



St. Paul's Hospital Millennium Medical College
School of Medicine

**Knowledge, Attitude, and Practice of Regional Anesthesia among
Anesthesiology Residents in Government Teaching Referral Hospitals in Addis
Ababa**

By: Dr Habtamu Shewalem (MD)

Addis Ababa, Ethiopia

March, 2026



St. Paul's Hospital Millennium Medical College

School of Medicine

**Knowledge, Attitude, and Practice of Regional Anesthesia among
Anesthesiology Residents in Government Teaching Referral Hospitals in Addis
Ababa**

By: Habtamu Shewalem (MD)

Advisors:

Dr. Roza Tadesse (MD, Assistant Professor of Anesthesiology)

Mr. Tolesa Diriba (MSc, Assistant professor)

Thesis research submitted to the department of anesthesiology, critical care, and pain medicine at St. Paul's Hospital Millennium Medical College in partial fulfillment of the requirement for certification of a specialty in the department of anesthesiology, critical care, and pain medicine

March, 2026

Addis Ababa, Ethiopia

Declaration

I, the undersigned, understand and accept full responsibility for the scientific and ethical conduct of this research project. I will provide timely progress reports to my advisor, seek necessary advice and approval during the course of the study, and maintain open communication with all stakeholders, including any sources of funding.

Name of the student: _____

Signature: _____

Date: _____

Approval of the Primary Advisor

Name of the primary advisor: _____

Signature: _____

Date: _____

Approval of the Co-Advisor

Name of the co- advisor: _____

Signature: _____

Date: _____

Name of investigator	Dr Habtamu Shewalem Anesthesiology, Critical Care and Pain Medicine Resident
Title of the study	Knowledge, Attitude, and Practice of Regional Anesthesia among Anesthesiology Residents in Government Teaching Referral Hospitals in Addis Ababa
Study area	St. Paul's Hospital Millennium Medical College ,Yekatit 12 Hospital and Tikur Anbessa Specialized Hospital
Study Design	Cross-sectional
Duration of the project	Four months (October 1/2025 –January, 2026)
Source the funding	St. Paul's Hospital Millennium Medical Collage
Total Estimated Cost of the Research	25,230 ETB
Address of investigator	Cell phone: (+251)-913605767 Email: habrichmend@gmail.com
Name of Advisers	Dr. Roza Tadesse (MD, Assistant Professor of Anesthesiology, Critical Care, and Pain Medicine) Mr. Tolesa Diriba (MSc, Assistant professor)

Acknowledgement

First, I would like to give my heartfelt gratitude to my advisors Dr. Roza Tadesse, and Mr. Tolesa Diriba for their constant guidance and for being there from the start with their constructive advises and supportive guidance.

Next, I would like to thank anesthesiology, critical care, and pain medicine department St. Paul's Hospital Millennium Medical College for giving me the opportunity to carry out this research, which will help me for my future career development. Finally, I want to thank all those who contributed ideas in the development of this proposal

Table of Contents

Declaration.....	iii
Acknowledgement.....	v
List of tables.....	viii
List of figures.....	viii
Abbreviation /Acronyms	ix
Abstract.....	x
1. Introduction.....	1
1.1. Background of the study	1
1.2. Statement of the problem	2
1.3. Rationale of the study	3
1.4. Significance of the study	4
2. Literature Review	4
2.1 Overview of Regional Anesthesia Practice in Ethiopia	4
2.2. Barriers to effective regional anesthesia practice	5
2.3 Training and education in regional anesthesia.....	6
2.4. Strategies for improving regional anesthesia practice in Ethiopia.....	7
2.5. Factors influencing the utilization of regional anesthesia	12
2.6. Conceptual Framework.....	14
3. Objectives of the study.....	14
3.1 General objective	15
3.2 Specific objectives	15
4. Methods and materials	16
4.1. Study setting	16
4.2. Study period	16
4.3. Study design.....	16
4.4. Population.....	16
4.5. Sample size determination and technique	17
4.6. Study variables	17
Dependent Variable	17
Independent Variables.....	17
4.7. Data collection instruments and technique.....	17
4.8. Operational definitions	17

4.9. Data management and analysis	17
4.10. Data quality assurance.....	18
4.11. Ethical considerations.....	18
5. Results	19
5.1. Socio-demographic characteristics	19
5.2. Knowledge about regional anesthesia	19
5.2. Training and exposure to regional anesthesia	21
5.3. Attitude of residents towards the use of regional anesthesia	22
5.4. Practice of regional anesthesia among resident physicians.....	24
6. Discussion.....	26
6.1. Implications of the study finding	28
6.2. Strength and limitation of the study.....	28
7. Conclusion and recommendation	29
7.1. Conclusion	29
7.2. Recommendations.....	29
8. References.....	31
Annexes	34
Annex I: Information Sheet	34
Annex II: Consent Form	36
Annex-III: Questionnaire.....	37

List of tables

Table 1. Socio-demographic, study place, and year of the anesthesiology residents in Addis Ababa, 2026-----	19
Table 2. Knowledge to regional anesthesia among anesthesiology residents in Addis Ababa, 2026 -----	21
Table 3. Training and exposure to RA among anesthesiology residents in Addis Ababa, 2026-	22
Table 4. Attitude of anesthesiology residents to regional anesthesia in Addis Ababa, 2026 -----	23
Table 5. Regional anesthesia practice among anesthesiology residents in Addis Ababa, 2026--	25

List of figures

Figure 1. Conceptual framework of the study derived from literature review [5, 9, 12, 14].....	14
Figure 2. Level of knowledge to regional anesthesia among anesthesiology residents in Addis Ababa, 2026	20
Figure 3. Self-rated overall attitude to RA among residents in Addis Ababa, 2026	23
Figure 4. Number of procedures performed using regional anesthesia	24

Abbreviation /Acronyms

ASA: American Association of Anesthesiologists

ACPs: Anesthesia care providers

BLH: Black Lion Hospital

CNS: Central nervous system

CA: Caudal anesthesia

CVS: Cardiovascular system

ERC: Ethics and research committee

GA: General Anesthesia

GRACE: Global Regional Anesthesia Curriculum

IV: Intravenous

IASP: International Association Study of Pain

LA: Local Anesthetic

LMIC: low- and middle-income countries

NPAPs; NOn-physician anesthesia provider

SD: standard deviation

SA: spinal anesthesia

SPHMMC: St Paulo's hospital millennium medical collage

PACU: Post anesthesia care unit

PN: Peripheral nerve

PNB: Peripheral Nerve Block

PNS: Peripheral Nerve Stimulator

RA: Regional Anesthesia

US: Ultra Sound

WHO: World Health Organization

Abstract

Background: Studies have highlighted that regional anesthesia (RA) is associated with better pain control, fewer side effects, and improved patient satisfaction compared to general anesthesia. However, the knowledge, attitudes, and practices of anesthesiology residents towards regional anesthesia in Ethiopian teaching hospitals have not been studied.

Objective: To assess the knowledge, attitude, and practice of regional anesthesia among anesthesiology residents in government teaching referral hospitals in Addis Ababa, Ethiopia.

Methods: An institution-based descriptive cross-sectional study was conducted from October 2025 to December 2025. A structured, self-administered questionnaire was distributed to 130 anesthesiology residents. Data were collected using Google Forms and exported to SPSS version 27 for further analysis. Descriptive statistics such as mean, standard deviation, frequency, and percentage were computed and presented using tables and figures.

Result: The study revealed that the majority of the residents had moderate knowledge (58.5%), followed by very good knowledge (33.8%), good knowledge (6.9%) and only 0.8% had very poor knowledge of regional anesthesia. Moreover, 51.5% of residents did not receive lectures on RA during their residency, and 76.9% did not receive hands-on training. Similarly, 51.5% had very good attitude, 26.9% had good attitude, 19% had medium attitude, and only 2% had a poor attitude toward RA. The results showed that 94.6% had practiced RA, whereas only 5.4% did not practice it.

Conclusion: Overall, while the majority of anesthesiology residents in Addis Ababa's government teaching referral hospitals exhibit moderate to very good knowledge, positive attitudes, and engagement in RA practice, there are notable gaps in specific knowledge and practice areas. Addressing these gaps through enhanced training programs and mentorship is essential to ensure residents are well-prepared to provide safe and effective RA in their future practice.

Keywords: KAP, regional anesthesia, Anesthesiology residents, Addis Ababa

1. Introduction

1.1. Background of the study

A vital component of contemporary surgical care, regional anesthesia (RA) has many benefits over general anesthesia (GA), such as better postoperative analgesia, fewer opioid-related side effects, a lower risk of serious cardiopulmonary problems, and quicker patient turnover. The need for safe, effective, and economical methods is increased in low- and middle-income countries (LMICs) due to resource limitations, such as a lack of operating room space, a shortage of ventilator equipment, and lack of anesthesiology specialists. Since RA directly addresses systemic bottlenecks and enhances patient safety outcomes in settings with the greatest need, it is a key component of the World Health Organization's agenda to strengthen emergency and essential surgical care (1).

A wide range of intricate obstacles stand in the way of the widespread adoption and application of RA in Ethiopia. In government teaching hospitals, which serve as the hubs for clinical service delivery and anesthesiology training, neuraxial and peripheral nerve blocks are still not used at optimal rates, despite their theoretical benefits. According to a recent study specifically noted that obstacles in Ethiopia include a lack of specialized equipment, insufficient opportunities for supervised training, and high workflow pressures that favor well-known techniques like GA over RA. It is challenging to establish and maintain consistent RA practice in this demanding environment due to these institutional realities and the high volume of emergency surgeries (2).

Despite these well-known systemic issues, there is a dearth of information in the literature about the actual use of RA by anesthesiology residents, who are the healthcare professionals most in charge of carrying it out. The frequency, types, and most importantly determinants of RA procedures performed by trainees have not been specifically examined in current studies, despite the fact that they have offered insightful information about general barriers. The most important factors influencing a resident's decision to use or refrain from using regional techniques in their daily practice are still unknown, whether they are perceived self-efficacy, the effectiveness of simulation training, the influence of supervising consultants, or particular institutional support structures. There is currently a dearth of focused analysis of these system-level and provider-level related factors (3).

Therefore, the purpose of this study is to assess the use of regional anesthesia and determine the associated factors among anesthesiology residents at Addis Ababa's government teaching referral hospitals. This study directly fills the identified knowledge gap by focusing on the trainee population. The results have the potential to significantly impact residency curricula, practical training modules, and resident confidence by producing evidence-based insights. The ultimate goal of this work is to improve clinical efficiency, optimize resource allocation, and increase access to safe, high-quality anesthetic care for the Ethiopian populace by informing national strategy and hospital-level policy.

1.2. Statement of the problem

The adoption of RA in Ethiopian clinical practice is still incredibly low, despite its widely acknowledged advantages in enhancing patient safety and surgical efficiency. Recent data clearly illustrates this discrepancy. This underutilization is not unique; rather, it is the outcome of a confluence of systemic, resource, and training barriers that significantly divide clinical reality from evidence-based recommendations. The main challenge is lack of equipment; most institutions cannot afford ultrasound guidance, which is currently the industry standard for accuracy and safety in peripheral nerve blocks. As a result, practitioners are forced to use outdated, unreliable methods, which impedes the development of critical skills (2). This technological gap is exacerbated by crippling supply chain issues, with a specific study finding that a staggering 89.6% of operating rooms reported a total absence of essential local anesthetics, making the consistent practice of RA impossible regardless of clinician intention (4).

Moreover, there are notable gaps in postgraduate training that are intricately linked to these resource limitations. Although anesthesiology residency programs offer a starting point, they frequently do not include thorough, standardized RA modules that incorporate supervised practice and practical simulation, which leaves residents with little exposure and low confidence in their procedural abilities. Even for procedures where RA would be better, this inadequate training environment, along with the everyday reality of equipment and medication shortages, unavoidably molds practitioner attitudes and sustains a reliance on well-known general anesthesia. The consequently low utilization rates, which are exemplified by the fact that 39% of public hospital anesthesiologists have never performed a regional block, have a negative effect on patient outcomes by

causing preventable opioid-related complications, extended recovery periods, and strained surgical capacity (5).

Since anesthesiology residents are essential to the future of the specialty as well as the provision of current services, it is imperative that we go beyond simply recording the existence of these barriers and specifically look into the related factors that affect RA practice among them. The relative importance of various factors, such as the quality of training programs, the degree of confidence and perceived competence, the impact of institutional support (or lack thereof), and the availability of essential supplies, must be determined through a methodical investigation. The first step in creating focused interventions to enhance training, direct logical policy, and eventually incorporate RA as a standard, life-improving aspect of Ethiopian surgical care is comprehending the intricate interactions between educational, resource-based, and attitudinal factors. Finally, this study will fill a major knowledge gap by methodically examining the underutilization of regional anesthesia, particularly among anesthesiology residents in Addis Ababa's teaching hospitals. Finding the specific educational, attitudinal, and institutional factors like confidence levels, the caliber of supervision, and particular resource shortages that most directly affect trainees' clinical decisions will go beyond merely identifying known systemic barriers. In order to improve patient safety, increase surgical efficiency, and create a more resilient anesthesia workforce for Ethiopia, the results will produce an evidence base that will direct the creation of focused interventions, improve residency curricula, and influence national policy (6,7).

1.3. Rationale of the study

Improved practice of RA is in line with patient safety goals globally and aligns well within health priorities for Ethiopia. Studies in Addis Ababa have shown that 56.7% of anesthetists were well aware of patient safety, but merely 68.9% had shown a very positive attitude towards safety protocols, indicating that further training is necessary. Addressing the challenges related to RA, namely, lack of resources, deficit of skills, or weaknesses of the curriculum, has a potential of strengthening postgraduate programs and promoting better perioperative care within the teaching hospitals.

1.4. Significance of the study

This study is important because it has the potential to close the significant gap between anesthesiology residents' positive attitudes and high theoretical knowledge and their actual clinical practice of regional anesthesia (RA). The study offers an evidence-based basis for focused institutional reforms by systematically identifying particular system-level obstacles, such as uneven senior supervision, excessive workloads, and the severe lack of necessary equipment, such as ultrasound machines. These results are essential for guiding the creation of improved residency programs and hands-on, supervised training modules. In the end, the study is an essential tool for hospital administrators and legislators to maximize resource allocation and put policies into place that enhance surgical efficiency, improve patient safety, increase surgical efficiency, and foster a more competent and confident anesthesia workforce in Ethiopia.

2. Literature Review

2.1 Overview of Regional Anesthesia Practice in Ethiopia

In order to improve patient outcomes and lower perioperative complications, RA, which includes spinal, epidural, and peripheral nerve blocks, is a crucial part of contemporary anesthetic practice. Its strategic significance is becoming increasingly acknowledged in Ethiopia, especially in low-resource environments where its benefits over general anesthesia are most noticeable. However, there are substantial systemic obstacles in the way of converting this recognition into common clinical practice (8,9).

Reforms in education are being implemented nationwide to close these gaps. The Ethiopian Association of Anesthesiologists spearheaded a significant initiative with the USAID Health Workforce Improvement Program; implementing a competency-based curriculum for anesthesia programs at eight universities the goal of this fundamental change is to raise the standard of anesthesia education. Additionally, the Addis Ababa University postgraduate program is a major force behind creating a sustainable specialist workforce. From 2011 to 2019, 159 anesthesiology residents were trained with the specific objective of providing high-quality care while working with limited resources (8,9).

The institutional level of implementation varies greatly in spite of these national initiatives. Although 61% of anesthesia providers practiced some kind of RA, the majority of its applications were restricted to the operating room for spinal blocks, according to a recent study conducted at

Jimma University. Significantly, there was a severe lack of adoption of advanced techniques: only 25.7% used nerve stimulation, and a startling 0% had access to ultrasound guidance, highlighting a serious technological deficiency. Regional data support this pattern of limited practice. Anesthetists in Amhara Regional State, Northwest Ethiopia, participated in a study that verified nearly universal spinal anesthesia performance (100%). Peripheral nerve blocks were, nevertheless, extremely rare and inconsistently performed. The study accurately measured the main obstacles, which were as follows, in order of prevalence insufficient practical skills (50.2%), inadequate knowledge (76.7%), lack of equipment (82.9%), and restricted access to medications (22.4%) (10).

Collectively, these studies show a glaring discrepancy between national educational objectives and clinical reality on the ground. They emphasize that increasing RA utilization in Ethiopia requires a multifaceted strategy that includes not only the supply of sufficient equipment and reliable medication supplies but also the development of practical, hands-on skills through focused, ongoing training workshops, especially in the areas of ultrasound and nerve simulator-guided techniques.

2.2. Barriers to effective regional anesthesia practice

Despite the recognized benefits of RA, its implementation in Ethiopia faces several profound challenges. These barriers are multifaceted, encompassing critical issues related to equipment availability, training deficiencies, and overarching systemic healthcare constraints (11).

A significant and frequently cited barrier is the lack of essential equipment. In a study conducted in Amhara Regional State Hospitals found that 82.9% of anesthesia professionals reported insufficient availability of regional anesthesia kits, including block needles, ultrasound machines, nerve stimulators, and epidural sets. This technological deficit forces practitioners to rely on landmark-based techniques, which are perceived as less reliable and safe, thereby discouraging the adoption of RA, particularly for peripheral nerve blocks (12).

Training deficiencies further compound the problem. The same study by highlighted significant gaps in provider preparedness, with 76.7% of respondents acknowledging a lack of theoretical knowledge and 50.2% citing insufficient practical skills as major impediments. These gaps often stem from inadequate hands-on experience during training due to a shortage of expert supervisors

and simulation opportunities, leaving graduates with low confidence in their procedural abilities (13).

Systemic healthcare constraints create an environment where RA practice is particularly challenging. The low physician-to-patient ratio and high volume of emergency surgeries lead to workflow pressures that favor faster, more familiar general anesthesia over RA, which may be perceived as time-consuming to perform. This workload imbalance contributes to provider exhaustion, further diminishing the capacity to implement technically demanding techniques. Moreover, pharmaceutical supply chain issues pose a critical barrier. A study by revealed a staggering 89.6% of operating rooms experienced a total absence of essential local anesthetics like bupivacaine making the consistent practice of RA impossible regardless of clinician skill or intention (14).

Addressing these interconnected barriers requires a multifaceted approach that includes the strategic procurement of necessary equipment, the enhancement of structured, simulation-based training programs, and systemic reforms to ensure a reliable supply of medications. Such concerted efforts are essential to optimize RA practice and improve surgical patient outcomes in Ethiopia.

2.3 Training and education in regional anesthesia

Improving RA practice in Ethiopia requires effective training and education. In order to overcome historical obstacles and directly address the shortage of instructors and equipment, recent initiatives have concentrated on modernizing curricula, offering structured hands-on experience, and utilizing innovative teaching methods (13).

A significant national effort has been the introduction of a competency-based curriculum for anesthesia programs. Spearheaded by the Ethiopian Association of Anesthesiologists in collaboration with the USAID Health Workforce Improvement Program, this curriculum has been implemented across eight higher education institutions. It explicitly emphasizes mastery of practical skills, including RA techniques, to ensure graduates are equipped for modern practice. Preliminary feedback from learners and faculty suggests this shift is fostering greater confidence; however, challenges remain in its uniform implementation due to inconsistent access to necessary training equipment across all sites, highlighting the gap between curriculum design and resource reality (15).

At the postgraduate level, the residency program at Addis Ababa University (AAU)/Tikur Anbessa Specialized Hospital serves as a critical pipeline for expert providers. Between 2011 and 2019, 159 residents entered this program, which was designed to build a self-sustainable workforce. While a comprehensive published evaluation is awaited, internal metrics indicate promising outcomes, including strong board examination pass rates and a high retention of graduates within the Ethiopian public healthcare system. This focus on retaining local expertise is a direct countermeasure to the "brain drain" previously identified as a systemic barrier (15).

To overcome the specific hurdle of providing hands-on ultrasound guidance training, innovative digital methods are being deployed. A pivotal study assessed the feasibility of teaching ultrasound-guided femoral nerve blocks via tele-simulation to Ethiopian house staff. The study demonstrated significant feasibility, reporting a 40% increase in written test scores and a 300% improvement in practical skills assessment scores immediately post-training. While data on long-term skill retention in clinical practice is still being collected, the model proved highly effective in utilizing remote expertise to maximize the training value of a single, locally available ultrasound machine (16).

2.4. Strategies for improving regional anesthesia practice in Ethiopia

2.4.1 Enhancing Training and Education

There is a specific and significant gap in training for regional anesthesia (RA), especially for contemporary techniques like ultrasound-guided nerve blocks, even though anesthesia education in Ethiopia has generally improved. This problem was quantified in 2023 who found that the great majority of anesthesia practitioners in practice had little to no access to formal training in these sophisticated techniques. The main obstacle to the broader use of RA, a safer and frequently more efficient substitute for general anesthesia in many surgeries, is this lack of training. The main finding of the study was that in order to have a long-lasting effect, RA training needs to be thoroughly and methodically integrated into the undergraduate and graduate anesthesia curricula of medical schools (13).

According to a 2022 study by, tele-simulation is the most promising of these. This method directly addresses the two issues of a lack of qualified instructors and inadequate equipment. A group of Ethiopian trainees took part in a four-week course that blended interactive, hands-on learning with

virtual lectures (for theory). In these practical sessions, trainees applied an ultrasound machine to a model or a coworker while global experts watched their technique in real time through a video call. This successfully replicated an in-person learning environment by providing prompt feedback and direction on probe placement and needle advancement. The results were convincing, demonstrating a sharp rise in post-test scores, demonstrating the efficacy of remote instruction in practical skills (17).

It is also described a two-phase approach to a partnership with organizations such as Emory University. The foundational knowledge is first established through online modules, and it is subsequently reinforced through in-depth, practical workshops held on-site. The online component guarantees that all learners have a foundational understanding, which makes the valuable in-person workshop time much more productive. This model is especially effective because it fosters confidence. Its tangible impact on patient care is the ultimate testament to its effectiveness: residents who received training using this approach went on to complete more successful regional blocks in their actual clinical practice (18).

Moreover, while the initial results from these programs are highly positive, most studies, including the [9] paper, lack data on whether the acquired skills and knowledge were retained months after the training ended. For these initiatives to create a permanent shift in practice, they must evolve beyond standalone projects. The true solution lies in integrating these methods into the official national curriculum and establishing structured follow-up systems. This could include periodic virtual refresher courses, a tiered mentor-ship program where trained providers teach others, and continuous remote support from international partners. This sustained effort is essential to ensure that the initial surge in competency is maintained and expanded upon, finally closing the regional anesthesia training gap for good.

2.4.2. Implementing Structured Curricula

By transforming education from an ad hoc to a systematic and quantifiable process, structured curricula are crucial to raising the standard and caliber of RA training. Collaborative efforts have piloted and localized international models in Ethiopia with notable success.

The implementation of a structured four-week RA curriculum in Ethiopian teaching hospitals was a groundbreaking initiative. This curriculum was painstakingly created to gradually increase competency.

Week 1 (Fundamentals): Learning goals centered on three fundamental concepts: sono anatomy, toxicity management, and local anesthetic pharmacology. Skills labs included practicing needle guidance on phantoms and operating ultrasound machines by hand.

In Week 2 (Lower Limb Blocks), trainees gained a thorough understanding of the sono anatomy and theory pertaining to fascia iliaca, sciatic, and femoral blocks. Performing at least five supervised lower limb blocks was part of the clinical application.

The curriculum progressed to interscalene, supraclavicular, and axillary brachial plexus blocks in week three (upper limb blocks). Five supervised upper limb blocks had to be completed.

Week 4 (Trunk & Synthesis): Neuroaxial and abdominal wall blocks (such as TAP) were covered in this last week. In order to fulfill a final clinical quota, residents were expected to synthesize their learning by completing a variety of blocks under supervision (19).

This pilot's evaluation approach was sound. It used written exams to evaluate theoretical knowledge both before and after the program. It was reported that the increase from 48% to 73% was statistically significant ($p < 0.001$). Additionally, validated tools were used to assess clinical competence through direct observation. Even though Bantie et al.'s study from 2021 demonstrated a significant improvement in monthly block performance, it also pointed out that longer-term retention tests at 6 and 12 months were necessary to make sure skills were retained after training.

In addition to individual pilots, Ethiopia adopted the globally accepted Global Regional Anesthesia Curriculum (GRACE). Its evidence-based approach, which combines required clinical practice with online modules, worked incredibly well.

A number of variables will determine whether or not such curricula can be scaled nationally. Despite being very successful, the four-week model requires a lot of resources, including specialized ultrasound equipment for training and a high faculty-to-trainee ratio. A "train-the-trainer" program would be necessary to create a critical mass of local faculty for a successful scale-up. The fundamental components of these curricula must ultimately be incorporated into national

accreditation requirements for all anesthesia training programs in order to have the greatest possible impact, turning structured RA training into a necessity rather than an elective.

This training's human component is essential. One resident commented, "For the first time, I had a clear road map to learn regional anesthesia," highlighting the curriculum's strengths. I finally gained the confidence to apply these techniques independently thanks to the organized practice. Surveys did, however, also highlight areas that needed improvement, most notably the call for additional simulation tools to practice complex blocks before administering them to patients. In agreement, faculty pointed out that "even though the results are excellent, maintaining this model necessitates protected teaching time and institutional support for us as instructors. Therefore, a tried-and-true method for standardizing and improving RA training in Ethiopia is the use of structured curricula such as GRACE and the four-week pilot. Their accomplishments show that the quality of anesthesia education can be raised and that this will directly improve patient care if a systematic approach, well-defined goals, and quantifiable results are used.

2.4.3 Expanding Access to Equipment and Resources

The availability of essential RA equipment, including nerve simulator, ultrasound machines, and local anesthetics, remains a significant barrier to the widespread practice of RA in Ethiopia. A study found that while RA techniques like spinal anesthesia are commonly practiced, the use of peripheral nerve blocks remains limited due to the lack of specialized equipment. The study recommended that efforts to improve the RA infrastructure in Ethiopian hospitals should focus on securing funding for the procurement and maintenance of equipment (20).

Several initiatives have aimed to address these challenges by partnering with international organizations to supply necessary RA equipment. For example, the African Regional Anesthesia Initiative (ARAI) has been instrumental in distributing ultrasound machines and nerve simulator to teaching hospitals in Ethiopia, enabling the expansion of ultrasound-guided regional anesthesia. These efforts have been complemented by local government and NGO support to ensure that equipment is not only available but also maintained and operational (21).

2.4.4. Establishing Sustainable Training Programs

The foundation of long-term RA practice improvement in Ethiopia is the implementation of sustainable, locally led training programs, which guarantee that advancement is independent of

ongoing outside assistance. The long-term partnership between Addis Ababa University and Haukeland University Hospital in Norway, which was established in 2011, is a prime example of this. With a focus on practical RA skills, this initiative created a strong postgraduate anesthesia-training program that has successfully trained more than 150 anesthesia residents. The program's ultimate success is determined by how it evolved from a project funded by donors to a self-sufficient workforce of Ethiopian anesthetists who can now train new cohorts on their own and spear head the national advancement of RA (22). The following precise, quantifiable indicators can be used to monitor the program's sustainability:

Number of Certified Local Trainers: The program specifically seeks to graduate educators as well as clinicians. The percentage of graduates who earn a "train-the-trainer" certification and are actively engaged in teaching is a crucial indicator.

Annual Trainee Throughput: The program's ability to successfully enroll and train a steady or growing number of new residents each year without sacrificing quality is a measure of its capacity.

Graduate Retention in Ethiopia: The proportion of graduates who stay in the Ethiopian healthcare system for at least five years after graduation, thereby preventing brain drain, is arguably the most important indicator.

The structured mentor-peer education system is a fundamental element of this sustainability. The goal of this system is to establish a nurturing, self-sustaining learning environment:

Mentor Selection: Based on their clinical experience and teaching prowess, senior consultants and recent top graduates are formally identified and chosen as mentors.

Peer-Led Sessions: Weekly supervised practice sessions utilizing simulation models are planned for junior and senior residents. This teaches newcomers the basics while reinforcing skills for senior residents.

Channels for Ongoing Support: To provide real-time case discussion and guidance, mentors are available through specialized mobile messaging groups (like Telegram or WhatsApp), establishing an ongoing support system that reaches out to rural practitioners reported longitudinal outcomes that show the program's significant impact:

Exam Pass Rates for Residents: The program consistently maintains a high first-time pass rate (>90%) on qualifying national and international exams, demonstrating the caliber of its instruction.

Employment Placements: The Ethiopian public health system employs all graduates, mostly in regional referral centers and tertiary teaching hospitals.

Geographic Deployment: About 30% of graduates are purposefully placed to oversee anesthesia services in underprivileged regional hospitals, increasing access to RA care for all.

A formal system for iterative updates is necessary to guarantee that the program stays at the forefront of anesthesia care. This comprises:

Periodic Curriculum Reviews: To make sure the curriculum is in line with both national requirements and international best practices, a committee of local faculty members reviews it once a year.

Integration of Emerging Techniques: New evidence-based RA techniques, like focused cardiac ultrasound for perioperative care or erector spinae plane blocks, are dynamically added to the curriculum.

Systematic Incorporation of Feedback: Following each rotation, mentors and trainees provide formal, anonymous feedback. The program's delivery and content are specifically improved using this input, which is methodically examined.

2.5. Factors influencing the utilization of regional anesthesia

A complex web of interrelated factors that can be broadly divided into system-level, provider-level, and patient-level determinants affects the use of regional anesthesia (RA). The adoption of RA is frequently fueled by technological advancements and an emphasis on improved recovery protocols in high-income nations. However, the factors are often rooted in basic resource limitations and training gaps in low- and middle-income countries (LMICs) like Ethiopia.

System-Level Factors: These are the most frequently cited barriers in LMIC settings. A critical factor is the lack of essential equipment. Studies consistently show that the absence of ultrasound machines and nerve stimulators severely limits the practice of peripheral nerve blocks, confining RA primarily to basic neuraxial techniques [17, 13]. Compounding this is the unreliable supply of local anesthetics reported that 89.6% of operating rooms in their study faced a total absence of essential local anesthetics, making consistent RA practice impossible regardless of clinician skill or intention. Furthermore, institutional culture and workflow pressures play a significant role; high

patient volumes and a preference for faster induction with general anesthesia in emergency settings create an environment that disincentivizes the use of RA (23,24).

Provider-Level Factors: These factors relate to the attitudes, abilities, and knowledge of anesthesia providers. One of the biggest challenges is a lack of real-world, experiential training. Low confidence and perceived competence result from a lack of exposure to supervised RA procedures, according to many practitioners, including residents. This is strongly related to attitudes and perceived self-efficacy; providers may be discouraged from trying RA techniques due to a lack of confidence in managing block failures or local anesthetic systemic toxicity (LAST) or fear of complications. Another important factor that affects trainees' willingness to practice and improve their skills is the degree of supervision and mentorship they have access to (22).

Interventions in Education and Training as Facilitators: On the other hand, structured education has been recognized as a crucial enabler. Ethiopian anesthesia providers' knowledge scores and practical skills have been demonstrated to be considerably enhanced by the use of competency-based curricula and simulation-based training, including cutting-edge techniques like tele-simulation. By fostering self-assurance and standardized skills, these interventions directly address provider-level factors. One strategic element to boost RA utilization, especially in rural areas, has been suggested to be strengthening the role of non-physician anesthesia providers (NPAPs) through focused training and transparent credentialing pathways (25).

2.6. Conceptual Framework

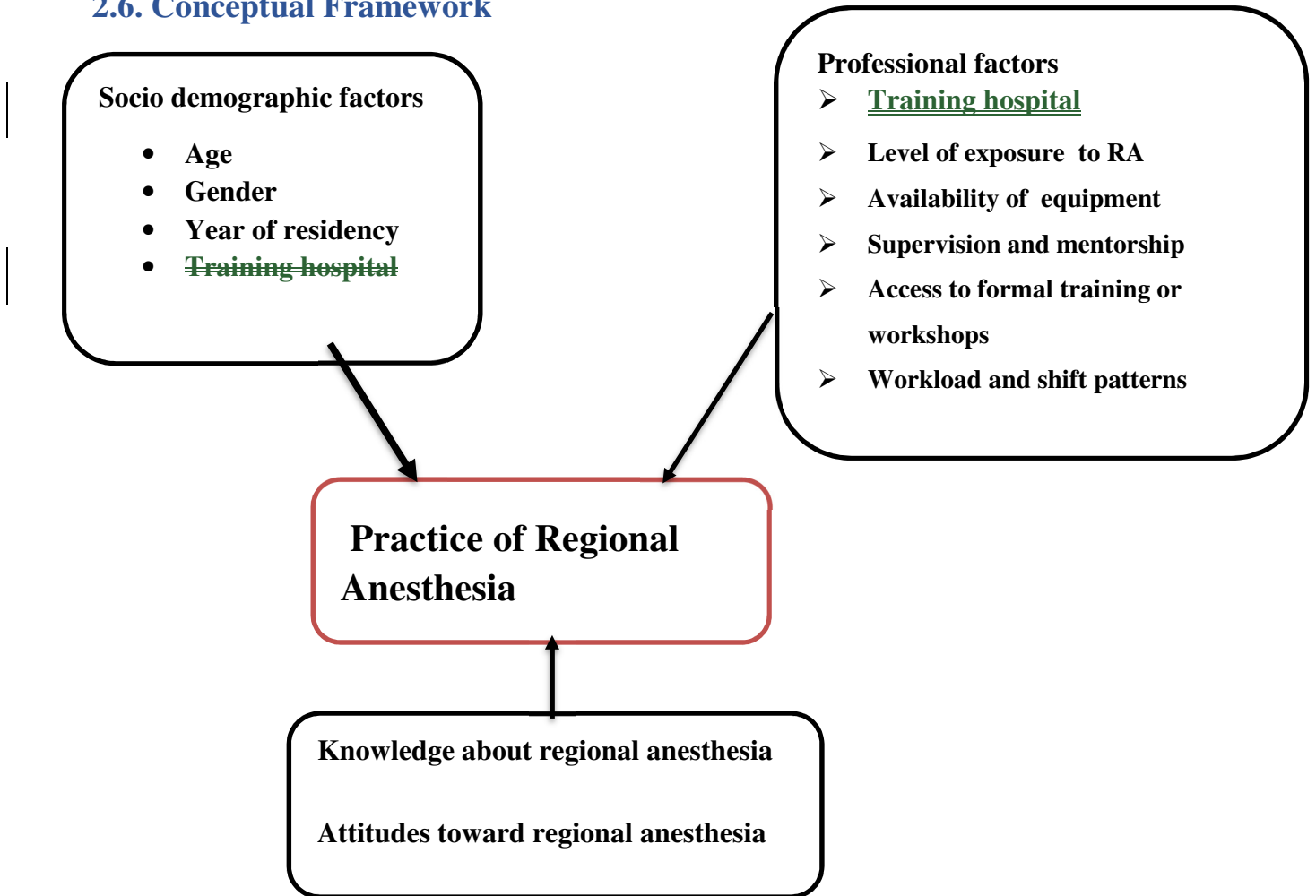


Figure 1. Conceptual framework of the study derived from literature review [5, 9, 12, 14]

3. Objective

3.1. General objective

The general objective of this study was to assess the level of knowledge, attitude, and practice of regional anesthesia among anesthesiology residents in government teaching referral hospitals in Addis Ababa, Ethiopia.

3.2. Specific objectives

- To determine the level of knowledge of regional anesthesia among anesthesiology residents
- To describe the level of attitude of regional anesthesia among anesthesiology residents
- To assess the level of practice of regional anesthesia among anesthesiology residents

4. Methods and materials

4.1. Study setting

The study was conducted in Addis Ababa, Ethiopia, which hosts the highest concentration of healthcare facilities in the country. The city has a total of 52 general hospitals, comprising 12 government hospitals and 40 private hospitals.

The study was carried out in three government teaching referral hospitals: Tikur Anbessa Specialized Hospital (TASH) – the largest referral and teaching hospital in the country, affiliated with Addis Ababa University; St. Paul's Hospital Millennium Medical College (SPHMMC) – a major teaching hospital providing multiple specialized medical service and training center for different health professionals. Yekatit 12 Hospital Medical College – a government teaching hospital actively involved in postgraduate medical education including Anesthesiology specialty.

These hospitals were selected because they are the only government teaching hospitals with anesthesiology residents central to postgraduate clinical training and offer relatively advanced surgical and anesthetic services. Anesthesiology residents in these settings are exposed to both general and regional anesthesia across a wide variety of surgical procedures. The practice environment is characterized by high patient volumes, diverse case complexity, and supervised training under faculty and senior anesthesiologists. As such, the study setting provides a representative overview of regional anesthesia practice patterns and influencing factors within teaching-focused, high-volume, and resource-variable healthcare environments in Ethiopia

4.2. Study period

The study was conducted from October 2025 to January 2026 over a total period of four months. This time frame ensured sufficient time for data collection, including participant follow-up, questionnaire distribution and retrieval, and response verification. The timeline was aligned with the academic calendar of anesthesiology residency programs and minimized interference with regular clinical and academic activities.

4.3. Study design

Institutional based cross-sectional study was conducted to achieve the aim of the study.

4.4. Population

The study population consisted of all anesthesiology residents in government teaching referral hospitals in Addis Ababa, Ethiopia

4.5. Sample size determination and technique

A census approach was used, involving all 130 anesthesiology residents, due to the manageable and relatively small population size. This ensured full representation of the target group and eliminated the need for sampling. Using a census approach improved the accuracy and generalization of the findings within this population. Accordingly, the final sample size was 130, equal to the total number of anesthesiology residents in the selected hospitals.

4.6. Study variables

Dependent Variable

Practice of Regional Anesthesia (good or practice)

Independent Variables

Socio-demographic Factors

- Age
- Sex
- Year of residency
- Training institution

Professional Factors

- Level of exposure to regional anesthesia procedures
- Availability of necessary equipment (e.g., ultrasound machines, nerve stimulators, RA kits)
- Supervision and mentorship
- Access to formal training or workshops
- Workload and shift patterns

Individual Factors

- Attitudes toward regional anesthesia
- Fear of complications or failure

4.7. Data collection instruments and technique

For data collection self-administered questionnaire that was created on Google form were used. The tool includes socio-demographics, knowledge, attitude, and practices to RA.

4.8. Operational definitions

Good knowledge about RA: Participants scored above the mean knowledge score.

Poor knowledge about RA: Participants scored below the mean knowledge score.

Good attitude towards: Participants scored above the mean attitude score determined using likert scale

Poor attitude towards RA: Participants scored below the mean attitude score.

Good practice of RA: Participants scored above the mean practice score.

Poor practice of RA: Participants scored below the mean practice score (26).

4.9. Data management and analysis

Data were coded, entered, and analyzed using SPSS version 27. Descriptive statistics such as mean standard deviation, frequency, percent, were computed to examine the univariate distribution and describe the results.

4.10. Data quality assurance

To ensure the highest standards of research quality, several rigorous measures were implemented to maintain the validity and reliability of the study. Content validity was established through an expert review process, while the clarity and feasibility of the instrument were further refined via pilot testing conducted on 5–10% of the sample. The internal consistency of the quantitative tools was confirmed by a Cronbach's alpha coefficient of ≥ 0.7 , indicating strong reliability. Furthermore, data collectors underwent comprehensive training to minimize bias and ensure standardized administration.

4.11. Ethical considerations

Ethical clearance was obtained from the SPHMMC Institutional Review Board. Written informed consent was obtained from participants. Confidentiality, privacy, and voluntary participation were maintained.

5. Results

5.1. Socio-demographic characteristics

In this study, 130 anesthesiology residents participated. Most were males (70.8%). The majority of study participants were aged 36-45 years (70%). Additionally, 47.6% of the participants were from SPHMMC, followed by Tikur Anbesa Hospital (33.8%). By residency year, 35.4% were first-year residents, and third-year residents accounted for 37.7% (**Table 1**).

Table 1. Socio-demographic, study place, and year of the anesthesiology residents in Addis Ababa, 2026

Variable	Category	Frequency	Percent
Sex	Male	92	70.8%
	Female	38	29.2%
Age (years)	20–24	5	3.8%
	25–35	34	26.2%
	36–45	91	70.0%
College/hospital	SPHMMC	62	47.7
	TASH	44	33.8
	Yekatit 12 hospital	24	18.5
Year of residency	R1	46	35.4
	R2	35	26.9
	R3	49	37.7

5.2. Knowledge about regional anesthesia

The result on self-rated and perceived level of knowledge about regional anesthesia showed that majority of the residents had moderate knowledge (58.5%) followed by very good knowledge (33.8%). Only 0.8% of the residents had very poor knowledge to regional anesthesia (**Figure 2**).

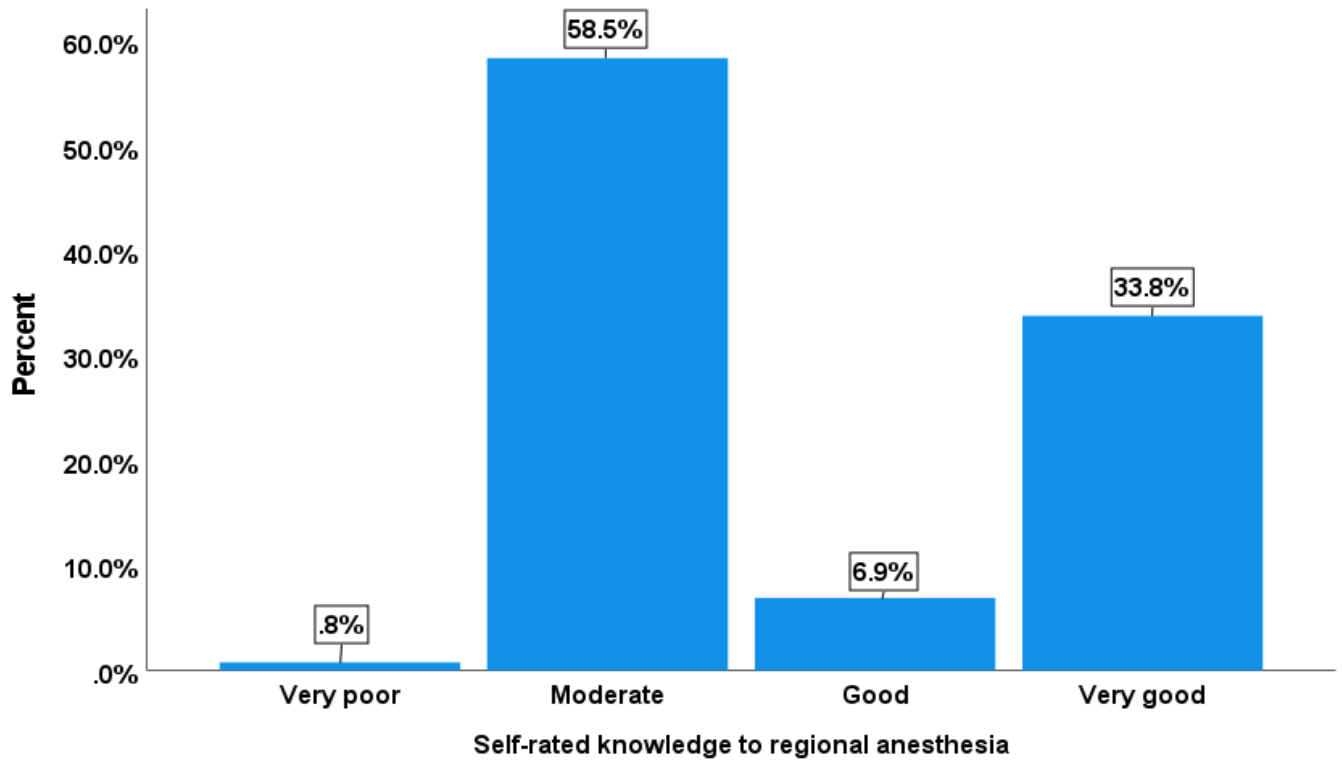


Figure 2. Level of knowledge to regional anesthesia among anesthesiology residents in Addis Ababa, 2026

Additional questions assessing the knowledge about regional anesthesia indicated that all of the residents were familiar to spinal anesthesia and residency training program is the major source of their knowledge (96.2%). Moreover, only 10.8% of the participants identified regional anesthesia is not safe, 96.2% knows RA is cost effective, 15.4% were not knowledgeable to relevant nerves, and 90% had responded RA is safe for children (**Table 2**).

Table 2. Knowledge to regional anesthesia among anesthesiology residents in Addis Ababa, 2026

Variable	Category/responses	Frequency	Percent
Regional Anesthesia provides adequate analgesia	True	125	96.2
	False	5	3.8
Regional anesthesia as sole anesthesia type if indicated	True	127	97.7
	False	3	2.3
Regional anesthesia is safe to patients	True	116	89.2
	False	14	10.8
Regional anesthesia minimize patients cost	True	125	96.2
	False	1	0.8
	Not sure	4	3.1
Knowledge to relevant anatomy of nerves	Yes	110	84.6
	No	20	15.4
Regional anesthesia is safe in children	True	117	90.0
	False	13	10.0

5.2. Training and exposure to regional anesthesia

The result on training and exposure to RA revealed that 51.5% of residents did not receive lecture on RA during residency, and 76.9% did not receive hands-on training. Moreover, 53.8% of residents performed more than 20 procedures using RA (**Table 3**).

Table 3. Training and exposure to RA among anesthesiology residents in Addis Ababa, 2026

Variable	Category/responses	Frequency	Percent
Lecture on RA during residency	Yes	63	48.5
	No	67	51.5
Hands on training or workshop on RA	Yes	30	23.1
	No	100	76.9
Number of RA procedures performed	1–10	25	19.2
	11–20	20	15.4
	More than 20	70	53.8
	None	15	11.5
Familiarized RA anesthesia technique	Spinal anesthesia	21	16.2
	Ultrasound-guided blocks	20	15.4
	Spinal anesthesia, Epidural anesthesia, Peripheral	85	65.4
	Epidural anesthesia	2	1.5
	Peripheral nerve blocks (single injection)	1	0.8
	Continuous nerve block/catheter techniques	1	0.8

5.3. Attitude of residents towards the use of regional anesthesia

The result on the overall self-rated attitude towards regional anesthesia indicates that majority of the residents had very good attitude (51.5%) followed by good attitude (26.9%) and only 2% had poor attitude to RA (**Figure 3**).

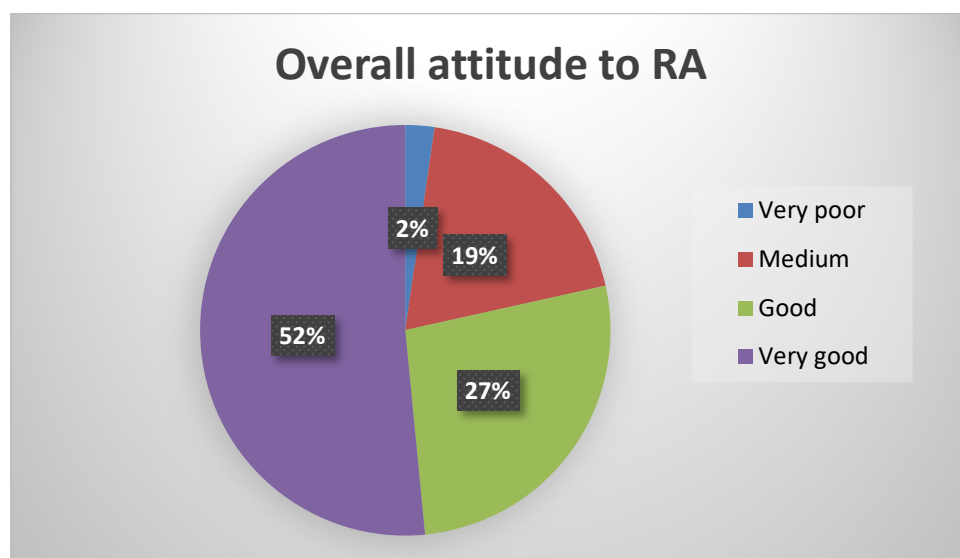


Figure 3. Self-rated overall attitude to RA among residents in Addis Ababa, 2026

Furthermore, additional items on attitude indicated that 86.9% of residents strongly agreed on expanding RA in Ethiopia, majority of the residents believed that patients prefer RA over GA (42.3%) (**Table 4**).

Table 4. Attitude of anesthesiology residents to regional anesthesia in Addis Ababa, 2026

Variable	Category/responses	Frequency	Percent
Belief on expanding RA in Ethiopia	Strongly agree	113	86.9
	Agree	9	6.9
	Neutral	4	3.1
	Disagree	4	3.1
Preference of patients GA over RA	Yes	55	42.3
	No	29	22.3
	Not sure	46	35.4
Belief on RA is safer than GA	Yes	128	98.5
	No	2	1.5
RA cost effective than GA	Yes	128	98.5
	No	2	1.5
Perform RA for children if indicated	Yes	114	87.7
	No	16	12.3
RA satisfies patients	Yes	126	96.9
	No	4	3.1
	Yes	129	99.2

Preference of RA if indicated and material available	No	1	0.8
---	----	---	-----

5.4. Practice of regional anesthesia among resident physicians

The results of a study on anesthesiology residents' practice of regional anesthesia revealed that 94.6% had practiced regional anesthesia, while only 5.4% had not. Notably, 57.6% demonstrated good practice, whereas 42.4% reported poor practice. Additionally, 65.4% of residents performed procedures using regional anesthesia (**Figure 4**).

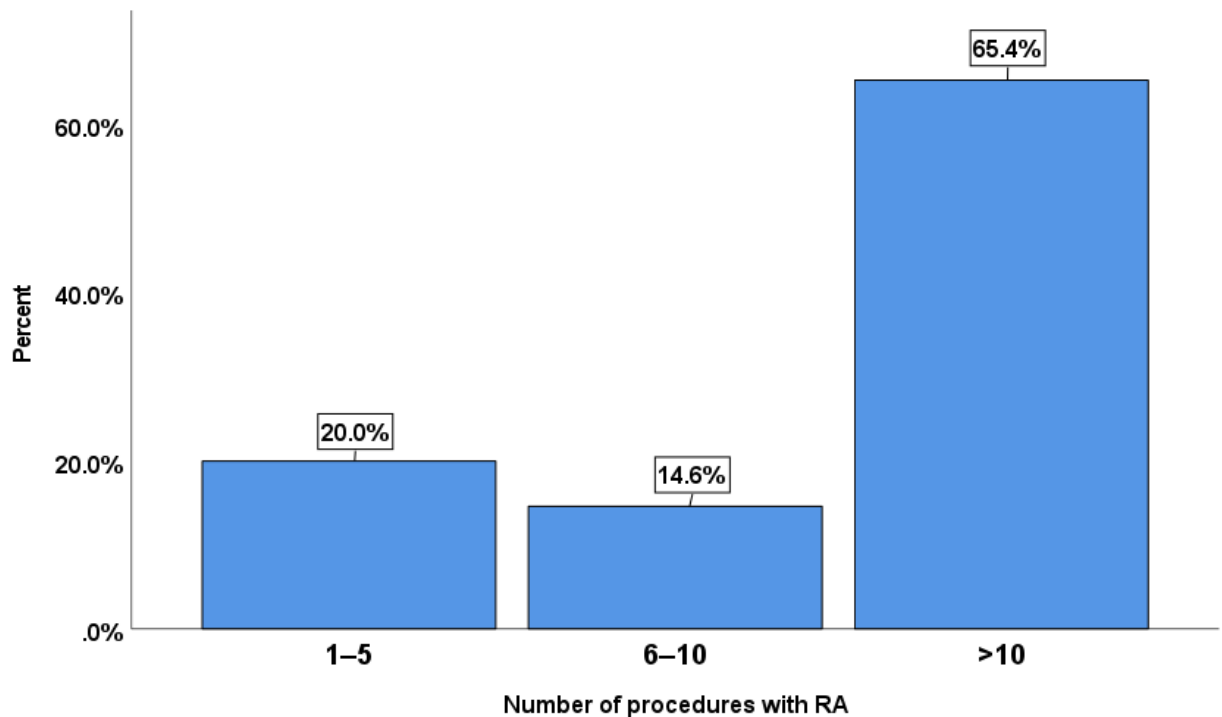


Figure 4. Number of procedures performed using regional anesthesia

Moreover, majority of the residents perform RA daily (88.5%), and the type of RA performed was Spinal, Epidural, and Ultrasound-guided block (62.3%). Additionally, a substantial proportion of participants always use ultrasound guided nerve blocks (63.1%) and confident in performing RA independently (53.8%), and only “sometimes” perform under senior supervision (70.8%) (**Table 5**).

Table 5. Regional anesthesia practice among anesthesiology residents in Addis Ababa, 2026

Variable	Category/responses	Frequency	Percent
Frequency of performing RA	Daily	115	88.5
	Monthly	14	10.8
	Weekly	1	0.8
Type of RA performed	Spinal, Epidural, Ultrasound-guided block	81	62.3
	Spinal	44	33.8
	Spinal and Epidural	4	3.1
	Spinal, Epidural, Land mark Peripheral nerve block	1	0.8
Routine use of ultrasound guidance for nerve blocks	Always	82	63.1
	Sometimes	33	25.4
	Never	10	7.7
	Rarely	5	3.8
Access to ultrasound	Yes	34	26.2
	No	96	73.8
Availability of senior supervisor while performing RA	Always	33	25.4
	Sometimes	92	70.8
	Rarely	5	3.8
Perceived barriers of practicing RA	Lack of equipment, limited patient acceptance, time constraints	118	90.8
	Lack of equipment	10	7.7
	Lack of supervision	2	1.5
Motivation to learn and practice RA	Very motivated	119	91.5
	Moderately motivated	11	8.5
Residency curriculum promotes exposure to RA	Yes	64	49.2
	No	33	25.4
	Not sure	33	25.4

6. Discussion

Studies that compared with general anesthesia, regional anesthesia is associated with better pain control, fewer side effects, and improved patient satisfaction. However, the knowledge, attitude and practice of anesthesiologists towards regional anesthesia in teaching hospitals of Ethiopia was not explored. This study aims to investigate the knowledge, attitude, and practice of RA among anesthesiology residents in three teaching hospitals in Addis Ababa. The result revealed that majority had moderate knowledge, very good attitude, and good practice of RA. The findings reveal important insights into the current state of RA education and practice among residents, highlighting strengths and areas for improvement.

The self-rated knowledge levels of the residents indicate that the majority have moderate knowledge (58.5%), followed by very good knowledge (33.8%). This finding suggests that while most residents feel confident in their knowledge of RA, there remains room for improvement, particularly in transitioning more residents from moderate to very good levels of knowledge. Encouragingly, only 0.8% of residents reported having very poor knowledge, indicating that nearly all residents have at least a foundational understanding of RA. Consistently, a study done in China on Knowledge, attitudes, and practices of anesthesiologists showed that Anesthesiologists demonstrated insufficient knowledge, positive attitude, and inactive practice towards ERAS and day surgery anesthesia management. This study also recommended that efforts be made to enhance anesthesiologists' knowledge and foster proactive practice in the domains of ERAS and day surgery anesthesia management (26).

The study further showed that all residents were familiar with spinal anesthesia, which is a positive reflection of the residency training program. The training program itself was identified as the primary source of knowledge for 96.2% of participants, emphasizing the critical role of structured residency programs in fostering RA knowledge. However, gaps in specific areas of knowledge were noted. For example, only 10.8% of residents identified regional anesthesia as unsafe, which may reflect a lack of awareness of potential complications and contraindications. Additionally, while 96.2% acknowledged that RA is cost-effective and 90% recognized that RA is safe for children, 15.4% of residents were not knowledgeable about the relevant nerves for RA procedures. This gap in anatomical knowledge could hinder the residents' ability to perform RA effectively and safely.

The results highlight significant deficiencies in RA training during residency. More than half of the residents (51.5%) reported not receiving lectures on RA, and an even higher proportion (76.9%) did not receive hands-on training. Despite these shortcomings, 53.8% of residents had performed more than 20

RA procedures. This discrepancy suggests that many residents are gaining practical exposure independently or through informal ways rather than structured training. The lack of formal hands-on training is concerning, as it is a crucial component of mastering RA techniques. The findings underscore the need to prioritize formalized didactic and practical training in RA within residency programs to ensure residents are adequately prepared. In line with our result, a study in Turkey revealed that 76% reported that they had not attended any lectures or seminars on regional block use in ophthalmic surgery concluding that the lack of theoretical and practical knowledge about ophthalmic nerve blocks is striking even among the group of physicians who practice regional anesthesia (21).

The majority of residents demonstrated a positive attitude towards RA, with 51.5% reporting a very good attitude and 26.9% reporting a good attitude. This positive perception is encouraging and indicates that residents recognize the value and importance of RA in anesthesiology practice. However, the small proportion of residents (2%) with a poor attitude highlights the need to address potential negative perceptions, which could stem from a lack of confidence or inadequate training. Fostering a positive attitude is critical, as it directly influences motivation to practice and improve RA skills.

In terms of practice, the results show that 57.6% of residents had good practice of RA, with 42.4% had poor practice of RA. The level of engagement in RA practice is promising and demonstrates that most residents have had the opportunity to translate their knowledge into clinical application. However, the fact that 42.4% of residents have not practiced RA and that a significant portion lacks hands-on training indicates barriers to ensuring all residents achieve adequate competency. Structured mentorship and supervised clinical opportunities could help bridge this gap and ensure that all residents gain sufficient practical experience. Our study is consistent with a cross-sectional study on regional anesthesia practice in public hospitals in Botswana that showed that all hospitals perform spinal anesthesia; however, other regional techniques were performed by a small number of participants in one referral hospital. Most hospitals had adequate regional anesthesia drugs and sedation medications, however, most hospitals (except one referral hospital) lacked ultrasound machine and the regional anesthesia kit. Similar to our study, the common challenges reported were lack of knowledge and skills, lack of equipment and supplies, and lack of hospital engagement and support. The solutions proposed includes regional anesthesia training and engaging the hospital management to get resources (24). This result highlighted that limited practice of regional anesthesia is observed in other African countries that needs continental intervention.

Consistently, a survey of exposure to regional anesthesia techniques in American anesthesia residency training programs showed that at all training levels, the number of blocks performed varied widely according to type of block, with spinal and epidural blocks being performed most often at all training levels. Confidence was high with frequently performed blocks (spinal and lumbar epidural) and low for those performed less than 10 times per resident. This study also highlighted that most third year residents are confident in performing lumbar epidural and spinal anesthesia. However, many are not confident in performing the blocks with which they have the least exposure (27).

6.1. Implications of the study finding

The result has clinical implication that residency programs should consider incorporating more comprehensive didactic and hands-on training modules focused on RA. Emphasis should be placed on anatomical knowledge, potential complications, and indications for RA to enhance both confidence and competence. Additionally, mentorship and supervision during RA procedures could help residents refine their skills and improve outcomes.

At policy level, ministry of health should make essential equipment and simulation machines available for training and practice.

6.2. Strength and limitation of the study

The strengths of the study lies on addressing a critical area of anesthesiology training, providing valuable insights into the KAP of residents regarding regional anesthesia. Additionally, the topic is highly relevant to clinical practice that directly impact the quality of patient care and the efficiency of resource utilization in healthcare settings. Importantly, being a multi-center study increases the generalizability of the findings to other settings with similar training environments.

However, the study is limited by the reliance on self-reported knowledge, attitude, and practice may be subject to bias, as residents might overestimate or underestimate their abilities. Also, the study focuses only on government teaching referral hospitals in Addis Ababa, which may not reflect the situation in private hospitals. Being a descriptive cross-sectional study, captures data at a single point in time, limiting the ability to assess trends or cause-effect relationships. The study did not explore deeply into the factors associated with gaps in training and practice using advanced statistical analysis technique.

7. Conclusion and recommendation

7.1. Conclusion

Overall, while the majority of anesthesiology residents in Addis Ababa's government teaching referral hospitals exhibit moderate to very good knowledge, positive attitudes, and engagement in RA practice, there are notable gaps in specific knowledge and practice areas. Addressing these gaps through enhanced training programs and mentorship is essential to ensure residents are well-prepared to provide safe and effective RA in their future practice.

7.2. Recommendations

To teaching hospitals

- Incorporate structured and comprehensive lectures on RA into the residency curriculum to ensure all residents receive foundational knowledge.
- Establish formal hands-on training programs, including simulation-based learning and supervised practice in real clinical settings, to improve residents' practical skills.
- Assign experienced anesthesiologists as mentors to provide guidance and supervision during RA procedures, ensuring safe and effective practice while building resident confidence.

To the Ministry of Health

- Ensure all referral hospitals are equipped with modern tools and facilities needed for RA practice.
- Advocate for the increased use of regional anesthesia in clinical practice by organizing workshops, and seminars
- Develop and disseminate national guidelines for RA training and practice to standardize procedures across hospitals and ensure consistency in resident education.

To the Ministry of Education

- Ensure the national anesthesiology residency curriculum includes mandatory and standardized modules on regional anesthesia.
- Include competency-based assessments to evaluate residents' knowledge, skills, and attitudes toward RA.

- Support simulation-based training to allow residents to practice RA safely in a controlled environment before performing procedures on patients.

To future researchers

- Conduct future large-scale, nationwide, analytical study to identify the determinants of poor practice of RA and produce generalizable findings.
- Interventional study assessing the effect of training on practice and patients outcomes are recommended.

8. References

1. Meara JG, Leather AJM, Hagander L, Alkire BC, Alonso N, Ameh EA, et al. Global Surgery 2030: Evidence and solutions for achieving health, welfare, and economic development. *Lancet*. 2015;386(9993):569–624.
2. Muluadam Admassie B, Adie Admass B, Yaregal Melesse D. Practice and Challenges Related to Regional Anesthesia in Amhara Regional Hospitals, Northwest Ethiopia: A Web-based Survey Study. *Anesthesiology*. 2025;142(2):415–7.
3. Skowrońska D, Garczyk A, Kluzik A, Grześkowiak M. What Do Patients Know About Anesthesia and Anesthesiologists? *J Clin Med*. 2025;14(23):1–14.
4. Gupta S, Grewal A, Jain K. Obstetric anaesthesiology: manpower and service provision issues in India. *Int J Obstet Anesth* [Internet]. 2024 Feb 1 [cited 2026 Mar 21];57:103928. Available from:
<https://www.sciencedirect.com/science/article/abs/pii/S0959289X23002820>
5. Yang Y, Leng Y, Wu W. Optimizing anesthesiology education for international students in China: challenges and innovative teaching strategies. *Front Educ*. 2025;10(July):1–13.
6. Spence J, Smith D, Wong A. Stress and burnout in anesthesia residency: a case study of peer support groups. *Qual Res Med Healthc* [Internet]. 2018;2(2):7417. Available from:
<http://dx.doi.org/10.4081/qrmh.2018.7417>
7. Keyvanlo Z, Kokabisaghi F, Yousefi M, Sedaghat A, Ebrahimipour H. Factors influencing the availability of anesthesiologists: a scoping review. *Hum Resour Health*. 2025;23(1).
8. Ravindranath S, Ranganath YS, Backfish-White K, Wolfe J, Adhikary S. The Role of Regional Anaesthesia and Acute Pain Services in Value-Based Healthcare. *Turkish J Anaesthesiol Reanim*. 2023;51(6):450–8.
9. Gohad R, Jain S. Regional Anaesthesia, Contemporary Techniques, and Associated Advancements: A Narrative Review. *Cureus*. 2024;16(7).
10. Mekonnen MT, Mustofa SY, Berhe YW, Arefayne NR, Tegegne BA. Intraoperative pediatrics hypothermia and its factors during general anesthesia at comprehensive specialized hospitals, Northwest Ethiopia: Multicenter follow up. *journals.plos.org* [Internet]. 2025 May 1 [cited 2026 Mar 21];20(5 May). Available from:
<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0320950>
11. Belay DM, Erku D, Bayih WA, Kassie YT, Minuye Birhane B, Assefa Y. The State of

- Radiology Research in Ethiopia: A Scoping Review. [pmc.ncbi.nlm.nih.gov](https://pubmed.ncbi.nlm.nih.gov/35811674/) [Internet]. 2024 [cited 2026 Mar 21];11. Available from: <https://pubmed.ncbi.nlm.nih.gov/articles/PMC11674753/>
12. Admassie BM, Admass BA, Yaregal Melesse D. Incidence and Associated Factors of Postoperative Undesirable Anesthetic Outcomes Among Surgical Patients at Referral Hospitals in Amhara Region, Ethiopia: A Multi-Center Study. *Patient Relat Outcome Meas.* 2023;Volume 14(May):137–52.
 13. Worku Zerssa G. management practices towards climate-smart agriculture: mitigation, adaptation and sustainable yield intensification in a Nitisol in Southwestern Ethiopia. 2022 [cited 2026 Mar 21]; Available from: https://rosdok.uni-rostock.de/file/rosdok_disshab_0000003002/rosdok_derivate_0000209020/Zerssa_Dissertation_2023.pdf
 14. D T, G A, W A. Availability of Essential Medicines in Ethiopia: A Systematic Review. *J Community Med Heal care.* 2021;6(1):1–7.
 15. Asemu YM, Yigzaw T, Ayalew F, Akalu L, Scheele F, van den Akker T. The Ethiopian Anesthetist Licensing Examination and Associated Improvement in in-School Student Performance: A Retrospective Study. *Adv Med Educ Pract.* 2023;14(July):741–51.
 16. Liu M, Salmon M, Zaidi R, Nagdev A, Debebe F, Muller MF, et al. Ultrasound-guided regional anesthesia: feasibility and effectiveness of teaching via telesimulation in Ethiopia. *Reg Anesth Pain Med* [Internet]. 2021 Aug 1 [cited 2026 Mar 21];46(8):722–6. Available from: <https://rapm.bmj.com/content/46/8/722>
 17. Chen XX, Trivedi V, Alsaflan AHA, Todd SC, Tricco AC, McCartney CJL, et al. Ultrasound-Guided Regional Anesthesia Simulation Training: A Systematic Review. *Reg Anesth Pain Med* [Internet]. 2017 Nov 1 [cited 2026 Mar 21];42(6):741–50. Available from: <https://rapm.bmj.com/content/42/6/741>
 18. Gamboa JE, Tamm-Daniels I, Flores R, Sarat Diaz NG, Villasenor MA, Gist MA, et al. Ultrasound-Guided Regional Anesthesia in a Resource-Limited Hospital: Prospective Pilot Study of a Hybrid Training Program. *JMIR Med Educ.* 2026;12:e84181.
 19. Matyal R, Mitchell JD, Mahmood F, Oren-Grinberg A, Leibowitz A, Amador Y, et al. Faculty-Focused Perioperative Ultrasound Training Program: A Single-Center Experience. *J Cardiothorac Vasc Anesth.* 2019 Apr 1;33(4):1037–43.

20. Satapathy AR, Khalid I Bin, Fathil SM. Simulation in Regional Anaesthesia: A Narrative Review of Its History, Evolution and Future Prospects. *J Clin Med*. 2025;14(1):1–14.
21. Gölboyu BE, Ciftci B. Evaluation of attitudes and knowledge of anesthesiologists about regional anesthesia methods in ophthalmic surgery: A national survey study. *Ann Clin Anal Med*. 2023;14(09):777–81.
22. Moll V, Schmidt PC, Amos C, Workneh RS, Tadesse M, Mulugeta E, et al. Building regional anesthesia capacity in limited-resource settings: A pilot study evaluating a 4-week curriculum. *Pain Manag* [Internet]. 2020 Jan 1 [cited 2026 Mar 21];11(1):29–37. Available from: <https://www.tandfonline.com/doi/abs/10.2217/pmt-2020-0044>
23. Habtu E, Nigatu M, Ayele Y, Tila M, Demissie WR. Practice of Regional Anesthesia and Its Associated Factors among Anesthesia Professionals Working in Teaching Referral Hospitals of Ethiopia; A Multi-center Study. *Open Pain J*. 2021;14(1):1–8.
24. Kassa M, Madzimbamuto F, Kediegite G, Tuyishime E. Regional anaesthesia practice in public hospitals in Botswana: A cross-sectional study. *PLoS One* [Internet]. 2023;18(12 December):1–9. Available from: <http://dx.doi.org/10.1371/journal.pone.0295932>
25. Etanaa NB, Benwu KM, Gebremedhin HG, Desta HB. The effect of simulation-based training in non-physician anesthetists in Tigray region, Ethiopia. *BMC Res Notes* [Internet]. 2020;13(1):1–5. Available from: <https://doi.org/10.1186/s13104-020-05041-1>
26. Jiang W, Han X, Wu P, Gu W. Knowledge, attitudes, and practices of anesthesiologists toward enhanced recovery after surgery and day surgery anesthesia management. *BMC Anesthesiol*. 2025;25(1).
27. Smith M, Sprung J, Zura A, ... EMRA and, 1999 undefined. A survey of exposure to regional anesthesia techniques in American anesthesia residency training programs. Elsevier [Internet]. [cited 2026 Mar 21]; Available from: <https://www.sciencedirect.com/science/article/pii/S1098733999901591>

Annexes

Annex I: Information Sheet

Introduction: This is an information sheet prepared to conduct a research on Practice of Regional Anesthesia and its Associated Factors among Anesthesiology Residents in Government Teaching Referral Hospitals of Addis Ababa in the Postgraduate Anesthesia program

Purpose of the study: The aim of this study is to assess on Practice of Regional Anesthesia and its Associated Factors among Anesthesiology Residents in Government Teaching Referral Hospitals of Addis Ababa in the Postgraduate Anesthesia program

Procedure: Formal letter will be obtained from research and ethic committee of St. Paul Hospital Millennium Medical College and concerned bodies to grant an official permission. Verbal informed consent will be obtained from each respondent just prior to the actual data collection.

Risk: the study will be carried out by asking your permission with already prepared and structured questionnaire. There will be no physical or psychological harm during the procedure. Besides, you have full right to stop any time you wish and you won't be obliged to give any information which you don't want to answer.

Benefits: for being involved in this study, there is no payment you will be granted with and no special privilege is also given to you. Perhaps, participating and giving information for the questions being asked plays a pivotal role in order to on Practice of Regional Anesthesia and its Associated Factors among Anesthesiology Residents in Government Teaching Referral Hospitals of Addis Ababa in the Postgraduate Anesthesia program

Confidentiality: any information you give will be kept confidential and won't be accessible to any third party. Any personal addresses won't be mentioned anywhere. The information you are going to give is used for only research purpose and will be burnt at the end.

The right not to participate: you have the right not to participate in the study, to stop at any time you want or not to give information for questions you don't want to answer. Finally, I duly acknowledge your participation and either response.

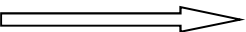
Person to contact: This research project will be reviewed and approved by the ethical review committee of St. Paul Hospital Millennium Medical College. If you have any question, or concern to ask please do not hesitate to contact the following person at any time you want.

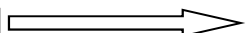
Principal investigator: Habtamu Shewalem, Tel- +251913605767

Annex II: Consent Form

Dear participant; I am I am collecting data for an investigator from St. Paul Hospital Millennium Medical College department of Anesthesiology and Critical Care Medicine, who is conducting a study on Practice of Regional Anesthesia and its Associated Factors among Anesthesiology Residents in Government Teaching Referral Hospitals of Addis Ababa in the Postgraduate Anesthesia program for partial fulfillment of speciality certificate in Anesthesiology and Critical Care, and Pain Medicine. You are selected randomly and your participation is very important in investigating prevalence of regional anesthesia . So here are some questions for you to answer which are important for the study. For your participation in this study, no payment will be granted or has no any special privilege given to you. Besides, you're not obligated to answer any question which you do not wish to answer. If you feel discomfort to respond any of the questions, please feel free to jump it any time you wish. Filling the questionnaire will take about 30 minutes. The information that you gave will be kept confidentially and won't be accessed to a third party; only be used for the research purpose and burnt at the end of the survey.

Are you volunteer to participate actively?

[No]  End

[Yes]  Continue

Annex-III: Questionnaire

Questionnaire: KAP of Regional Anesthesia and its Associated Factors among Anesthesiology Residents in Government Teaching Referral Hospitals of Addis Ababa in the Postgraduate Anesthesia program

Target Group: Anesthesiology Residents (Postgraduate Anesthesia Program)

Instructions to Respondents:

Please answer all questions honestly.

Your responses are anonymous and confidential.

Tick (✓) in the appropriate box or write in the space provided.

Section I: Sociology-Demographic Characteristics

No	Question	Response options	Skip patern	Remark
1.	How old are you	-----years		
2.	Sex	☐ Male ☐ Female		
3.	Year of residency	☐ R1 ☐ R2 ☐ R3		
4.	Hospital of Training:	☐ Black Lion Hospital ☐ St. Paul's Hospital ☐ Yekatit 12 hospital		

Section II: Knowledge Assessment

5.	Which of the following regional anesthesia techniques are you familiar with (Check all that apply)	☐ Spinal anesthesia ☐ Epidural anesthesia ☐ Peripheral nerve blocks ☐ Ultrasound-guided blocks		
----	--	---	--	--

6.	What is your primary source of knowledge about regional anesthesia	☐ Residency training ☐ Textbooks ☐ Workshops/CMEs ☐ Senior colleagues ☐ Online resources		
7.	Do you feel your theoretical knowledge of regional anesthesia is adequate	☐ Yes ☐ No ☐ Not sure		
8.	Ultrasound guidance improves the success rate and safety of nerve blocks.	☐ True ☐ False ☐ Not sure		
9.	Regional anesthesia reduces perioperative opioid use.	☐ True ☐ False ☐ Not sure		
10.	Regional Anesthesia provides adequate analgesia	☐ True ☐ False		
11.	RA can be used as sole anesthetic type if patient procedure indicated	☐ True ☐ False		
12.	Regional Anesthesia is safe to patients	☐ True ☐ False		
13.	Regional Anesthesia minimize patients cost	☐ True ☐ False ☐ Not sure		
14.	Do you know relevant anatomy of nerves	☐ Yes ☐ No		
15.	RA is safe in children	☐ True ☐ False		

16.	How would you rate your knowledge of RA in general	☐ Very poor ☐ Poor ☐ Medium ☐ Good ☐ Very good		

Section III: Training and Exposure

17.	Have you received formal lectures on regional anesthesia during your residency?	☐ Yes ☐ No		
18.	Have you had hands-on training or workshops on regional anesthesia techniques (e.g., nerve blocks, spinal, and epidural)?	☐ Yes ☐ No		
19.	Approximately how many regional anesthesia procedures have you performed independently?	☐ None ☐ 1–10 ☐ 11–20 ☐ More than 20		
20.	Which techniques are you most familiar with? (Select all that apply)	☐ Spinal anesthesia ☐ Epidural anesthesia ☐ Peripheral nerve blocks (single injection) ☐ Continuous nerve block/catheter techniques ☐ Ultrasound-guided blocks		

Section IV : Attitude about Regional Anesthesia

21.	Do you believe regional anesthesia should be more widely practiced in Ethiopia?	☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree		
22.	Do you think patients in your hospital prefer general anesthesia over regional anesthesia?	☐ Yes ☐ No ☐ Not sure		
23.	Do you believe RA provides adequate analgesia?	☐ Yes ☐ No		
24.	Do you think RA is important in the field of anesthesia?	☐ Yes ☐ No		
25.	Do you think RA is safer than GA?	☐ Yes ☐ No		
26.	Do you think RA is cost effective than GA?	☐ Yes ☐ No		
27.	Do you believe knowledge of relevant anatomy is important for performing RA?	☐ Yes ☐ No		
28.	Do you perform RA for children if indicated?	☐ Yes ☐ No		
29.	Do you think RA is good for patient satisfaction?	☐ Yes ☐ No		
30.	Do you prefer RA if patient indicated and all material available?	☐ Yes ☐ No		

31.	How would you rate your attitude towards RA in general?	☐ Very poor ☐ Poor ☐ Medium ☐ Good ☐ Very good		
-----	---	---	--	--

Section V: Practice of Regional Anesthesia

32.	Have you personally performed regional anesthesia procedures during your residency?	☐ Yes ☐ No		
33.	Approximate number of procedures you have performed independently:	☐ None ☐ 1–5 ☐ 6–10 ☐ >10		
34.	How often do you perform regional anesthesia in your current clinical practice?	☐ Daily ☐ Weekly ☐ Monthly ☐ Rarely/Never		
35.	Which types of regional anesthesia have you personally performed?	☐ Spinal ☐ Epidural ☐ land mark Peripheral nerve block ☐ Ultrasound-guided block		
36.	Do you routinely use ultrasound guidance for nerve blocks?	☐ Always ☐ Sometimes ☐ Rarely ☐ Never		
37.	Do you feel confident in performing regional anesthesia independently?	☐ Yes ☐ No ☐ Partially		

38.	Do you have adequate access to ultrasound machines and equipment for regional anesthesia?	☐ Yes ☐ No		
39.	Availability of senior supervision when performing regional anesthesia	☐ Always ☐ Sometimes ☐ Rarely ☐ Never		
40.	Perceived barriers to practicing regional anesthesia (check all that apply):	☐ Lack of equipment ☐ Lack of supervision ☐ Time constraints ☐ Limited patient acceptance ☐ Limited personal skill/confidence ☐ Other: _____		
41.	Motivation to learn and practice regional anesthesia:	☐ Very motivated ☐ Moderately motivated ☐ Not motivated		
42.	Do you think the residency curriculum provides sufficient exposure to regional anesthesia?	☐ Yes ☐ No ☐ Not sure		