.

**Materials and Methods**: This study adopted a quantitative research approach with a true experimental design to evaluate the effectiveness of 2% lignocaine gel versus emla cream in reducing pain during venepuncture in children.

**Setting and population:** The study was conducted in the blood collection center of the pediatric outpatient department (opd) complex at a tertiary care hospital. The accessible population included children aged 6 to 9 years attending the blood collection center over a six-week data collection period.

**Sampling method and sample size:** A total of 60 children were selected through simple random sampling using a computer-generated random number table. Participants were then randomly allocated into two equal groups (30 in the experimental group and 30 in the control group) using the lottery method, with allocation concealment ensured by assigning this step to a research assistant.

**Blinding:** A triple-blinding method was employed to minimize outcome bias. The researcher, the research assistant, and the subjects were all blinded to the intervention being administered to each child.

## Inclusion criteria:

- Children aged 6–9 years
- Able to verbalize pain
- Undergoing venepuncture in the antecubital fossa using a 24g needle



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## **Exclusion criteria:**

- Children with chronic illness
- Known allergies or history of allergic reactions
- Received analgesia within the past 24 hours
- Critically ill patients
- Children with behavioral disorders that affect comprehension
- Developmental delays
- Experiencing any form of acute pain at the time of the procedure

Data collection instruments and procedure: Data collection was done using a two-part tool:

- •Part A : Sociodemographic data including age, gender, birth order, primary caregiver presence, and history of hospitalization or previous venepuncture
- •Part B: Wong-baker faces pain rating scale (wbfprs), administered within one minute after the venepuncture procedure

**Intervention protocol:** The researcher identified a suitable vein in the antecubital fossa and marked an area of approximately 7 cm<sup>2</sup> (equivalent to a 1-rupee coin) for the application of the topical anesthetic. A trained research assistant, who was blinded to group assignment, applied either **2% lignocaine gel (experimental group)** or **emla cream (control group)** to the marked area based on random allocation. After 20 minutes, the assistant wiped off the cream using a skin disinfectant. The researcher, still blinded to the intervention, then performed the venepuncture. Pain levels were recorded using the wong-baker faces scale within one minute of completing the procedure.

## Data analysis & interpretation

The collected data was organized, analyzed and interpreted using descriptive and inferential statistics. The scheme of statistical analysis was as follows: section 1: description of sample characteristics in both the emla and 2 % lignocaine group, section 2: description of pain score of subjects in both groups, section 3: comparison of pain scores between study groups and section 4: association of pain scores with selected variables among both groups of study.

**Statistical methods used**: chi square and fischer exact test was used to establish the homogeneity of samples in experimental and control group. Mann whitney test was used to analyze the pain scores among the subjects in both groups. Anova was used to analyze the association of pain with selected sociodemographic variables.



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#### Fig 1: percentage distribution of samples based on severity of pain in both groups

#### Table 1: Comparison of mean pain scores in both study groups

Parameter	2 % lignocaine		Emla		Z value	P value
Pain score	Mean	Sd	Mean	Sd	0.19	0.85
	2.67	1.688	2.73	2.434		

**Results:** The study sample was evenly distributed across all age groups, with a nearly equal number of male and female participants in both the control and experimental groups. Each age category had more than 10% representation. In terms of birth order, over half of the children were first-born (63.33% in the control group and 56.67% in the experimental group). Only three participants were third in birth order, all of whom were in the control group (10%). Most participants were accompanied by their primary caregivers—100% in the control group and 96.67% in the experimental group. A majority of the children had not undergone venepuncture in the past year (control group: 60%, experimental group: 70%), and most had no hospital admissions in the previous year (control: 90%, experimental: 86.67%). As shown in figure 1, both groups had an equal proportion of children (36.67%) reporting moderate pain. Notably, 2 children (6.66%) in the emla group experienced severe pain, whereas none in the lignocaine group did. Additionally, 8 children (26.6%) in the emla group reported no pain, compared to 4 (13%) in the lignocaine group. Half of the participants in the lignocaine group reported only mild pain, which is a significant observation.

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Table 1 indicates that the difference in mean pain scores between the two groups was not statistically significant. The calculated mann-whitney z value was 0.19, with a p-value greater than 0.05.

## Discussion

A study by bahorski js et al. (2015) compared the effectiveness of 4% lidocaine with a combination of 2.5% lidocaine and 2.5% prilocaine in children aged 18 months to 7 years undergoing venepuncture. Their results demonstrated that both formulations were effective, with 4% lidocaine having a quicker onset of action, aligning with the findings of the current study, though not with statistical significance.

More recent research comparing emla, amethocaine, and 4% lidocaine found that the injectionfree 4% lidocaine was the most consumer-friendly, offering pain relief in as little as 1–3 minutes. In another study, gwetu et al. (2015) evaluated the effectiveness of emla cream versus placebo in children aged 6–8 years. Emla was found to significantly reduce pain during phlebotomy, with 91.3% of children in the emla group reporting pain relief, compared to 25.0% in the placebo group. Among those treated with emla, only 1.6% reported moderate pain and 7.1% reported mild discomfort. The relative risk of pain was substantially lower in the emla group (rr: 0.11; 95% ci: 0.05–0.27).

These findings contrast with the current study, where only 26.67% of children in the emla group reported no pain, and 6.66% experienced severe pain. Nonetheless, the majority (66.67%) reported only mild to moderate pain, consistent with some level of effectiveness.

#### Conclusion

This study aimed to compare the effectiveness of 2% lignocaine gel and emla cream in reducing pain perception during venepuncture among school-aged children (6–9 years) at a tertiary care hospital's blood collection center. A total of 60 participants were recruited, with 30 in each group. Sociodemographic data confirmed the homogeneity of the two groups.

The findings revealed no statistically significant difference in mean pain scores between the two interventions. The calculated mann-whitney z value was 0.19, with a p-value greater than 0.05, indicating that 2% lignocaine gel is as effective as emla cream in managing venepuncture-related pain in this population.

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