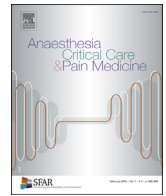




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Original Article

Understanding the practice of neuroanaesthesia across low- and middle-income countries (LMICs): a cross-sectional survey

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ABSTRACT

Background: Understanding the challenges in resource-limited settings is crucial for improving the quality of care, building capacity, and facilitating international collaboration in neurosurgical care. We conducted this survey with the aim of assessing and describing the current practices, challenges, training, and infrastructure associated with neuroanaesthesia across LMICs, to identify key gaps.

Methods: This cross-sectional survey collected data on training, education, details about clinical practice, agents used, availability of equipment and resources, and challenges involved. Data were analysed using descriptive statistics, and comparisons were made across different geographical regions and economic strata [low-income countries (LICs), lower middle-income countries (LoMICs), and upper middle-income countries (UMICs)].

Results: A total of 453 anaesthesiologists from 38 LMICs took the survey. About 54.9% (133/242) of respondents from UMICs reported the presence of an academic program for training in neuroanaesthesia, while 67.2% (45/67) of respondents from LICs do not have any facility for neuroanaesthesia training. Approximately 40.4% (183/453) of respondents have a recognized neuroanaesthesia course available at their institute. The availability of dedicated neuroanaesthetists was limited (69/453; 15.2%). Only 46.8% (212/453) of respondents were satisfied with the availability of critical neuroanaesthesia tools, and variation was observed across LMICs ($p < 0.001$). The presence of a dedicated quality improvement program was reported by only 16.8% of the respondents.

Conclusion: This survey provides useful insight about the unmet needs and the opportunities for strengthening neuroanaesthesia practice in the LMICs.

Introduction

Neuroanaesthesia is a specialized field within anaesthesia focused on providing care for neurosurgical and neurointerventional procedures. The practice of neuroanaesthesia in Low- and Middle-Income Countries (LMICs) remains understudied. Recently, the organization, infrastructure, workforce, and adherence to protocols in neurocritical care practice in LMICs have been studied in detail [1,2], but similar information regarding neuroanaesthesia practice is still lacking. Understanding the challenges, training practices, equipment availability, and clinical outcomes of neuroanaesthesia in these settings is crucial for improving the quality of care, building capacity, and facilitating international collaboration in neurosurgical care.

To assess and describe the current practices, challenges, training, and infrastructure associated with neuroanaesthesia across LMICs, we conducted a survey with the aim of:

- 1 Identifying commonly used neuroanaesthesia techniques and drugs used.
- 2 Exploring the availability of equipment and monitoring techniques.
- 3 Understanding training practices and the level of expertise in neuroanaesthesia.
- 4 Identifying the barriers and challenges faced by neuroanaesthesia providers in LMICs.
- 5 Proposing recommendations to improve neuroanaesthesia care.

We hypothesised that the practice of neuroanaesthesia in LMICs is largely varied, resource-dependent, and characterized by a limited specialized workforce.

Methods

Ethics approval

Ethics approval for this cross-sectional online survey was obtained from the Institute Ethics Committee (Ref No. AIIMS3459/11.03.2025, RP-3/2025, dated 21.03.2025). The survey was conduc-

ted from 21st April 2025 to 3rd July 2025. Participating institutes in the various LMICs sought clearance from their respective ethics committees, when required, facilitated by the national coordinators.

Survey design

The survey questionnaire (in English and Spanish) was framed and reviewed by the steering committee (HP, CM, IK, RL, AL, ST, JM, CT, DG, KP), which was constituted of experts in neuroanaesthesia across various LMICs. Members were selected based on their expertise in the field, practice in LMICs, and their involvement in the design and review of the study. The questionnaire was piloted among the committee members, and necessary modifications were made based on the suggestions.

Study participants

This survey targeted anaesthesiologists working in various hospital settings across LMICs, who cared for patients undergoing neurosurgical and neurointerventional procedures. Multiple responses from different respondents within the same hospital were permitted. All respondents were asked to provide their names and affiliations before completing the survey, ensuring transparency and allowing us to acknowledge all respondents as collaborators in the study.

Survey distribution

The survey was disseminated using a snowball sampling approach. National representatives from LMICs recruited participants through professional anaesthesia and neuroanaesthesia networks, international organizations, informal networking, and social media platforms, including a WhatsApp group™ dedicated to anaesthesia and neuroanaesthesia care. The invitation included a brief description of the study and a link to the survey. The intention was to include providers from as many varied regions within LMICs to ensure global representation. Participation was voluntary and uncompensated. Submitting a response to this survey was considered implied consent from the respondents to participate in this study.