Assessment of Knowledge and Awareness of Local Anesthetics among Non-Anesthesiology Resident Doctors Performing Interventional Procedures

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Abstract

Background: Local anesthetics (LAs) are crucial in performing various interventional procedures, ensuring patient comfort and safety. However, non-anesthesiology resident doctors often administer LAs with varying levels of expertise. Inadequate knowledge of proper dosages, potential side effects, and management of complications can jeopardize patient safety. This study aims to evaluate the knowledge and awareness of local anesthetics among non-anesthesiology resident doctors performing interventional procedures. **Aims & Objectives:** To assess the current level of knowledge and awareness related to local anesthesia administration, including proper patient assessment, preparation, monitoring, and management of complications among non-anesthesiology resident doctors. **Methods**: A Descriptive study was conducted among 121 non-anesthesiology resident doctors across multiple specialties, including General Surgery, Orthopedics, General Medicine , ENT, Obstetrics And Gynecology, Ophthalmology, Pediatrics, Emergency Medicine and Radiology who routinely perform interventional procedures. A validated questionnaire was used for assessment of knowledge related to local anesthesia administration. Descriptive statistics were applied to analyze the results. **Results**: Among the study participants, majority were belonged to Ophthalmology department, followed by 18 participants from Medicine department. Out of total, 34% participants were from 1st year of residency, 39% participants were from 2nd year of residency, and 27% participants were from 3rd year of residency. Of total, 114(96%) participants had knowledge assessment score in between 5-10. Only 7(4%) participants had more than 10 knowledge assessment score. The mean score among study participants was 8.21 $\pm$ 1.5. There was no statiscally significant difference found between mean knowledge score and year of residency. There was a statiscally significant difference found between mean knowledge score and various department. **Conclusion:** This study reveals critical gaps in the knowledge of local anesthetics among non-anesthesiology resident doctors. Regular educational interventions, such as workshops and practical sessions, are necessary to enhance resident proficiency and ensure patient safety.

Keywords: Local anesthetics, LA toxicity, Non-anaesthesia healthcare professionals, Knowledge, Practices.

Introduction

Local anesthetics (LAs) are widely used in various medical disciplines, particularly in interventional procedures such as minor surgeries, wound suturing, and diagnostic tests. LAs provide analgesia and allow for pain-free interventions, thereby improving patient outcomes and procedural success rates. However, the administration of LAs requires an understanding of their pharmacological properties, appropriate dosages, and potential complications.[1] Anaesthesiologists are not the only professionals who employ local anaesthetics. The use of neural blocking techniques has become more widespread due to advancements in the technology, increased awareness of its benefits, and the creation of additional LAs. [2,3]

Local anaesthetics can be injected close to nerve ends, applied topically, or injected into tissues. Even though local anaesthesia is usually safe, there are several situations when it shouldn't be used, include allergies to local anaesthetics, injection site infections, and illnesses that raise the possibility of systemic toxicity. Local tissue reactions (such as bruising and swelling), systemic toxicity (such as impacts on the central nervous system and cardiovascular system), and allergic reactions are possible side effects of local anaesthesia. Minimise these hazards by using proper procedure, monitoring, and dosage calculation. [4]

Local anesthetic systemic toxicity (LAST) is a potentially fatal complication if not recognized and managed promptly. [5] Non-anesthesiology residents, such as those in surgery, orthopedics, and emergency medicine, frequently administer LAs during procedures, but their training in the pharmacology and safety of LAs may not be comprehensive. Studies have shown that inadequate knowledge can result in incorrect dosing, unawareness of signs of toxicity, and delayed management of adverse reactions, posing risks to patient safety. [6,7]

Assessing proficiency ensures that doctors can perform these procedures safely, minimizing the risk of adverse events for patients. Thus the aim of this present study was to assess the proficiency of non-anesthesiology resident doctors in administering local anesthesia for interventional procedures.

Aims & Objectives: To assess the current level of knowledge and awareness related to local anesthesia administration, including proper patient assessment, preparation, monitoring, and management of complications among non-anesthesiology resident doctors.

Methodology: A Descriptive study was conducted among 121 non-anesthesiology resident doctors across multiple specialties, including General Surgery, Orthopedics, General Medicine , ENT, Obstetrics And Gynecology, Ophthalmology, Pediatrics, Emergency Medicine and Radiology who routinely perform interventional procedures.

Sample Size

As per the study by Taanya Imtiaz and Akshay Khandelwal (2022) [8] 95% of the dental students are aware about local anesthetic causing reversible loss of sensation and their main purpose of action. As per the above proportion the minimum required sample size required for this study was calculated using the formula,

$$n = \frac{Z_\alpha^2 pq}{d^2}$$

Z_α^2 = Table value of standard normal distribution at 'α' level of significance = 1.96 at 5 per cent of level of significance

p = 0.95

q = 0.05

d = effect size = 0.04

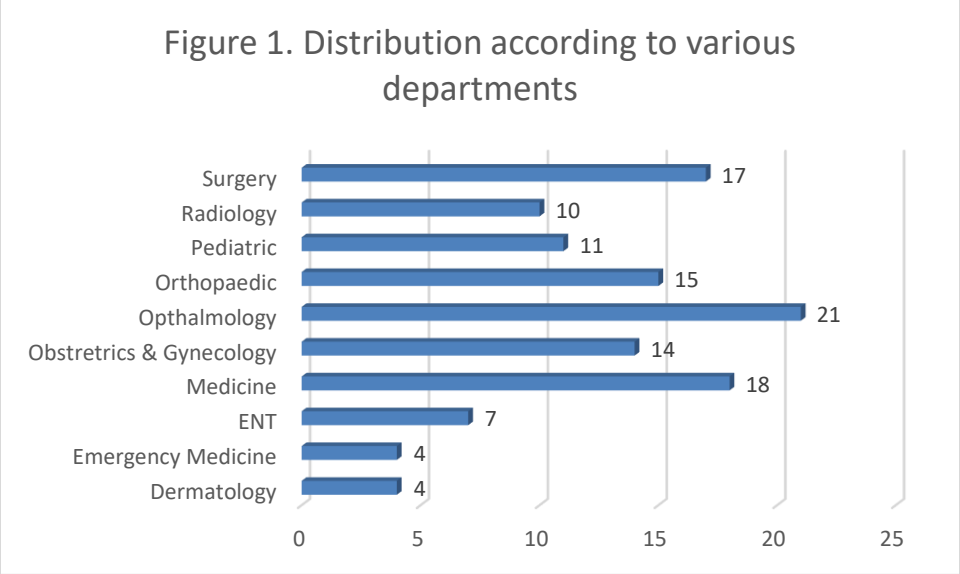
So, minimum required sample size is 121.

All Non- anaesthesiology resident doctors in Sri Devaraj Urs Medical College, Tamaka, Kolar were included. Anaesthesiology resident doctors and Non anesthesiology resident doctors who were refusing to participate in the study were excluded. Ethical approval for the study was obtained from the Institutional Review Board (IRB). The informed written consent was take prior to the study from all participants.

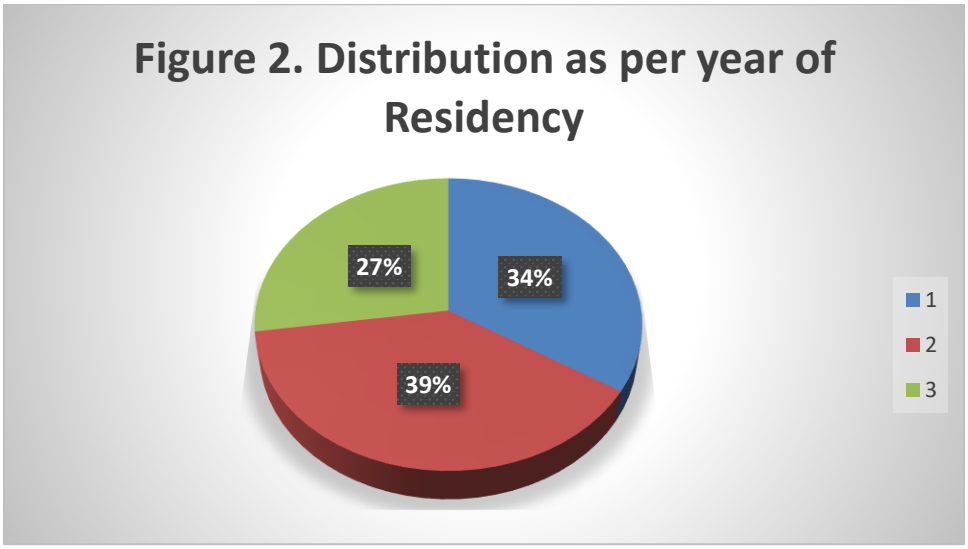
Data Collection & Analysis

Data were collected through a validated self-administered questionnaire. The questionnaire was designed to assess various aspects of knowledge regarding local anesthetics. Data were analyzed using SPSS version 26.0. Descriptive statistics, such as frequencies and percentages, were used to describe categorical data. Knowledge scores were calculated for each participant, and participants were grouped based on their total scores. Anova tests was used to evaluate the relationship between the level of knowledge and the participants' years of residency and department of training. A p-value < 0.05 was considered statistically significant.

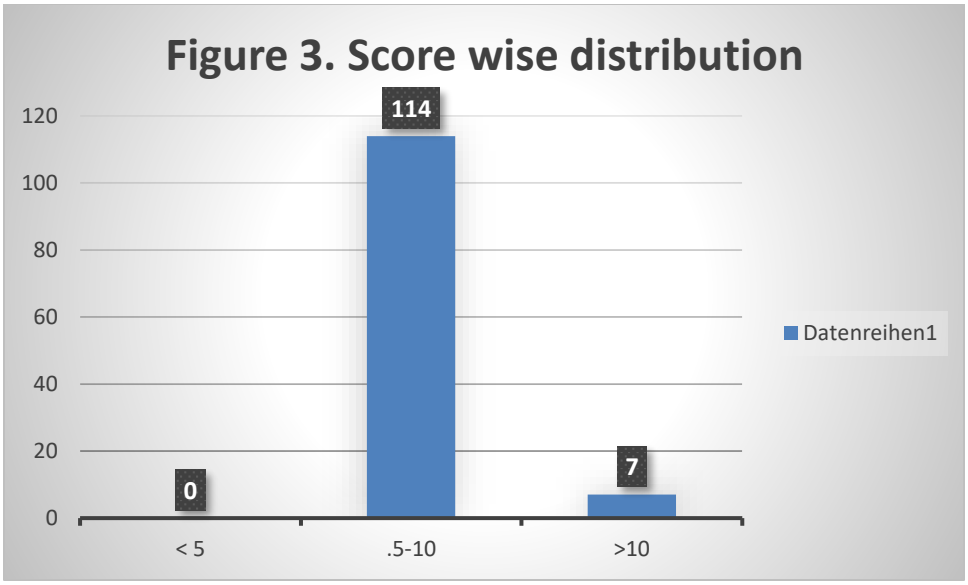
Results



Among the study participants, majority were belonged to Ophthalmology department, followed by 18 participants from Medicine department, followed by 17 participants were belonged to surgery department. Total 4 participants were from emergency medicine and another 4 participants were from Dermatology department. [Figure 1]



Out of total, 34% participants were from 1st year of residency, 39% participants were from 2nd year of residency, and 27% participants were from 3rd year of residency. [Figure 2]



Of total, 114(96%) participants had knowledge assessment score in between 5-10. Only 7(4%) participants had more than 10 knowledge assessment score. The mean score among study participants was 8.21 ± 1.5. [Figure 3]

Table 1. Comparison of Knowledge level and year of Residency

Year of Residency	Mean Knowledge score	P value
1	8.0 ± 1.6	0.552
2	8.3 ± 1.4	
3	8.36 ± 1.63	

The mean Knowledge score was 8.0 ± 1.6, 8.3 ± 1.4 and 8.36 ± 1.63, respectively among 1st , 2nd, and 3rd year resident doctors. There was no statiscally significant difference found between mean knowledge score and year of residency. [Table 1]

Table 2. Comparison of Knowledge level and Department

Department	Mean Knowledge score	P value
Dermatology	9.0 ± 1.9	0.0001
Emergency Medicine	10.5 ± 2.1	
ENT	8.71 ± 1.9	
Medicine	7.0 ± 1.4	

Obstetrics & Gynaecology	8.14 ± 0.9	
Ophthalmology	9.0 ± 1.8	
Orthopaedic	7.3 ± 1.5	
Paediatric	8.75 ± 0.5	
Radiology	8.25 ± 1.2	
Surgery	7.67 ± 1.3	

The mean highest knowledge score was observed among emergency residents, followed by Dermatology and Ophthalmology Department. There was a statiscally significant difference found between mean knowledge score and various department. [Table 2]

Discussion

This study highlights significant gaps in the knowledge and awareness of local anesthetics among non-anesthesiology resident doctors. While the majority demonstrated a basic understanding of the pharmacology of LAs, knowledge of safe dosages and awareness of complications was lacking in many participants, particularly those with fewer years of training. These findings are consistent with previous studies indicating that non-anesthesiology residents often receive limited formal training in the safe use of LAs, relying instead on clinical experience and ad-hoc learning. [9,10]

The most concerning finding was the limited awareness of LAST, a potentially fatal complication if not recognized early. Previous research indicates that inadequate recognition of LAST can lead to delayed or inappropriate management, resulting in poor patient outcomes. Moreover, the lack of knowledge regarding the maximum safe dosages of LAs, particularly lidocaine, is alarming, as overdose is a leading cause of LAST. [11]

This study underscores the need for structured educational interventions, including simulation-based learning and targeted workshops, to enhance the knowledge and competence of non-anesthesiology residents in using local anesthetics. Training programs should emphasize the recognition and management of LAST, safe dosing practices, and the use of appropriate antidotes, such as lipid emulsion therapy.

Limitations

The study was limited by its single-center design, which may not reflect the knowledge levels of residents at other institutions. Additionally, the self-reported nature of the data collection may introduce response bias.

Conclusion

The findings of this study reveal significant knowledge gaps among non-anesthesiology resident doctors in the administration of local anesthetics, particularly in the areas of safe dosing and the management of complications. Educational interventions, such as mandatory workshops and simulation exercises, should be incorporated into residency training to improve resident competence in administering local anesthetics and managing potential complications, thus ensuring better patient safety.

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Presentation at a meeting

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Conflicting interest: Nil

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