

**A SURVEY OF ANAESTHESIOLOGISTS' PRACTICING IN KENYA ON  
KNOWLEDGE ATTITUDE AND PRACTICE TOWARDS THE USE OF  
PERIPHERAL NERVE BLOCKS.**

**A DISSERTATION SUBMITTED IN PART FULFILLMENT OF THE  
REQUIREMENT FOR A MASTERS DEGREE IN ANAESTHESIOLOGY OF THE  
UNIVERSITY OF NAIROBI**

**PRINCIPAL INVESTIGATOR**

**DR. STEPHEN MUCHIRI MWANGI (UoN, 2013)**

**POST GRADUATE STUDENT IN ANAESTHESIOLOGY**

**UNIVERSITY OF NAIROBI**

**SUPERVISOR**

**DR. MARK GACII, MBChB, M.MED ANAESTHESIOLOGY**

**LECTURER IN ANAESTHESIA, UNIVERSITY OF NAIROBI**

**DECLARATION**

I declare that this dissertation is my original work and has not been submitted for a degree award in any university.

Signature: .....

Date: .....

Dr. Stephen Muchiri Mwangi, MBChB (UoN)

H58/60922/2010

Post Graduate student in Anaesthesia

University of Nairobi

This dissertation has been submitted for the degree of Masters of Medicine in Anaesthesiology with my approval as a university supervisor.

Signature: .....

Date: .....

Dr. Mark Gacii, MBChB, M.MED Anaesthesia (UoN)

Lecturer, Anaesthesia Department of Surgery

University of Nairobi, Kenya.

## **DEDICATION**

This research is dedicated to the love of my life-Anne Murugi Nthiga for her support and understanding which was indispensable for the completion and success of this study.

## **ACKNOWLEDGEMENTS**

I sincerely thank and acknowledge the following:

- To my supervisor, Dr. Mark Gacii for his guidance, patience and supervision in writing of this dissertation.
- The lecturers Department of Anaesthesiology and my student colleagues for their overwhelming support and encouragement.
- Ms. Kellen Karimi, my statistician for her time and effort in data entry and analysis.
- The KNH-UoN Ethical Review Committee for reviewing and allowing this study to be conducted.
- All the anaesthesiologists who participated in this study for their time and response to the questionnaire.



## UNIVERSITY OF NAIROBI

### Declaration of Originality Form

**Name of Student:** Stephen Muchiri Mwangi

**Registration Number:** H58/60922/10

**College:** College of Health Sciences

**Faculty/School/Institute:** School of Medicine

**Department:** Surgery

**Course Name:** Anaesthesia

**Title of work:** A survey of anaesthesiologists' practicing in Kenya on knowledge attitude and practice towards the use of Peripheral Nerve Blocks

#### DECLARATION

1. I understand what Plagiarism is and I am aware of the University's policy in this regard
2. I declare that this \_\_\_\_\_ (Thesis, project, essay, assignment, paper, report, etc) is my original work and has not been submitted elsewhere for examination, award of a degree or publication. Where other people's work or my own work has been used, this has properly been acknowledged and referenced in accordance with the University of Nairobi's requirements.
3. I have not sought or used the services of any professional agencies to produce this work.
4. I have not allowed, and shall not allow anyone to copy my work with the intention of passing it off as his/her own work.
5. I understand that any false claim in respect of this work shall result in disciplinary action, in accordance with University Plagiarism Policy.

**Signature of student** \_\_\_\_\_

**Date** \_\_\_\_\_

**Signature of supervisor(s)** \_\_\_\_\_

**Date** \_\_\_\_\_

# TABLE OF CONTENTS

<b>DECLARATION</b> .....	<b>II</b>
DEDICATION .....	III
ACKNOWLEDGEMENTS .....	IV
TABLE OF CONTENTS .....	VI
<b>LIST OF TABLES</b> .....	<b>VII</b>
<b>LIST OF FIGURES</b> .....	<b>VIII</b>
<b>ABBREVIATIONS</b> .....	<b>IX</b>
<b>DEFINITION OF OPERATIONAL TERMS</b> .....	<b>X</b>
<b>ABSTRACT</b> .....	<b>XI</b>
<b>CHAPTER 1: INTRODUCTION</b> .....	<b>1</b>
1.1 BACKGROUND .....	1
1.2 PROBLEMS FACING THE USE OF PERIPHERAL NERVE BLOCKS .....	2
<b>CHAPTER 2 LITERATURE REVIEW</b> .....	<b>4</b>
2.1 OVERVIEW OF PERIPHERAL NERVE BLOCKS .....	4
2.2 KNOWLEDGE ATTITUDE AND PRACTICES.....	4
2.3 METHODS OF NERVE LOCALIZATION.....	6
2.4 ADVANTAGES OF PERIPHERAL NERVE BLOCK .....	9
2.5 COMPLICATIONS OF PNBS .....	11
2.6 JUSTIFICATION .....	15
2.7 RESEARCH QUESTION .....	16
2.9 BROAD OBJECTIVE .....	16
2.10 SPECIFIC OBJECTIVES .....	16
<b>CHAPTER 3: METHODOLOGY</b> .....	<b>17</b>
3.1 STUDY DESIGN .....	17
3.2 STUDY POPULATION .....	17
3.3 INCLUSION CRITERIA.....	17
3.4 EXCLUSION CRITERIA .....	17
3.5 SAMPLE SELECTION.....	17
3.6 DATA MANAGEMENT AND ANALYSIS.....	19
3.7 ETHICAL CONSIDERATIONS.....	19
3.9 STUDY LIMITATIONS .....	20
<b>CHAPTER 4: RESULTS</b> .....	<b>21</b>
4.1 SOCIO-DEMOGRAPHIC CHARACTERISTICS .....	21
4.2 ANAESTHESIA PRACTICE .....	24
4.3 ANAESTHESIA TRAINING .....	26
4.4 KNOWLEDGE .....	29
4.5 ATTITUDE .....	33
4.6 PRACTICE.....	34
4.7 CHI SQUARE TEST.....	40

<b>DISCUSSION .....</b>	<b>43</b>
<b>CONCLUSION .....</b>	<b>46</b>
<b>RECOMMENDATIONS .....</b>	<b>46</b>
<b>REFERENCES .....</b>	<b>47</b>
<b>APPENDIX 1: QUESTIONNAIRE .....</b>	<b>54</b>
<b>APPENDIX 2: CONSENT .....</b>	<b>59</b>
<b>CONSENT EXPLANATION.....</b>	<b>59</b>
<b>APPENDIX 3: KNH/UON ERC APPROVAL LETTER .....</b>	<b>62</b>

## **LIST OF TABLES**

<b>TABLE 1: ATTITUDES ON THE PERFORMANCE OF PERIPHERAL NERVE BLOCKS .....</b>	<b>33</b>
<b>TABLE 2: CROSS TABULATION BETWEEN IMPORTANCE OF PNB IN THE FIELD OF ANAESTHESIA AND THE NUMBER OF PNBs DONE IN A MONTH.....</b>	<b>40</b>
<b>TABLE 3: CROSS TABULATION BETWEEN RATING ON PNB AND NUMBER OF PNBs DONE IN A MONTH .....</b>	<b>40</b>
<b>TABLE 4: CROSS TABULATION BETWEEN REGULAR USE OF REGIONAL ANAESTHESIA AND THE NUMBER OF PNBs DONE.....</b>	<b>41</b>
<b>TABLE 5: CROSS TABULATION BETWEEN LEVEL OF TRAINING IN PNB AND USE OF REGIONAL ANAESTHESIA.....</b>	<b>41</b>
<b>TABLE 6: CROSS TABULATION BETWEEN YEARS POST ANAESTHESIA TRAINING AND THE NUMBER OF PNBs DONE IN A MONTH .....</b>	<b>42</b>

## LIST OF FIGURES

FIGURE 1: SEX OF THE RESPONDENTS.....	21
FIGURE 2: AGE OF THE RESPONDENTS.....	22
FIGURE 3: NUMBER OF YEARS POST ANAESTHESIA TRAINING .....	23
FIGURE 4: TEACHING HOSPITALS WHERE ANAESTHESIOLOGISTS' PRACTICED .....	24
FIGURE 5: NON- TEACHING HOSPITALS WHERE ANAESTHESIOLOGISTS' PRACTICED .....	25
FIGURE 6: WHERE KNOWLEDGE ON PERFORMING PNB WAS ACQUIRED .....	26
FIGURE 7: RATING THE TRAINING ON PERIPHERAL NERVE BLOCKS .....	27
FIGURE 8: REASONS FOR HAVING LESS THAN ADEQUATE TRAINING ON PNB .....	28
FIGURE 9: PERFORMANCE OF INTERSCALENE BLOCKS IS RECOMMENDED .....	29
FIGURE 10: NEGATIVE ASPIRATION TEST ABOLISH POSSIBILITY OF INTRAVASCULAR INJECTION.....	30
FIGURE 11: PNB CAN BE USED AS A SOLE METHOD OF ANAESTHESIA AND ANALGESIA.....	31
FIGURE 12: PNB HAVE INFERIOR PAIN CONTROL COMPARED TO GENERAL ANAESTHESIA.....	32
FIGURE 13: REGULAR USE OF ANAESTHESIA .....	34
FIGURE 14: TYPES OF REGIONAL ANAESTHESIA DONE .....	35
FIGURE 15: NUMBER OF PNBs DONE IN A MONTH .....	36
FIGURE 16: REASONS FOR NOT DOING PNB .....	37
FIGURE 17: PERIPHERAL NERVE BLOCK DONE .....	38
FIGURE 18: FUTURE OF PERIPHERAL NERVE BLOCKS.....	39



## **ABBREVIATIONS**

CNS	Central nervous system
CT	Computer tomography
CVS	Cardiovascular system
DA	Diploma in Anaesthesia
ERC	Ethics and research committee
ETT	Endotracheal tube
GA	General Anaesthesia
IV	Intravenous
KNH	Kenyatta National Hospital
LA	Local Anaesthetic
MD	Medical Doctor
MMed	Master of Medicine
PACU	Post anaesthesia care unit
PN	Peripheral nerve
PNB	Peripheral Nerve Block
PNS	Peripheral Nerve Stimulator
RA	Regional Anaesthesia
US	Ultra Sound

## **DEFINITION OF OPERATIONAL TERMS**

### **Anaesthesiologist**

Is a doctor (with a degree of Bachelor of Medicine and Bachelor of Surgery or its equivalent) who has specialized in the medical field of anaesthesia. This could be a master of medicine in anaesthesia, a post graduate diploma in anaesthesia or their equivalents.

### **Peripheral nerve blocks**

It is the injection of a local anaesthetic around a nerve or a group of nerves with blockade of nerve impulse conduction; causing temporary analgesia with loss of sensory and motor sensation (the patient is usually awake during surgery).

### **General Anaesthesia**

It is a state of reversible unconsciousness and insensibility. It is characterized by analgesia, amnesia and muscle relaxation.

### **Regional Anaesthesia**

It is a form of anaesthesia in which the patient is awake but the area of surgery is insensate.

### **Post Anaesthesia Care Unit (PACU)**

It is the area designed and staffed to monitor and care for patients who are recovering from the immediate effects of anaesthesia and surgery.

## **ABSTRACT**

**Introduction:** Peripheral nerve blocks are an alternative to general anaesthesia and neural axial blocks. Despite their benefits as compared to other forms of anaesthesia, they are infrequently used. This study's aim was to find out the reason as to why anaesthesiologists practicing in Kenya do not frequently practice this form of anaesthesia.

**Objective:** Was to determine knowledge, attitude and practice of anaesthesiologists practicing in Kenya toward peripheral nerve blocks.

**Research Methodology:** This was a cross-sectional descriptive study that was carried out over a period of three months following approval from the KNH/UON-ERC. It was conducted by way of a self administered questionnaire to anaesthesiologists practicing in Kenya. The questionnaire was pre-tested before conducting the study and was accompanied by a consent form that was signed by the participant. For anaesthesiologists outside Nairobi, the principal investigator made appointments and travelled to the different regions for purposes of data collection

**Setting:** The research was carried out in Kenya among anaesthesiologists registered with the Kenya Society of Anaesthesiologists and practicing in Kenya.

**Results:** The study revealed that 26.2% of the respondents considered their training in peripheral nerve blocks as poor. Of these 18.5% and 59.3% of respondents gave the reason as no exposure and inadequate exposure during masters of medicine training in anaesthesiology respectively. Twenty seven point seven percent (27.7%), reported that they did not do any peripheral nerve blocks at all, 43.1% performed 1-4 PNBs, 23.1% performed 5-10 and only 6.2% performed more than 10 PNBs in a month.

## ***Conclusion***

Majority of anaesthesiologists acquired their knowledge on peripheral nerve blocks from training workshops. Majority of anaesthesiologists perform peripheral nerve blocks but peripheral nerve blocks are still infrequently practiced since only 29.2% of anaesthesiologists did 5 or more blocks in a month.

## 1.1 Background

Most of the advancements in regional anaesthesia owe their roots to the development of local anaesthetics (LA) which has evolved a lot since its inception in the 16<sup>th</sup> century. The first local anaesthetic to be discovered was Cocaine. Its anaesthetic effects were first documented by a Spanish Jesuit Bernabe Cobo who in his 1653s Manuscript work on the new world mentions that toothaches can be alleviated by chewing coca leaves [1].

“And this happen'd to me once, that I repaired to a barber to have a tooth pull'd, that had work'd loose and ach'd, and the barber told me he would be sorry to pull it because it was sound and healthy; and a monk friend of mine who happen'd to be there and overhearing, advised me to chew for a few days on Coca. As I did, indeed, soon to find my toothache gone” [2].

The active ingredient from the coca leaf was extracted in 1860 by Albert Niemann who named it cocaine [3]. Its first use as local anaesthetic was by Viennese Ophthalmologist Carl Koller. He noticed it would numb the tongue when applied to the mouth and experimented on the corneas of frogs, rabbits and dogs. In September 11<sup>th</sup> 1884, he applied it to a patient as LA for glaucoma surgery [4]. His success was presented by a colleague Dr Josef Brettauer in the German Ophthalmology Society Congress in the same year. Following this development, the use of cocaine as a LA spread rapidly to other parts of the world [4].

Dr William Stewart Halsted and Richard John Hall on coming across Koller's work became interested in LA. In 1884, Halsted was occasionally performing operations in the bedroom of his own house in New York City, and it was there that the two surgeons began their work on regional anaesthesia (RA).

cocaine (15 mg) into the forearm and concluded that it blocked transmission in the cutaneous nerves because it provided analgesia below but not above the point of injection. He did this by surgically exposing the nerve roots and injecting each nerve directly. G. Hirschel in 1911 became the first to do a percutaneous brachial plexus block through the axillary approach [6]. As the popularity of cocaine grew, so did the frequency of its toxic effects [7]. Between 1884 and 1891, 200 cases of systemic intoxication and 13 of death due to cocaine were reported [2] prompting physicians to turn to gases like nitrous oxide and ether. These doubts caused a reduction in the use of cocaine and forced the pharmacological industry to develop alternative LA. In 1898, Alfred Eihorn synthesized nirvaquine [8] which turned out to be irritant to tissues and its use was immediately stopped. He later synthesized benzocaine in 1900 and procaine (novocaine) in 1905. In 1944, Nils Lofgren and Bengt Lundquist developed lidocaine [7] and it immediately gained popularity because of its potency, rapid onset and reduced incidents of allergic reactions.

## **1.2 Problems facing the use of peripheral nerve blocks**

- i. Delay in onset time. Once the block has been performed adequate time is required for the block to take effect. This can vary from 20 to 45 minutes depending on the type of block performed and LA used. This can lead to delays in between cases and impatience from the other theater staff.
- ii. Peripheral nerve blocks are technically demanding. Technique selection is of vital importance for the success of the block. The anaesthesiologist should know the relevant anatomy for the block chosen and be competent in performing it.

For example a successful regional block may fail to provide adequate operating conditions because the site and duration of surgery, the need for tourniquet application, or appropriate peri-operative sedation was not considered [9].

- iii. Multiple injections. Some anaesthesiologists are discouraged from the practice of PNBs by the fact that one may have to give more than one injection to achieve adequate operating conditions. This is especially so for peripheral nerve blocks (PNBs) of the lower limbs.
- iv. Equipment. The proper selection of equipment such as needles of the appropriate type and length and a properly functioning nerve stimulator is very important for successful block performance. These equipments are often expensive and may not be readily available at most centres.
- v. Lack of familiarity by the surgeon on the benefits of PNBs may lead to resistance and lack of cooperation from the surgeon.

## **2.1 Overview of Peripheral Nerve Blocks**

Peripheral nerve block is the injection of LA around a nerve or a group of nerves with blockade of nerve impulse conduction, causing temporary analgesia with loss of sensory and motor sensation. The aim of any PNB technique is to locate a nerve or nerves, and deposit LA around the nerve or nerves, in order to block nerve conduction. Peripheral nerve blocks can be used as the sole method of anaesthesia and analgesia during surgery, as a supplement to provide analgesia and muscle relaxation along with general anaesthesia (GA), as an initial step in providing prolonged post operative analgesia or in control of chronic pain. Regional anaesthesia has gained popularity over the last two decades due to development of new equipment for locating nerves, and an increase in evidence attesting to its efficacy, value and advantages [10].

## **2.2 Knowledge attitude and practices**

The success of PNB is undoubtedly more anaesthesiologist-dependent than is the case with neuraxial and GA. The main determining factor for success is the anaesthesiologist's technical skills and determination, which are required for successful practice of PNB [11].

Proper training is a pre-requisite for the successful and safe implementation of nerve blocks [12]. Indeed, many attribute the complications associated with use of RA to lack of appropriate training and exposure to the techniques during the residency program [13].

There is ample evidence that the current training in RA leaves residents unprepared to implement the full breadth of RA techniques and that some anaesthesiology residency programs are failing to teach RA [14]. This study showed that RA training varied substantially between residency trainings. They also found out that some residents were performing as few as one block per year.



another study 97.6% of anaesthesiologists in the United States of America used at least some RA techniques in their practice but only 50.8% of them rated their training in PNBs as adequate [16]. A structured regional anaesthesia rotation, a well defined training curriculum, a dedicated team of mentors with training in RA, and ample clinical volume are all pre-requisites for the adequate training of residents. The present training recommendations should be re-evaluated and restructured to define a core group of widely applicable and relatively simple nerve blocks that should be mastered by all postgraduates [12].

In a survey of exposure to RA techniques in American anaesthesia residency training programmes, it emerged that the medium level of confidence increased with level of training. That is clinical anaesthesia residents in their third year of residency were more confident than those in their first and second year of study. However, 51%, 62% and 75% of clinical anaesthesia residents in their third year of residency (final year) were not confident in performing interscalene, femoral and sciatic nerve block respectively. The study also showed that residents, who were more confident, consistently had more exposure.

This shows that residents who are nearing the end of their training lack the confidence needed for the techniques with which they had little exposure. In the study, lower confidence was associated with a greater desire for more teaching [17].

In another study approximately half (43.6%) of the respondents believed that the use of PNB in their practice would either increase or not change (50.4%) only a few thought that the use of PNBs would decrease in their practice (6.3%) [16].

procedures [18]. This is shown by a national survey on the practice of peripheral nerve blocks in the United States. The study found out that, 97.8% of anaesthesiologists perform at least some RA techniques. Of these, at least half (50.5%) performed less than five PNBs per month. This trend persisted even among anaesthesiologists who reported RA was a substantial part of their practice [16].

In this study, two upper extremity blocks (axillary and interscalene) and one lower extremity block (ankle) were far more commonly performed than other PNBs. Both PNBs and other RA techniques were used far less frequently in the outpatient than in the inpatient setting.

## **2.3 Methods of Nerve Localization**

### **2.3.1 Paraesthesia**

Paraesthesia is the elicitation of a sensory feeling described as “an electric current” or a “shock” in the sensory distribution of a nerve. This requires the needle to be in contact with the nerve increasing the theoretical possibilities of nerve damage.

Admir Hadzic and Jerry D. Vloka recommended that paraesthesia be limited to brachial plexus blockade, and its use be discouraged in infraclavicular, lumbar plexus, femoral, sciatic, popliteal, and other "deep" blocks as it is both unreliable and unacceptable in modern practice [19].

Paraesthesia should be elicited with the greatest care, using a fine needle. Repeated and rough probing of the nerves should be avoided. In case of pain during injection, the procedure must be stopped immediately and the needle withdrawn.

The major drawback of the paraesthesia technique is that it is associated with greater patient discomfort and it is more difficult to teach, as compared to the nerve stimulator technique. The development of well designed peripheral nerve stimulators (PNS), and more recently ultrasound (US) machines, provide a more reliable method for nerve localization

nerve and confirm proximity of the needle to the nerve. The use of nerve stimulators to carry out nerve blocks can be dated back to the middle of the 20<sup>th</sup> century.

Kulenkampff had described the brachial plexus in 1928 and Perthes used electrical stimulation to locate the brachial plexus, but the technique was crude, equipment cumbersome and it did not gain wide acceptance.

In 1955 Pearson demonstrated that motor nerves could be located by electrical stimulation using an insulated needle [20]. In 1962 Greenbalatt and Denson devised a portable transistorized nerve stimulator which stimulated further use of PNS in RA [20].

The point of needle insertion is determined by anatomical landmarks. It is important to make sure the circuit is complete as soon as the needle is inserted. The machine may have a flashing light or audible beep or some other mechanism to indicate that the circuit is complete. The needle is then advanced until the desired motor twitch is obtained. The current is then reduced until no motor response is seen. The displayed current on the nerve stimulator is noted. A current between 0.2-0.5mA is accepted as an ideal threshold current. Below 0.5mA has been shown to give a high success rate. Below 0.2mA may mean that the needle tip is in the nerve and should be withdrawn before injection [20].

### **2.3.3      Ultrasound (US).**

It is sound with frequency above the audible range (> 20,000 cycles per second). Frequencies used in clinical imaging are in the 1 -20MHZ range, and have a velocity of 1540msec in soft tissue.

Fascicles of peripheral nerves (PN) can be detected with high resolution US imaging [21]. This fascicular echo texture (honeycomb architecture) is the most distinguishing feature of the PNs. The nerves can have a round, oval or triangular shape [22]. Interestingly a single nerve can have all these shapes along its nerve path [23]

Direct nerve imaging also serves to identify other structures like arteries, fascia and other connective tissues, and with successful drug injection, the borders of the nerves are clarified.

Advantages of US are that it allows visualization of the PNs, the block needle and LA distribution enabling targeted drug injections and catheter placement. Another advantage is that there are no independently confirmed adverse biological effects of diagnostic US.

In addition, direct visualization of the spread of LA decreases the risk of intravascular injection, systemic toxicity, pneumothorax, and a failed block [24]. In experienced hands, the benefits of performing a PNB with real-time US imaging of needle placement and LA spread include decreased performance as well as onset time, a decreased dose of LA required to achieve a successful block, and an increase in block success rate [25-30].

Disadvantages include the fact that the US machine is expensive and requires training and expertise to operate. It is also an indirect method of nerve visualization and images are subject to individual interpretation.

#### **2.3.4 Transarterial transfixation**

This is especially useful for the brachial plexus block, where the axillary artery is transfixed and LA placed deep and superficial to it. This results in blockade of the radial, ulna, and median, but not the musculocutaneous nerve. The major drawback of the technique is inadvertent intravascular injection of LA with resultant systemic toxicity.

Other methods of nerve localization that have been used or are in use include fluoroscopy, computerized tomography (CT) and magnetic resonance imaging (MRI).

#### 2.4.1 Better pain control

Major surgical operations normally cause tissue damage and pain. Tragically postoperative pain is still inadequately relieved despite substantial improvements in the knowledge of the mechanisms and treatment of pain [31]. Inadequate relief of postoperative pain may result in harmful physiologic and psychological consequences that lead to significant morbidity and mortality [32], which may delay recovery and the return to activities of daily living [33]. In addition, pain significantly contributes to patients' dissatisfaction with their anaesthesia and surgical experience [34]. It has also been recognized that inadequately treated postoperative pain may lead to chronic pain, which is often misdiagnosed and neglected [35,36].

The physiological changes secondary to pain are caused by endocrine, metabolic and inflammatory processes. This causes autonomic over activity which results in an increased heart rate, peripheral vascular resistance, increased arterial blood pressure, and myocardial contractility, which all culminate in increased myocardial oxygen consumption from increased cardiac work [37].

In addition, intense sympathetic stimulation may also produce coronary vasoconstriction as well as atherosclerotic plaque rupture and, subsequently, decrease myocardial oxygen supply [38].

Nerve blocks, if done correctly, can provide excellent anaesthesia and post operative pain relief eliminating all the problems mentioned above. The use of PNBs is associated with less requirement of post operative opioid analgesics and therefore reduced adverse effects [11].

In a comparison of infraclavicular peripheral nerve block and GA in out-patients undergoing hand and wrist surgery, Hadzic et al found that 3% of patients in the infraclavicular group compared to 43% in the GA group had pain on arrival at the post anaesthesia care unit (PACU). This was by use of the visual analog score of more than three. None of the patients who received an infraclavicular nerve block requested for pain treatment while at the hospital compared to 43% of patients in the GA group

### **2.4.2 Reduced infection rates**

Unlike neural axial techniques, there is no risk of meningitis. Infection and fever are relative contra indications for neural axial techniques, because of the potential risk of meningitis and / or spinal abscesses. This is supported by study done by Carp H et al which found bacteremia prior to dural puncture increases the risk of meningitis [<sup>40</sup>]. In contrast patients with localized infection, not at the site of needle placement are considered suitable for single injection PNBs.

### **2.4.3 Perioperative anticoagulation.**

Perioperative anticoagulation to minimize graft occlusion or thrombo-embolic complications increases the risk of spinal hematoma in patients with indwelling spinal or epidural catheters. This is in contrast to single injection or continuous PNB when performed at sites that can be monitored and compressed [<sup>41</sup>].

Other advantages of PNB include: Reduced admissions to PACU, reduced length of stay at PACU as well as reduction in discharge time for patient undergoing day case surgery [<sup>39, 42 & 43</sup>]. There was also reduced nausea, vomiting and sore throat [<sup>39</sup>].

Apart from PNBs having fewer overall side effects, they also have a lower incidence of severe side effects, compared to neural axial techniques like spinal. A survey by Auroy et al in 2002 found that in the 10 cases of cardiac arrest related to RA reported, nine occurred following spinal anaesthesia for non-obstetric indications. Of these nine, three died; this is in comparison to one cardiac arrest from a lumbar plexus block [<sup>44</sup>].

The reported incidence of complications associated with PNB is generally low and varies from 0-5% [45]. The incidence can be minimized by ensuring adequate supervision and training in LA techniques, and by exercising care in performance of each block. Complications include nerve injury, systemic toxicity from intravascular injection and/or systemic absorption of the LA.

Systemic toxicity results in cardiovascular (CVS) and central nervous system (CNS) adverse effects and for this reason a patient should always have an intravenous (IV) access before performing the PNB.

A full range of resuscitation equipment and drugs must be available and in working order at the block placement area before performing the block. These include;

- i. An anaesthetic breathing system through which oxygen may be administered under pressure via a face mask or endotracheal tube (ETT).
- ii. Laryngoscopic equipment with an assortment of various types and sizes of commonly used blades, ETTs, oropharyngeal airways and laryngeal mask airways.
- iii. An oxygen source
- iv. Suction apparatus
- v. Various emergency and IV induction medications. These include atropine, ephedrine, epinephrine, phenylephrine, midazolam, propofol and succinylcholine.

It is usually better to perform PNBs in the awake or slightly sedated patient except in children. This provides valuable information like block onset and efficacy and also alerts the anaesthesiologist on early complications like IV or intraneural injection.

patients' quality of life as well as medico-legal implications for the anaesthesiologist involved. The nerve damage can be temporary or permanent.

The American Society of Anaesthesiologists' Closed Claims Project reported temporary nerve injury being at least 2½ times more common than permanent nerve injury following peripheral nerve blockade [46].

The etiology of neurologic complications is usually multi-factorial with only a small proportion of postoperative sequelae being caused by PNBs alone. The incidence of neurologic injury following hand surgery under an axillary block was 3.4% in a series of 533 patients. However, the nerve block was implicated in only 1.9% of these cases [45]. Peripheral nerve injury in humans may result from intra-neural injection [47, 48] or direct needle trauma [49]. Other mechanisms of nerve injury include neuronal ischaemia, neurotoxicity, drug error, and infections.

Neurologic complications can also be caused or compounded by the underlying disease, surgery, patient positioning and tourniquet application.

During intra-neural injection, damage is secondary to direct needle trauma, physical distraction of neural fibres and disruption of neuronal microvasculature with consequent intra-neural hematoma and ischaemia. Ischaemia can also result from the increased intra-neural pressures secondary to intra-neural drug injection. This causes an increase in endoneural pressure exceeding the capillary perfusion pressure. Currently, prevention of intra-neural injection in PNB has focused on methods of nerve localization.

This is done using a PNS where drug injection is avoided with a current below 0.2mA and US where the peripheral nerve is identified and LA is injected around it. In an animal study Chan et al [50] found US to be sensitive in detecting intra-neural injection of as little as one millilitre of injectate.



Nerve damage by drug errors is through injection of the wrong drugs which may be neural toxic or use of very high concentrations of LA. Correctly administered LA does not have a risk of nerve injury but very high concentrations can lead to permanent nerve damage [51].

### **2.5.2 Systemic toxicity**

Systemic toxicity occurs when the LA is accidentally injected into the intravascular space or due to increased absorption from the site of injection. Local anaesthetics inhibit nerve impulse conduction resulting in progressive depression of function of CVS and CNS. Early features of toxicity are numbness and tingling sensation of the tongue and circumoral area. Central nervous system complications are usually progressive that is; light headedness, anxiety, drowsiness, tinnitus, tremors, visual disturbance, confusion and loss of consciousness preceded or followed by convulsions. Subsequently coma and apnea develop. This is usually when LA injection is slow or with systemic absorption. If a large dose is delivered directly to the CNS like in intra-arterial injection into the cerebral artery during interscalene block the first sign of toxicity can be convulsions.

Cardiovascular system collapse can be from direct myocardial depression and vasodilatation leading to hypotension and dysrhythmias or from hypoxemia secondary to apnea. Serious CVS effects generally occur at higher plasma concentrations than the CNS effects.

Intravascular injection can be reduced by always aspirating before LA injection and injecting the LA in small increments to avoid injection of large amounts into a vessel. Inadvertent intravascular injection can still occur despite seeing no spontaneous blood flow in the needle and negative repeated aspiration on the syringe [52, 53]. Another method is use of US with color Doppler for vessel identification. Case reports have shown successful resuscitation from LA toxicity by intravenous administration of intralipid 20% [54, 55].

- i. Total failure
- ii. Incomplete block
- iii. Wear off block

In total block failure, the block does not take at all. This is usually due to injection of the LA at the wrong location.

In incomplete block numbness is experienced in the region of the nerve distribution but it is not adequate for surgical stimulation. This can occur due to using a highly dilute concentration of LA.

The wear off type of failure is when the anaesthesia from the block wears off before surgery is over. This is usually due to use of a short acting LA or prolongation of surgery beyond the time anticipated.

Ways of reducing block failure are [<sup>56</sup>].

- i. The anaesthesiologist. He/she should be confident and well trained and know the relevant anatomy of the block to be done.
- ii. Patient counselling and education. This serves to allay anxiety and improve patient co-operation.
- iii. Technique selection. The anaesthesiologist should be comfortable with the technique he/she has selected and it should provide adequate operating conditions for the surgery at hand.
- iv. Choice of LA. This should be guided by the toxicity profile of the drug as well as the anticipated duration of surgery. The expiry date should be confirmed before administration.

and prevent unnecessary discomfort.

- vi. Equipment like US or PNS should be available and in working condition. Needles of the appropriate length should be available.

#### **2.5.4 Allergic reactions**

Serious allergic reactions are now rare. They are usually secondary to para-aminobenzoic acid, produced on hydrolysis of ester LA. The reactions range from contact dermatitis to full blown anaphylaxis. Allergic reactions to amide LA are extremely rare and when present, are usually due to the preservative in the solution rather than the amide itself [57].

#### **2.6 Justification**

Major surgical operations normally cause tissue damage and pain. Tragically, postoperative pain is still inadequately relieved despite substantial improvements in the knowledge of the mechanisms and treatment of pain [30]. Inadequate relief of postoperative pain may result in harmful physiologic and psychological consequences that lead to significant morbidity and mortality [32], which may delay recovery and the return to activities of daily living [33]. In addition, pain significantly contributes to patients' dissatisfaction with their anaesthesia and surgical experience [34].

Despite the reduced overall and severe adverse effects of PNBs and their numerous advantages their use still seems uncommon. This is in the backdrop of major advancements in equipment and technology that make PNBs both safe and easy to administer. Ndungu D.N. in his MMed thesis (2010) done in KNH reported that the majority (70.1%) of blocks given to patients were neural axial blocks [57]. The reduced use of PNBs is further demonstrated by the low number of scientific papers presented at the annual Kenya Society of Anaesthesiologist Scientific Conferences.

In the last two years, only two papers presented were on PNBs. In 2010, two out of forty eight papers, that is, only 4% were on PNBs and in 2011 out of the twenty four papers presented none was on PNBs.

There are no local studies on the use of PNBs. Therefore, this will be a pilot study which will help shed light on the current knowledge, attitude and practice of anaesthesiologists practicing in Kenya toward PNBs.

Hopefully questions arising from this study will become topics for further study in this valuable field of anaesthesia. Information gathered from this study will also help come up with recommendations to local residency programs as well as the government to help improve the quality of anaesthesia training and care.

## **2.7 Research Question**

Does the anaesthesiologists' knowledge and attitude influence the practice of peripheral nerve blocks?

## **2.9 Broad objective**

To determine the knowledge, attitude and practice of peripheral nerve blocks among anaesthesiologists practicing in Kenya.

## **2.10 Specific objectives**

1. To determine the knowledge of basic PNBs among anaesthesiologists practicing in Kenya.
2. To determine the attitude of anaesthesiologists in Kenya towards PNBs.
3. To determine the practice of PNBs among anaesthesiologists in Kenya.

### **3.1 Study Design**

The study is a cross-sectional descriptive survey on knowledge, attitude and practice toward peripheral nerve blocks of anaesthesiologists practicing in Kenya.

### **3.2 Study population**

All anaesthesiologists practicing in Kenya and registered with the Kenya Society of Anaesthesiologists

### **3.3 Inclusion criteria**

All qualified consenting anaesthesiologists registered with the Kenya Society of Anaesthesiologists and currently practicing in Kenya.

### **3.4 Exclusion criteria**

Non-consenting anaesthesiologists

Anaesthesiologists registered with Kenya Society of anaesthesiologists but currently not practicing in Kenya or are deceased.

Anaesthesiologists who are currently not in clinical practice

### **3.5 Sample Selection**

There are 115 registered anaesthesiologists with the Kenya Society of Anaesthesiologists. A list of all the registered anaesthesiologists was obtained from KSA. The registered members were stratified according to their location/town. Random sampling was then employed in the selection of the study participants.

$$n_0 = \frac{Z^2 pq}{e^2}$$

Where:

$n_0$  = sample size

$Z^2$  = 95%

$e$  = the desired level of precision (0.08)

$p$  = the estimated proportion of an attribute that is present in the population (50.5%)

$q$  is  $1-p$

$$N_0 = \frac{1.96^2 * (0.5 * 0.5)}{0.08^2}$$

=150

Adjusted the formula for population less than 5,000

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

Where:

N= total population size (115)

$$= \frac{150}{\quad}$$

$$1 + (150 - 1)$$

$$\frac{\quad}{115}$$

$$= 65.3$$

The minimum sample size is 65 anaesthesiologists.

### **3.6 Data management and analysis**

#### **3.6.1 Data analysis**

Data obtained was analyzed using Statistical Package for Social Sciences (SPSS) version 17.0. The results are presented as numbers, percentages, medians and ranges, and in form of bar charts, tables and pie charts as appropriate. Chi-square was performed on discrete variables to test for association using a significance level of 0.05.

### **3.7 Ethical considerations**

The study was undertaken after approval by the University of Nairobi and the KNH scientific research and ethical committee.

The nature of the study was explained to the participants in full.

The study was undertaken after informed consent was obtained from the participants.

Confidentiality was maintained at all times.

Results of the study will be availed to the Ethics Committee of the Kenyatta National Hospital and College of Health Sciences, University of Nairobi.

Actual data collected in form of questionnaires will be looked up in a cabinet while electronic data will be saved in a password protected file after analysis to ensure confidentiality.

### **3.9 Study limitations**

Not all anaesthesiologists who are registered were interviewed. The results of the study therefore cannot be generalized in the entire population.

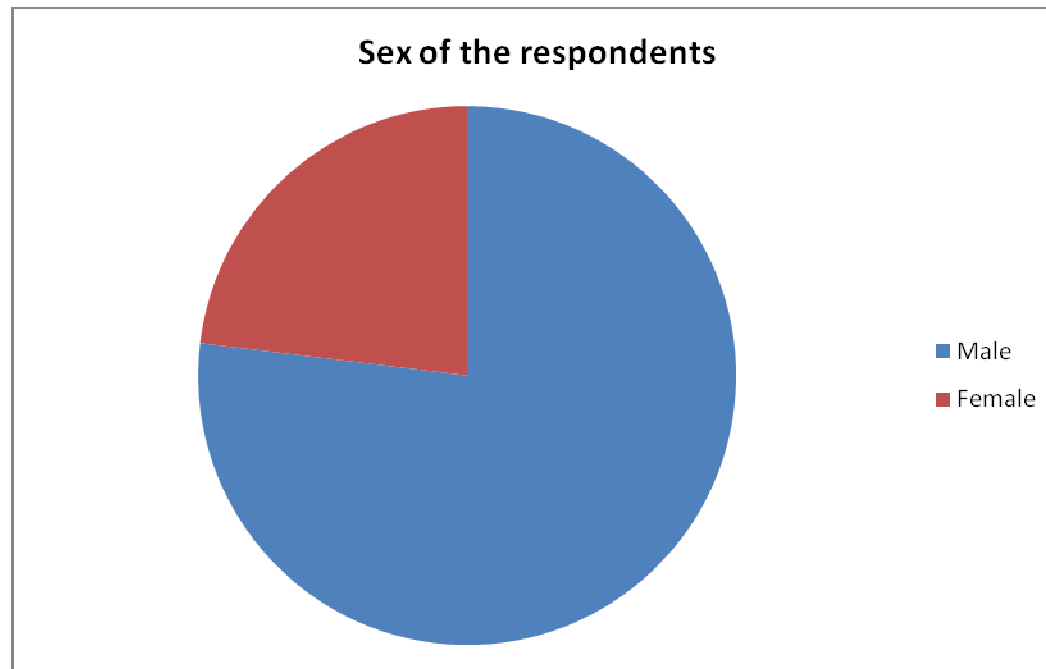


This was a cross-sectional descriptive survey on knowledge, attitude and practice toward peripheral nerve blocks of anaesthesiologists practicing in Kenya. A total of 65 anaesthesiologists were interviewed; thus achieving 100% sample size.

#### 4.1 Socio-demographic characteristics

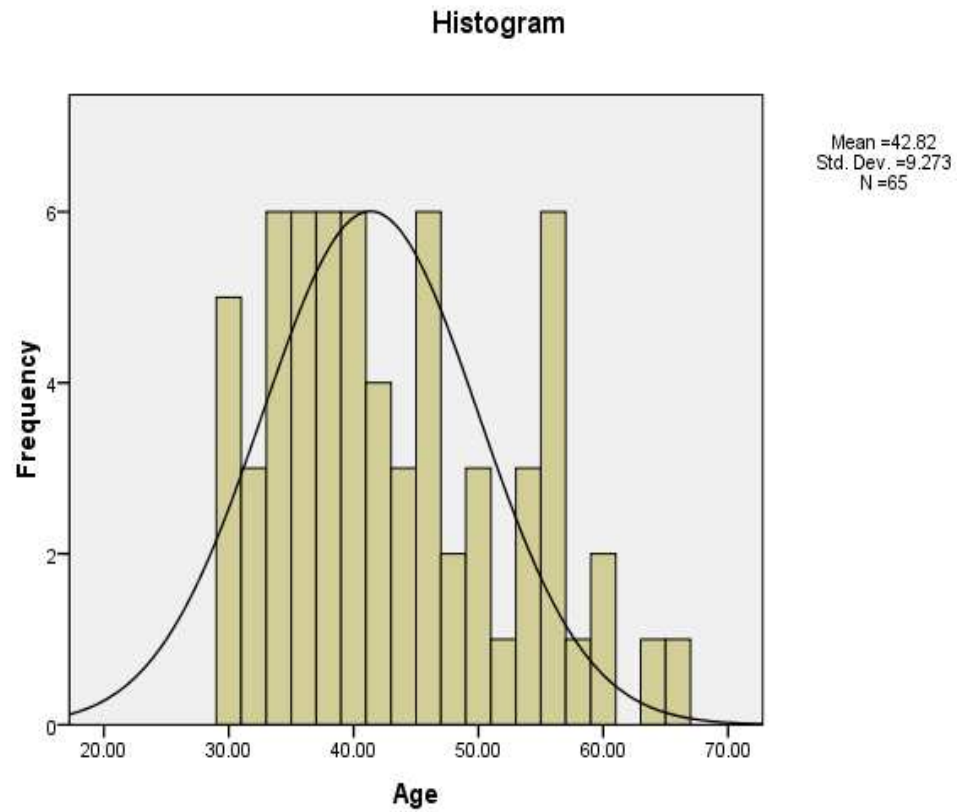
##### 4.1.1 Gender

There were more males 76.9% (n=50) than females 23.1% (n=15) with a male to female ratio of 1:0.3.



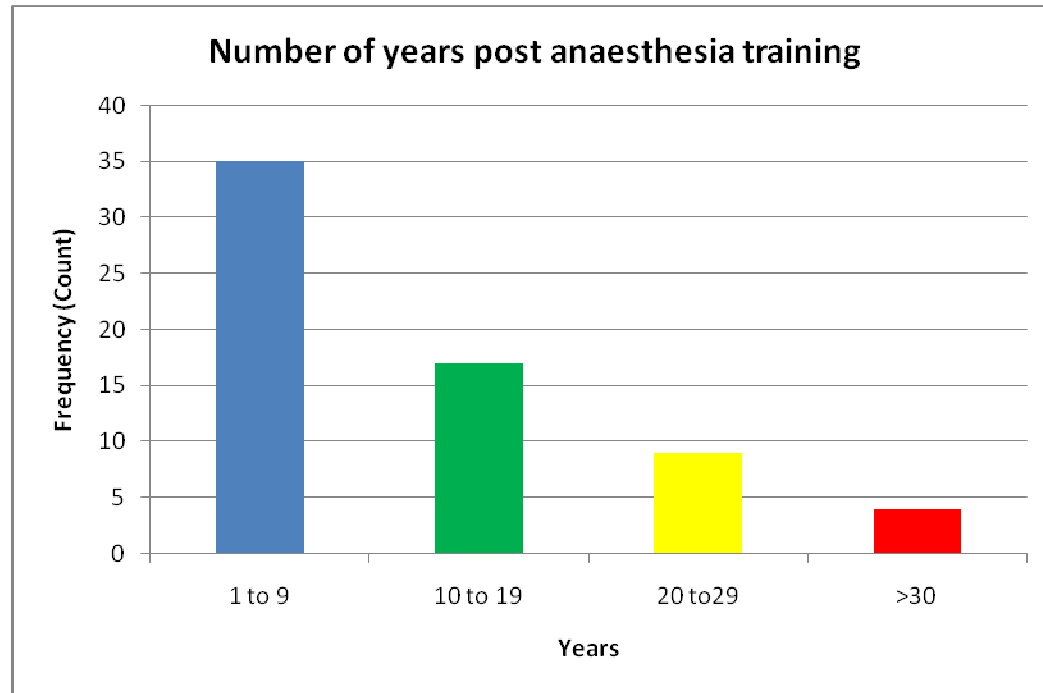
**Figure 1: Sex of the respondents**

29.2% (n=19) were between the age of 40 and 49 years, 23.1% (n=15) and 4.6% (n=3) were between the ages of 50-59 and above 60 years respectively. The mean age of the respondents was 42 years with a standard deviation of 9.2.



**Figure 2: Age of the respondents**

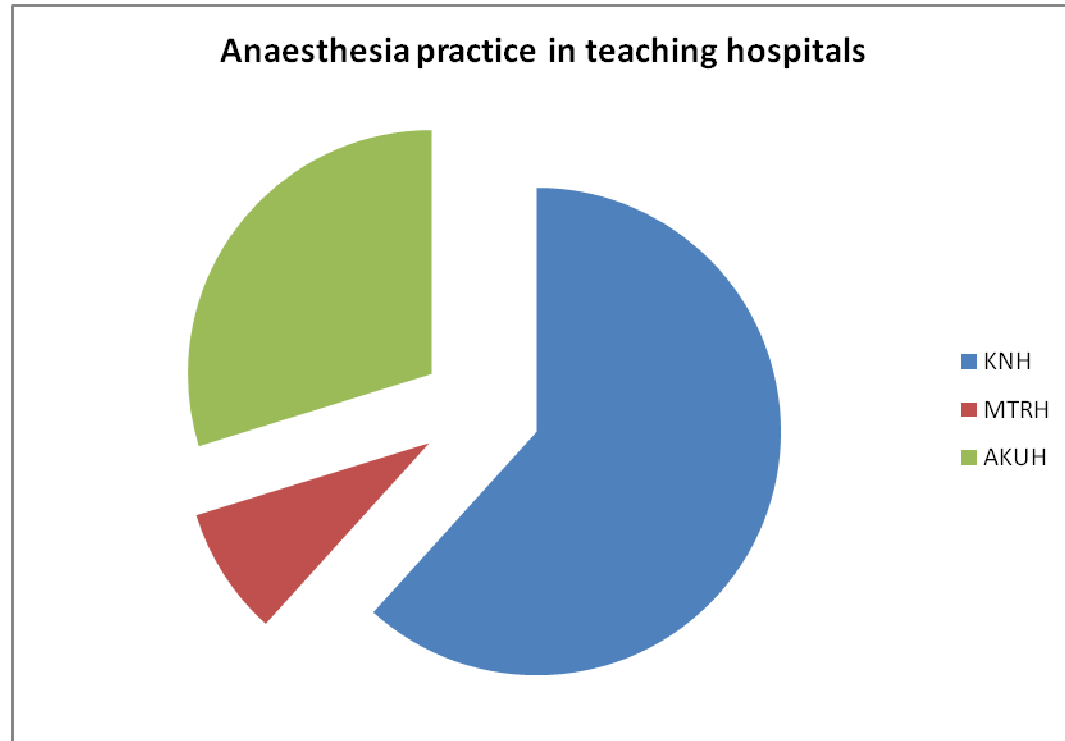
(26.5%) had 10-19 years post anaesthesia training. There were 9 (13.8%) respondents who had between 20 and 29 years post anaesthesia training and only 4 (6.1%) respondents with more than 30 years post anaesthesia training. As shown in the figure below.



**Figure 3: Number of years post anaesthesia training**

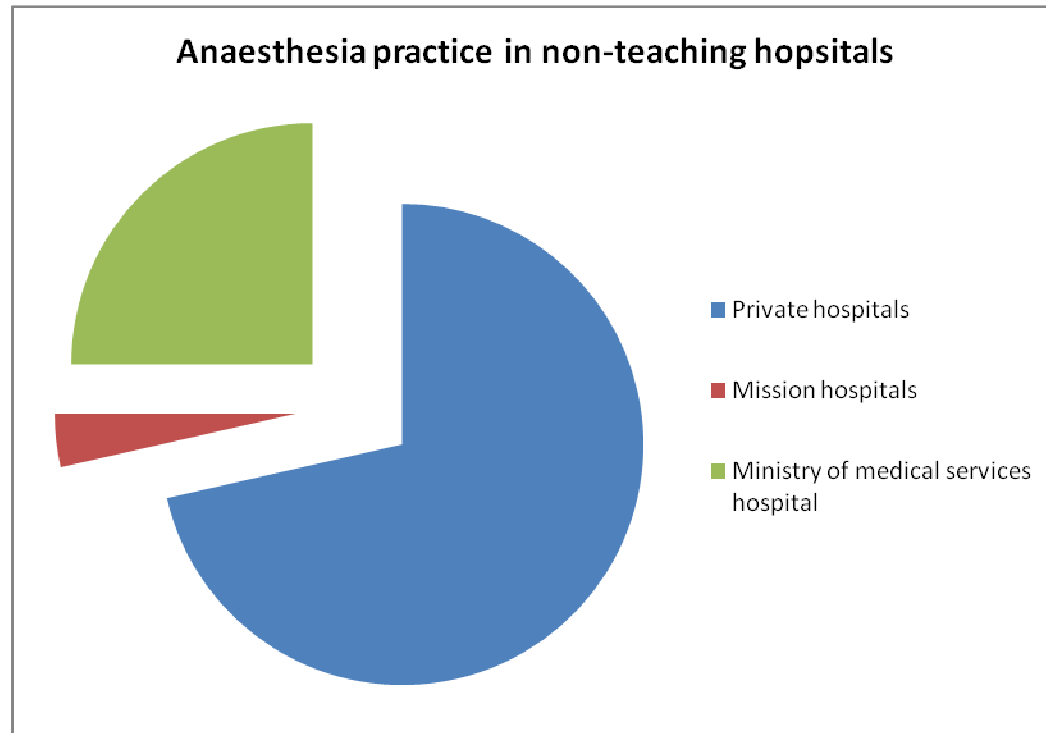
#### 4.2.1 Teaching hospital

Among the teaching hospitals, anaesthesia was mostly practiced in the Kenyatta National Hospital (61.7 %). Figure 4



**Figure 4: Teaching hospitals where anaesthesiologists' practiced**

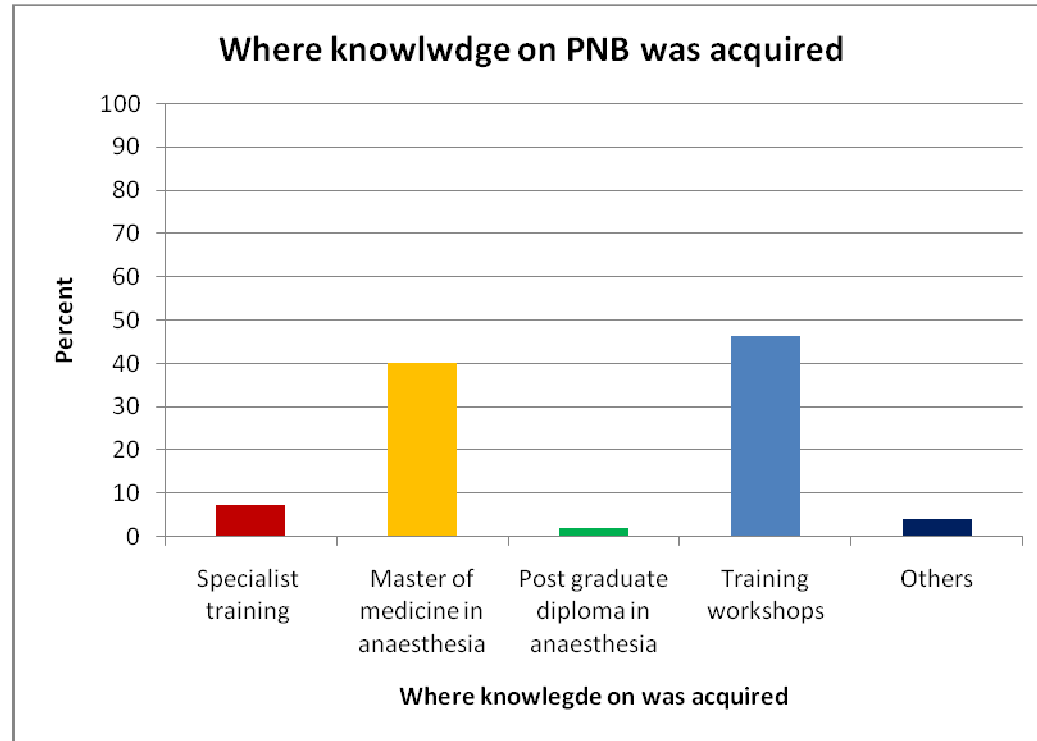
shown in figure 5 below;



**Figure 5: Non- teaching hospitals where anaesthesiologists' practiced**

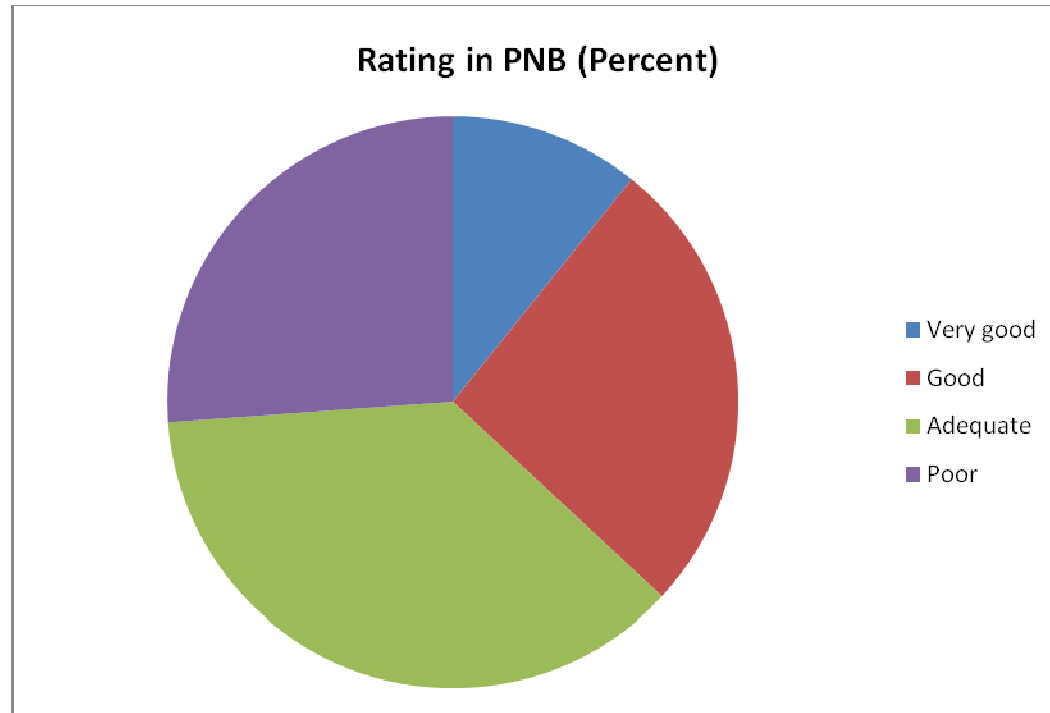
#### 4.3.1 Where knowledge on performing peripheral nerve blocks was acquired

Knowledge on PNB was mostly acquired from training workshops; 46.3% (n=44) and Masters of medicine in anaesthesia training; 40.0% (n=38). As shown in figure 6 below.



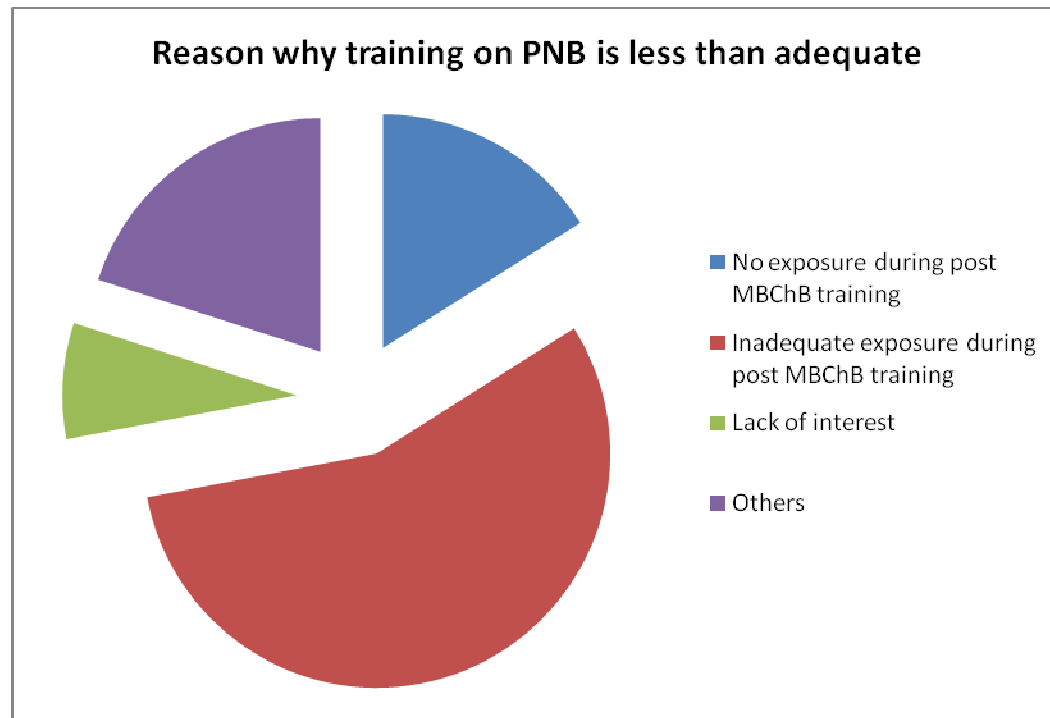
**Figure 6: Where knowledge on performing PNB was acquired**

of all respondents reported to have attained very good training on how to perform peripheral nerve block, 26.2% (n=17) and 36.9% (n=24) had good and adequate training on performing peripheral nerve block respectively. Twenty six point two percent (n=17) rated their training as poor as shown in figure 7 below.



**Figure 7: Rating the training on peripheral nerve blocks**

training to inadequate exposure during masters of medicine in anaesthesia training. Other reasons included lack of exposure during post MBChB training and lack of interest.

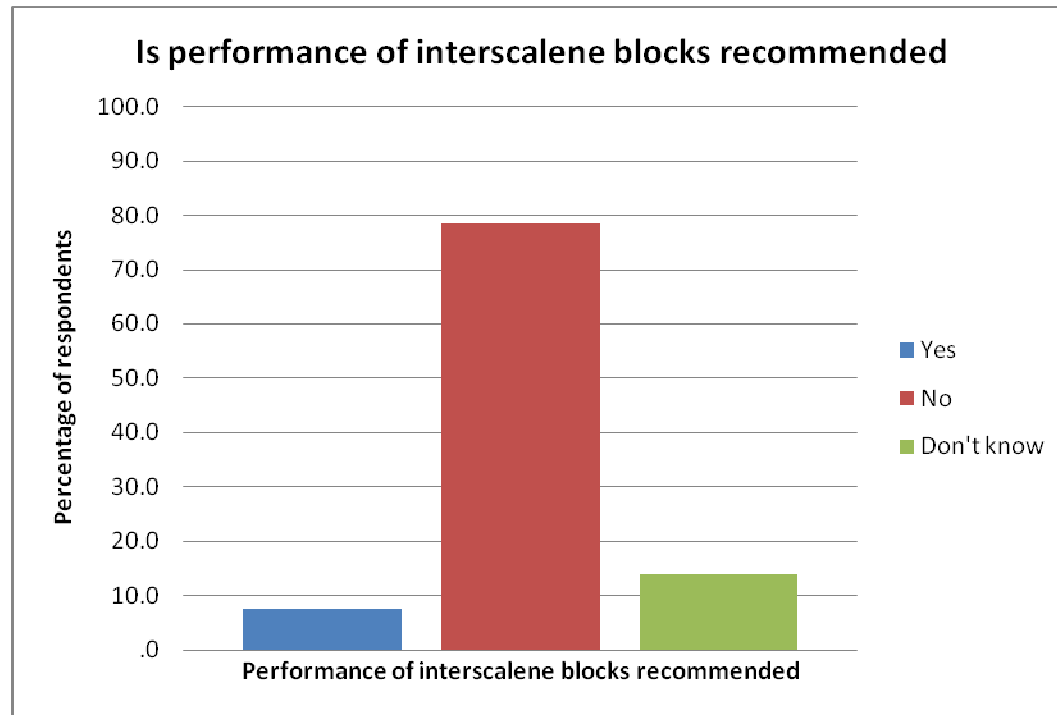


**Figure 8: Reasons for having less than adequate training on PNB**



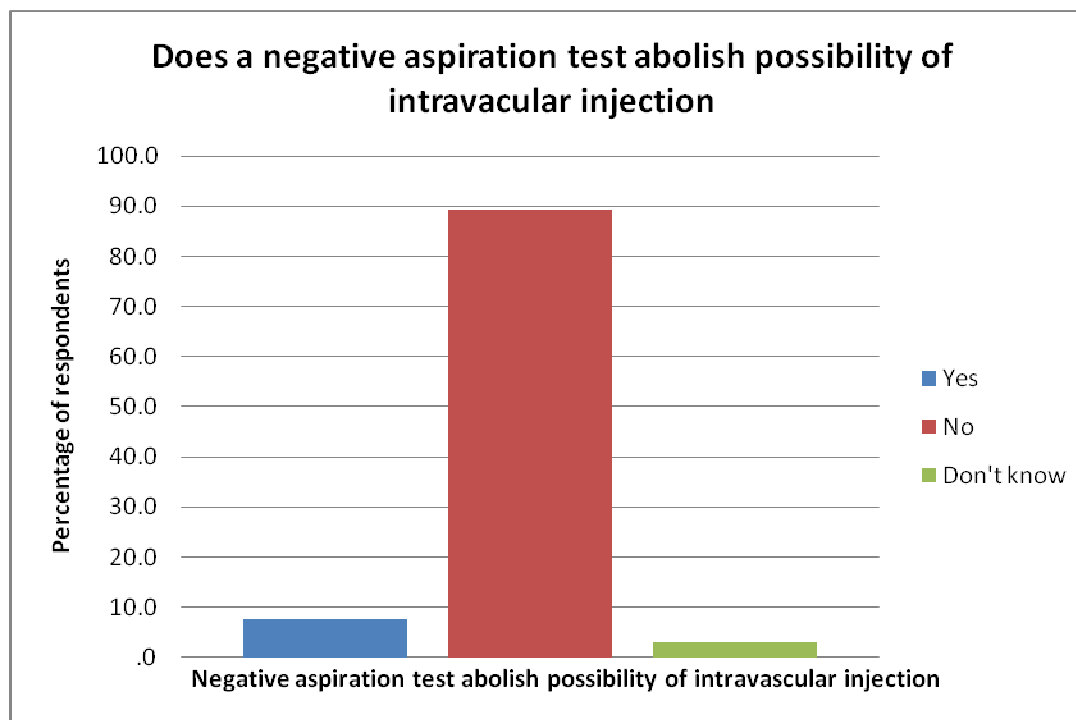
#### 4.4.1 Is performance of bilateral interscalene blocks recommended?

Seventy eight point five percent (n=51) of respondents reported that performance of bilateral interscalene blocks is not recommended. It is important to note that 13.8% (n=9) of respondents did not know whether it is recommended or not and only 7.7% (n=5) reported that the procedure is recommended.



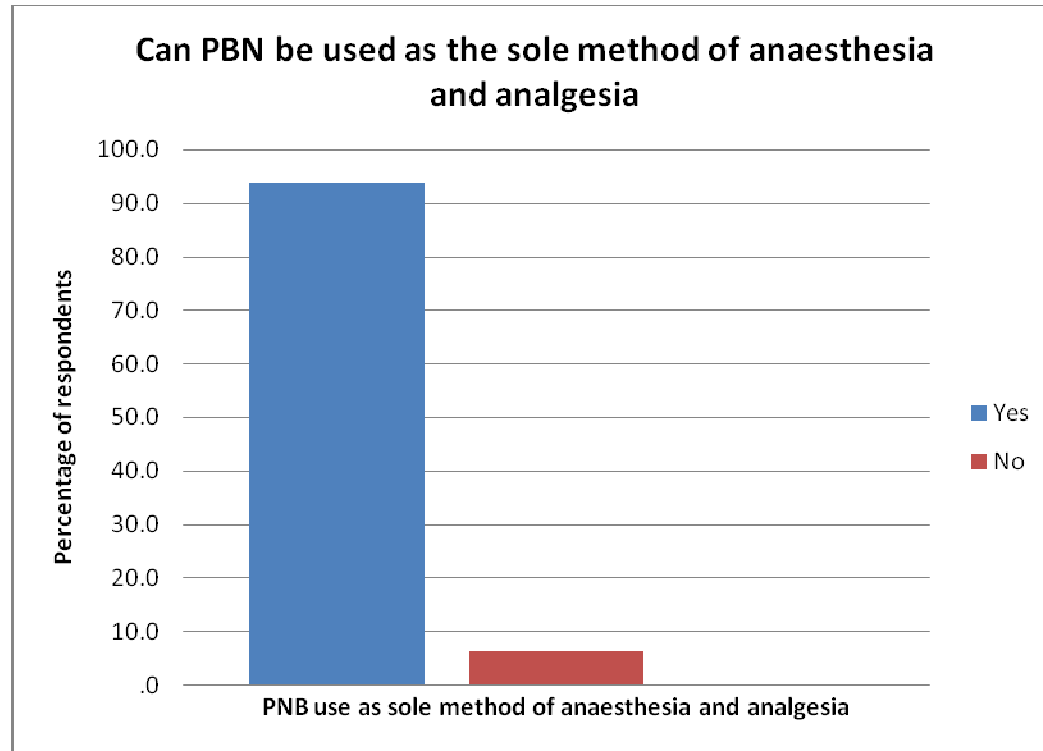
**Figure 9: Performance of bilateral interscalene blocks**

test abolishes the possibility of intravascular injection. Only 7.7% (n=5) agreed that the procedure abolishes possibility of intravascular injection and about 3.1% (n=2) did not know whether a negative aspiration test abolish possibility of intravascular injection.



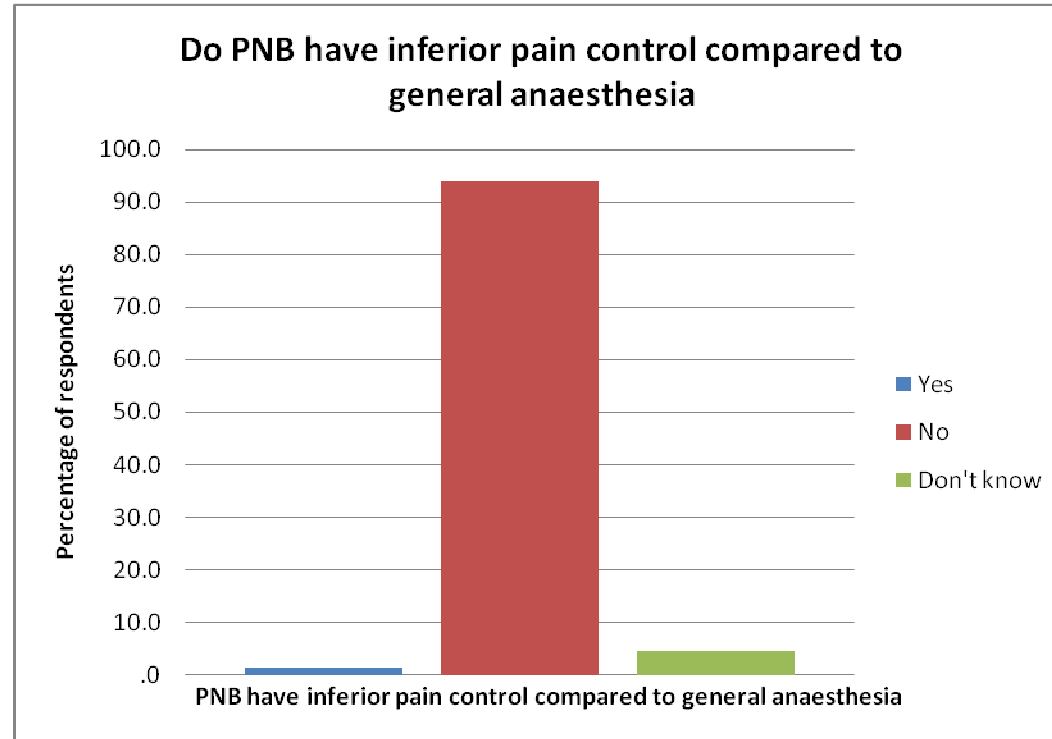
**Figure 10: Negative aspiration test abolish possibility of intravascular injection**

An overwhelming majority 93.8% (n=61) of respondents agreed that indeed PNBs can be used as the sole method of anaesthesia and analgesia.



**Figure 11: PNB can be used as a sole method of anaesthesia and analgesia**

Sixty one (93.8%) of the respondents did not agree with the statement that PNBs have inferior pain control compared to general anaesthesia, 4.6% (n=3) agreed that peripheral nerve blocks have inferior pain control compared to general anaesthesia.



**Figure 12: PNB have inferior pain control compared to general anaesthesia**

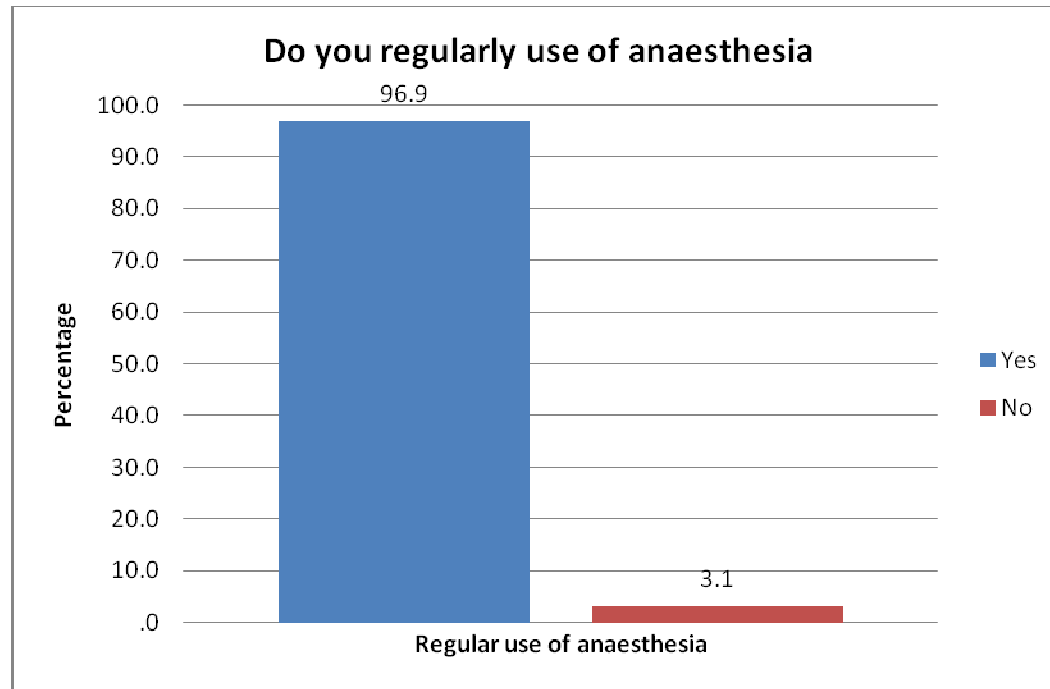
Respondent's attitude was assessed among the respondents. Eighty seven point seven percent (n=57) reported that nerve blocks are very important in the field of anaesthesia. Seventy five point four percent (n=49) believed that patient education on procedure of performing peripheral nerve blocks is important. An overwhelming majority believed that knowledge of general anatomy is very important when performing nerve blocks (96.1%) (n=63). There was however varied believes on the statement that sedation is important when performing peripheral nerve blocks; only 18.5% (n=12) of the respondents believed that sedation is very important and 43.1% (n=28) believed it to be important when performing peripheral nerve block. Some respondents thought that it is not important; 10.8% (n=7)

**Table 1: Attitudes on the performance of peripheral nerve blocks**

Attitude	Very Important (%)	Important (%)	Somewhat Important (%)	Not Important (%)
Do you believe patient education on procedure of peripheral nerve blocks is important?	75.4	24.6		
Do you think nerve blocks are important in the field of anaesthesia?	87.7	12.3		
Do you believe sedation is important when performing peripheral nerve blocks?	18.5	43.1	27.7	10.8
Do you believe knowledge of relevant anatomy is important when performing nerve blocks?	96.9	3.1		

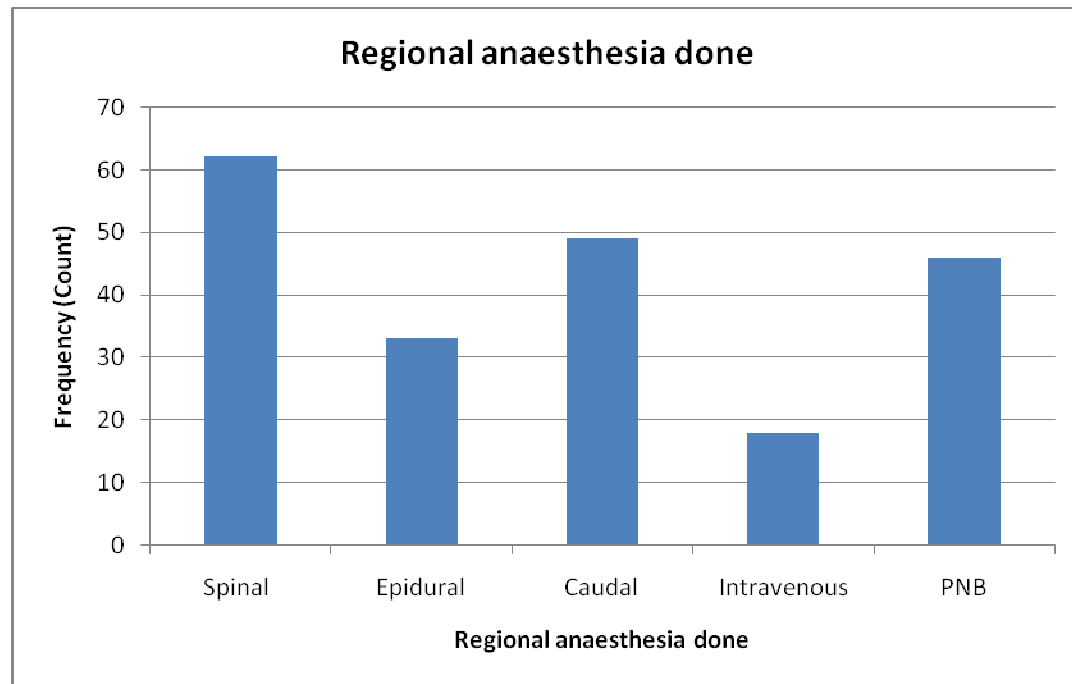
#### 4.6.1 Use of regional anaesthesia in practice

A majority of respondents (96.9%) (n=63) reported to be using regional anaesthesia in their practice.



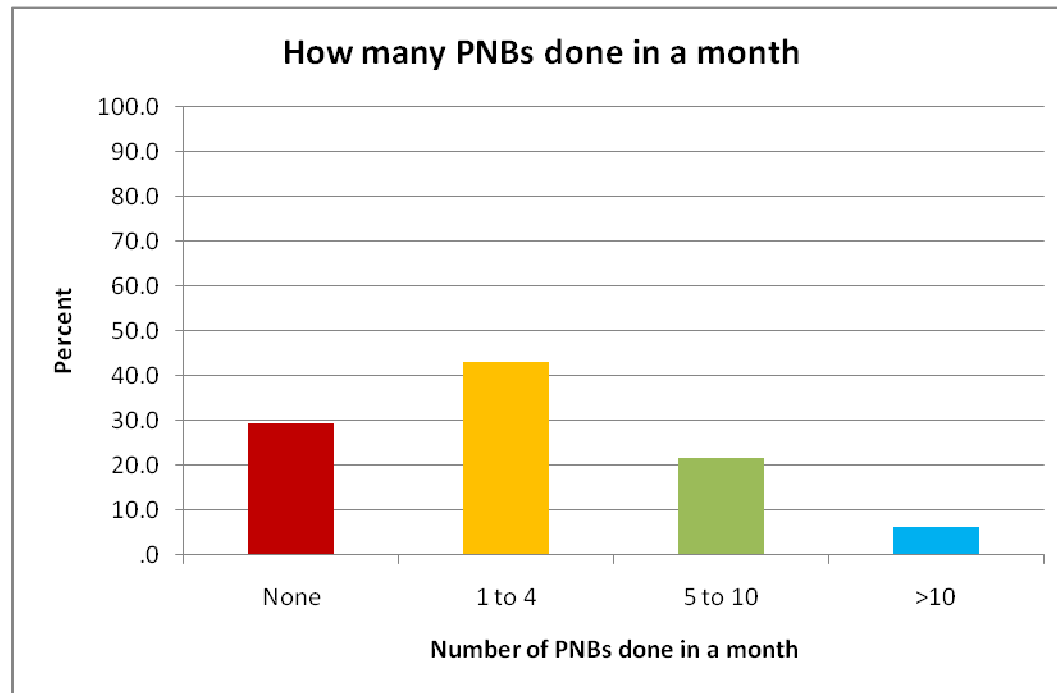
**Figure 13: Regular use of anaesthesia**

regional anaesthesia done included epidural and intravenous; which accounted for 15.9% (n=33) and 8.7% (n=18) respectively.



**Figure 14: Types of regional anaesthesia done**

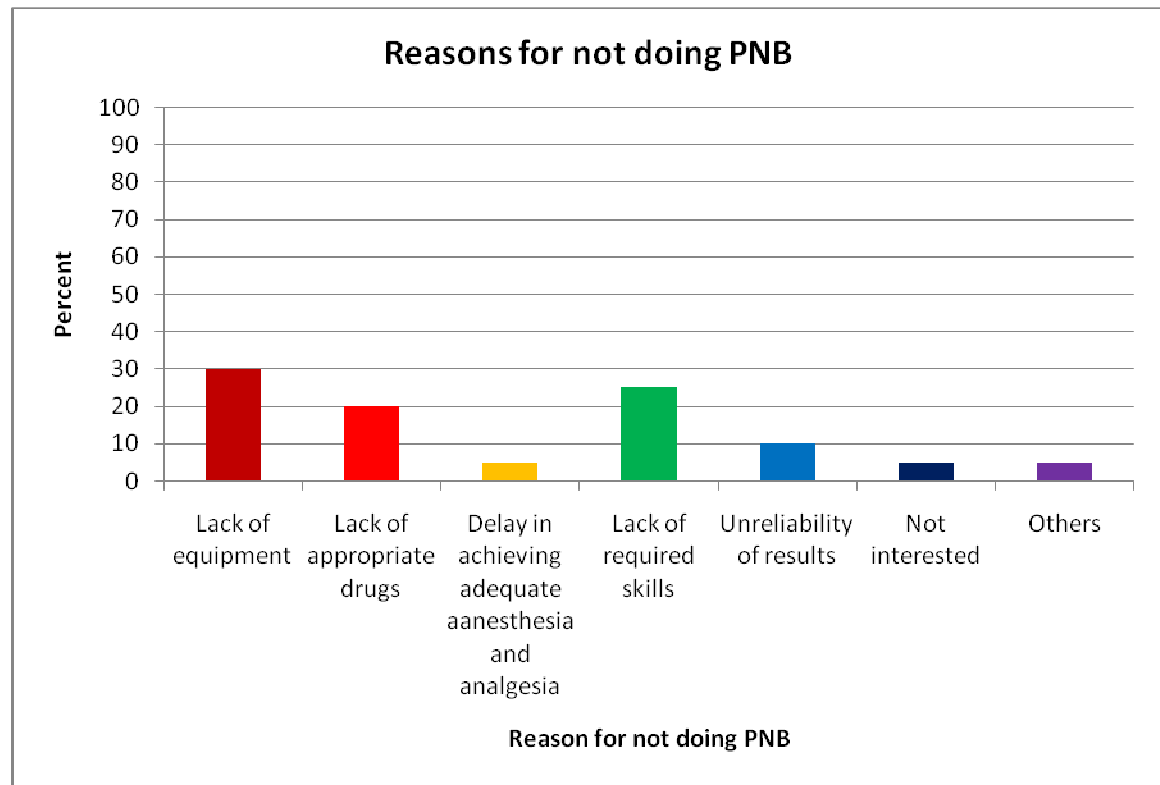
performed between 5-10 and only 6.2% (n=4) performed more than 10 nerve blocks in a month. However, 29.2% (n=18) do not perform any peripheral nerve blocks.



**Figure 15: Number of PNBs done in a month**

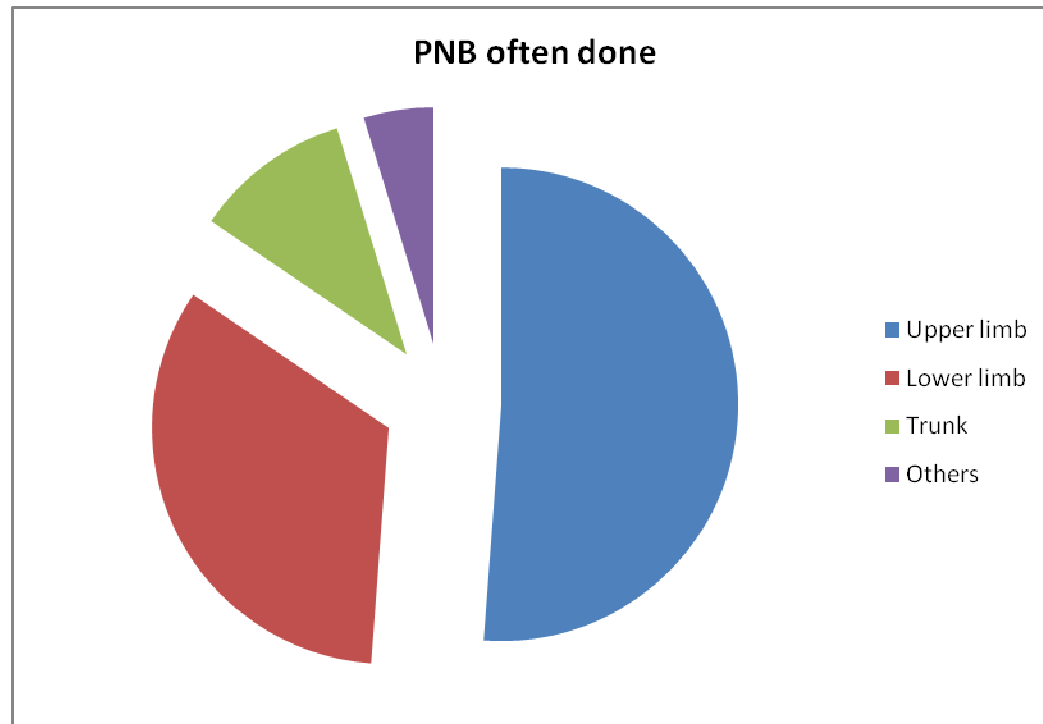


the main reasons.



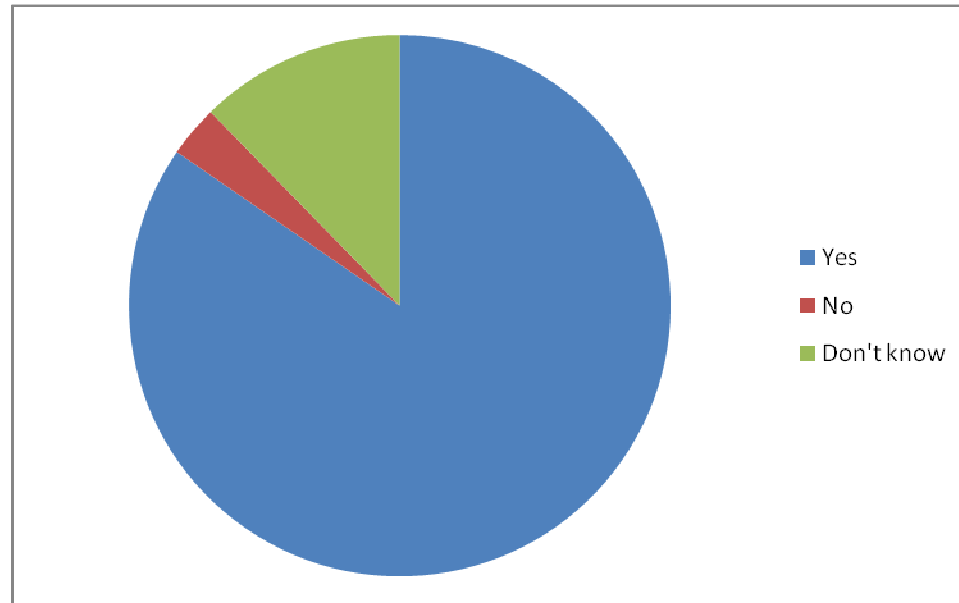
**Figure 16: Reasons for not doing PNB**

represented 11.1% of all blocks. Other blocks done accounted for 3.7% of all blocks done and they included; infraorbital, occipital and periumbilical.



**Figure 17: Peripheral nerve block done**

majority of the respondents; (84.6) (n=55) were positive that their practice on peripheral nerve blocks would increase in future.



**Figure 18: Future of peripheral nerve blocks**

Chi square test was done to check for association between various variables. The association between the respondents belief that nerve blocks are important in the field of anaesthesia and the number of nerve blocks they performed in a month was assessed. There was no significant association; p value= 0.109.

**Table 2: Cross tabulation between importance of PNB in the field of anaesthesia and the number of PNBs done in a month**

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.047 <sup>a</sup>	3	<b>0.109</b>
N of Valid Cases	65		

A highly significant association was found between how the respondents rated themselves in peripheral nerve blocks and the number of peripheral nerve blocks they performed in a month; p value= 0.008.

**Table 3: Cross tabulation between rating on PNB and number of PNBs done in a month**

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	22.403 <sup>a</sup>	9	<b>0.008</b>
N of Valid Cases	65		

**Table 4: Cross tabulation between regular use of regional anaesthesia and the number of PNBs done**

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.996 <sup>a</sup>	3	0.172
N of Valid Cases	65		

There was no significant association between the level of training in peripheral nerve blocks and use of regional anaesthesia in their practice; p value=0.728

**Table 5: Cross tabulation between level of training in PNB and use of regional anaesthesia**

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.306 <sup>a</sup>	3	0.728
N of Valid Cases	65		

There was a significant association between years post anaesthesia training and the number of peripheral nerve blocks done in a month; p value=0.083

**PNBs done in a month**

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	89.208 <sup>a</sup>	72	.083
N of Valid Cases	65		

The use of PNBs still seems uncommon despite the reduced adverse effects of PNBs and their numerous advantages. This is in the backdrop of major advancements in equipment and technology that make PNBs both safe and easy to administer. Peripheral nerve blocks are typically practiced by relatively few, highly skilled practitioners who have invested significant effort and dedicated a significant part of their professional lives to mastering PNB procedures [<sup>18</sup>].

The aim of the study was to determine the knowledge, attitude and practice of peripheral nerve blocks among anaesthesiologists practicing in Kenya. The study also aimed to determine if the anaesthesiologists' knowledge and attitude influenced their practice.

The target sample of 65 was achieved with a 100% response rate. The mean age of respondents was 42 years with a male to female ratio of 1:0.3. Majority had practiced anaesthesia for 1-9 years post masters of medicine in anaesthesia.

Among the teaching hospitals majority of the anaesthesiologists interviewed practiced in KNH while among the non teaching hospitals, majority of the anaesthesiologists were in private practice. However I should mention this as a bias as many of the anaesthesiologists practicing in teaching hospitals and MOM hospitals also practiced in private hospitals thereby increasing the number in private practice.

Knowledge of PNBs was mainly acquired from training workshops this representing 46.3% (n=44) of respondents while 40% reported masters of medicine in anaesthesia as their source of knowledge.

Thirty six point nine percent (n=24), 26.2% (17) and 10.8% (n=7) rated their training as adequate, good and very good respectively. Importantly slightly more than a quarter 26.2% (n=17) rated their training as poor.

correlated well with the number of blocks performed [<sup>15</sup>]. This follows that inadequate exposure will lead to anaesthesiologists with a low level of confidence and hence ill prepared to practice PNBs.

This is collaborated by a study which showed that training in RA leaves residents unprepared to implement the full breadth of RA techniques and that some anaesthesiology residency programs are failing to teach RA [<sup>14</sup>]. This study showed that RA training varied substantially between residency trainings and that some residents were performing as few as one block per year.

Knowledge on PNBs was found to be good with 78.5% of respondents reporting that performing bilateral interscalene blocks is not recommended. Of note is that 13.8% did not know if performance of bilateral interscalene blocks is recommended. Ninety three point eight percent were of the opinion that PNBs can be used as the sole mode of anaesthesia and analgesia and that they do not have inferior pain control compared to general anaesthesia. In a comparison study between infraclavicular peripheral nerve block and general anaesthesia for out-patients undergoing hand and wrist surgery, Hadzic et al found that 3% of patients in the infraclavicular group compared to 43% in the GA group had pain on arrival at the post anaesthesia care unit. None of the patients who received an infraclavicular nerve block requested for pain treatment while at the hospital compared to 43% of patients in the GA group. [<sup>39</sup>]. Eighty nine point two percent of the respondents were of the opinion that a negative aspiration test did not abolish the possibility of intravascular injection. This is collaborated by some case reports where inadvertent intravascular injection still occurred despite seeing no spontaneous blood flow in the needle and having negative repeated aspiration on the syringe [<sup>52, 53</sup>].



seven percent and 12.3% were of the opinion that nerve blocks are very important and important in the field of anaesthesia respectively. Ninety six point nine percent were of the opinion that knowledge of relevant anatomy is very important when performing nerve blocks while the remainder 3.1% thought it important. There were varied opinions on the importance of sedation when performing nerve blocks. The majority 43.1% thought it was important while 18.5%, 27.7% and 10.8% thought that it was very important, somewhat important and not important respectively.

Practice of regional anaesthesia was found to be very high 96.9% compared to practice of PNBs which was high at 70.8% but 43.1% of respondents did less than 5 blocks per month. This is comparable to a national survey on the practice of peripheral nerve blocks in the United States. The study found out that, 97.8% of anaesthesiologists perform at least some RA techniques and that of these, at least half (50.5%) performed less than five PNBs per month. Of note is that even though majority of anaesthesiologists (70.8%) perform some PNBs, 72.3% did less than 5 blocks per month or none at all.

PNBs often done where chiefly upper limb blocks 50.6% followed by lower limb blocks at 34.6%.

Reasons for not doing PNBs were sought and 28.3% sighted lack of equipments as the cause. Other reasons included lack of skills required and lack of appropriate drugs at 21.7% and 15.2% respectively.

When asked about their future practice of PNBs, the majority (84.6%) of respondents were optimistic that their future practice will increase, 3.1% of respondents did not expect their future practice of PNBs to increase while 12.3% did not know if it will increase or not.

- Twenty six point two percent of the respondents considered their training in PNBs as poor.
- Seventy seven point eight percent of these attributed this to either no exposure or inadequate exposure during masters of medicine in anaesthesia training.
- Majority of respondents did perform PNBs but the practice is still infrequent, that is very few did more than 5 blocks per month.
- There is a gap between knowledge and attitude of the respondents and their practice.
- Upper limb PNBs practiced more compared to lower limb blocks.

## **RECOMMENDATIONS**

1. More emphasis on teaching of PNBs during masters of medicine in anaesthesia training.
2. To strengthen already existing avenues of learning PNBs like the training workshops.
3. Conduct studies in future to find out reasons for the gap between knowledge and attitude and the practice.
4. The ministry of health as well as teaching hospitals to provide equipment and drugs to encourage the practice of PNBs.

- Editorial Atlas, 1945:5-6.
2. Calatayud j, Gonzalez A: History of the development and evolution of local anesthesia. *Anesthesiology* 2003; 98(6):1503-1508.
  3. Niemann A: Ueber eine neue organische Base in den Cocablättern. *Archiv der Pharmazie* 1860; 153:129-55, 291-308
  4. Fink R: Leaves and needles: The introduction of surgical local anesthesia. *Anesthesiology* 1985; 63:77-83.
  5. Hall J: Hydrochlorate of cocaine. *New York Medical Journal* 1884; 40:643-644.
  6. Hirschel G: Anesthesia of the brachial plexus for operations on the upper extremity. *Medicaal Wochenschr* 1911; 58:1555-1556.
  7. Fink R: History of local anesthesia. In: Cousins, Bridenbaugh (eds 4): *Neural Blockade*. Philadelphia, Lippincott, 1980:12.
  8. Ruetsch A, Boni T, Borgeat A: From cocaine to ropivacaine: the history of local anesthetic drugs. *Current Topics in Medical Chemistry*, 2001; 1:175
  9. Admir H, Jerry D: *Peripheral nerve blocks; Principles and practice*. 1<sup>st</sup> Edition. New York: McGraw-Hill Professional, January 1 2004: 81.
  10. David M Scott: Regional anaesthesia in military medicine. *Australian Defense Force Health*; 2008; 9:15-17.

12. Admir H, Jerry D, Jonathan K: Training requirements for peripheral nerve blocks. Current opinions in anesthesiology 2002; 15:669-673.
13. Bouaziz H, Mercier J, Narchi P et al: Survey of regional anesthesia practice among French residents at time of certification. Regional Anesthesia and Pain Medicine 1997; 22:218-222.
14. Bridenbaugh L: Are anesthesia resident programs failing regional anesthesia. Regional Anesthesia and Pain Medicine 1982; 7:26-28
15. Kopacz D, Neal J, Pollock J: The regional anesthesia 'learning curve': what is the minimum number of epidural and spinal blocks to reach consistency? Regional Anesthesia and Pain Medicine 1996; 21:182-190.
16. Hadzic A, Vloka D, Kuroda M et al: The practice of peripheral nerve blocks in the United States: a national survey. Regional Anesthesia and Pain Medicine 1998; 23:241-246.
17. Michael P, Juray S, Andrew Z et al: A survey of exposure to regional anesthetic techniques in American Anesthesia residency programs. Regional Anesthesia and Pain Medicine 1999; 24(1): 11-16.
18. Admir H: Is regional anesthesia really better than general anesthesia? Anesthesia & Analgesia 2005,101: 1631-1633.

20. Anand M, Uma L: Nerve stimulation for peripheral nerve blockade. Anaesthesia tutorial of the week no.149:6.
21. Silvestri E, Martinoli C, Derchi E, et al: Echotexture of peripheral nerves: Correlation between US and histologic findings and criteria to differentiate tendons. Radiology 1995; 197:291-296.
22. Gruber H, Peer S, Kovac P et al: The Ultrasonographic appearance of the femoral nerve and cases of Iatrogenic impairments. Journal of Ultrasound Medicine 2003; 22: 163-172.
23. Schafhalter-Zoppoth I, Gary T: The musculocutaneous nerve: Ultrasound appearance for peripheral nerve blocks. Regional Anaesthesia and Pain Medicine 2005;30 : 385-390.
24. Marhofer P, Greher M, Kapral S: Ultrasound guidance in regional anaesthesia. British Journal of Anaesthesia; 2005: 94(1): 7-17.
25. Sites D, Brull R: Ultrasound guidance in peripheral regional anesthesia: philosophy, evidence-based medicine, and techniques. Current Opinion in Anaesthesiology; 2006: 19(6): 630-639.
26. Williams R, Chouinard P, Arcand G et al: Ultrasound guidance speeds execution and improves the quality of supraclavicular block. Anesthesia & Analgesia; 2003: 97(5): 1518-1523.

28. Kapral S, Greher M, Huber G et al: Ultrasonographic guidance improves the success rate of interscalene brachial plexus blockade. *Regional Anesthesia and Pain Medicine* 2008; 33(3): 253-258.
29. Marhofer P, Schröogendorfer K, Wallner T et al: Ultrasonographic guidance reduces the amount of local anesthetic for 3-in-1 blocks. *Regional Anesthesia and Pain Medicine* 1998; 23(6): 584-588.
30. Marhofer P, Chan S: Ultrasound-guided regional anesthesia: current concepts and future trends. *Anesthesia & Analgesia* 2007; 104(5): 1265-1269.
31. Apfelbaum L, Chen C, Mehta S, et al: Postoperative pain experience: results from a national survey suggest postoperative pain continues to be undermanaged. *Anesthesia & Analgesia* 2003; 97:534–540.
32. Liu S, Carpenter L, Mackey C et al: Effects of perioperative analgesic technique on rate of recovery after colon surgery. *Anesthesiology* 1995; 83: 757–765.
33. Wu L, Naqibuddin M, Rowlingson J et al: The effect of pain on health-related quality of life in the immediate postoperative period. *Anesthesia & Analgesia* 2003; 97: 1078–1085.
34. Tong D, Chung F, Wong D: Predictive factors in global and anesthesia satisfaction in ambulatory surgical patients. *Anesthesiology* 1997; 87:856-864.

36. Macrae A: Chronic pain after surgery. *British Journal of Anaesthesia* 2001; 87:88–98.
37. Liu S, Block M, Wu L: Effects of perioperative central neuraxial analgesia on outcome after coronary artery bypass surgery: a meta-analysis. *Anesthesiology* 2004; 101:153–161.
38. Girish P, Babatunde O: Consequences of inadequate post operative pain relief and chronic persistent post operative pain. *Anaesthesiology Clinics of North America* 2005; 23: 21-26.
39. Hadzic A, Arliss J, Kerimoglu B et al: A comparison of infraclavicular nerve block versus general anesthesia for hand and wrist day-case surgeries. *Anesthesiology* 2004; 101:127.
40. Carp H, Bailey S: The association between meningitis and dural puncture in bacteremic rats. *Anesthesiology* 1992; 76:739 -742.
41. Vandermeulen P, Van Aken H, Vermeylen J: Anticoagulants and spinal-epidural anesthesia. *Anesthesia & Analgesia* 1994; 79:1165 -1177.
42. Vloka D, Hadzic A, Mulcare R: Femoral nerve block versus spinal anaesthesia for outpatients undergoing long saphenous vein stripping surgery. *Anesthesia & Analgesia* 1997; 84: 749 -752.

44. Auroy Y, Benhamou D, Laurent B et al: Major Complications of Regional Anesthesia in France. *Anesthesiology* 2002; 97:1274–1280.
45. Admir H, Jerry D: *Peripheral nerve blocks; Principles and practice*. 1<sup>st</sup> Edition. New York: McGraw-Hill Professional, January 1 2004: 67.
46. Lee L, Posner K, Domino K et al: Injuries associated with regional anesthesia in the 1980s and 1990s: a closed claims analysis. *Anesthesiology* 2004; 101(1):143-152
47. Fremling A, Mackinnon E: Injection injury to the median nerve. *Annals of Plastic Surgery* 1996; 37:561.
48. Shah S, Hadzic A, Vloka D et al: Neurologic complication after anterior sciatic nerve block. *Anesthesia & Analgesia* 2005; 100:1515.
49. Selander D, Edshage S, Wolff T: Paresthesiae or no paresthesiae? Nerve lesions after axillary blocks. *Acta Anaesthesiologica Scandinavica* 1979; 23:27.
50. Chan S, Brull R, McCartney L et al: An ultrasonographic and histologic study of intraneural injection and electrical stimulation in pigs. *Anesthesia & Analgesia* 2007; 104(5):1281-1284.
51. Lambert A, Lambert H, Strichartz R: Irreversible conduction block in isolated nerve by high concentrations of local anaesthetic agents. *Anesthesiology* 1994; 80:1082-1093



53. Ruetsch A, Fattinger E, Borgreat A: Ropivacaine induced convulsions and severe cardiac dysrhythmias after sciatic block. *Anaesthesiology* 1999; 90:1784-1786.
54. Litz J, Popp M, Stehr N et al: Successful resuscitation of a patient with ropivacaine-induced asystole after axillary plexus block using lipid infusion. *Anaesthesia* 2006; 61: 800.
55. Rosenblatt A, Abel M, Fischer W et al: Successful use of a 20% lipid emulsion to resuscitate a patient after a presumed bupivacaine-related cardiac arrest. *Anesthesiology* 2006; 105:217.
56. Admir H, Jerry D: *Peripheral nerve blocks; Principles and practice*. 1<sup>st</sup> Edition. New York: McGraw-Hill Professional, January 1 2004: 80-83.
57. Aitkenhead A, Smith G, Rowbotham D: *Textbook of Anaesthesia*. 5<sup>th</sup> Edition. London: Churchill Livingstone, August 23<sup>rd</sup> 2006: 315.
58. Ndungu N: *Patients' perspectives of regional anaesthesia at the Kenyatta National Hospital following elective orthopaedic surgery* 2010.

**Initials**

.....

**County where you practice**

.....

**A: BIODATA**

1. Age in years

.....

2. Sex

Male

Female

3. What are your qualifications in full?

.....

4. Years in practice post anaesthesia training

.....

5. Hospital where you practice anaesthesia. Tick all appropriate responses.

a. Teaching hospital

Kenyatta National Hospital

Moi Teaching and Referral Hospital

Aga Khan University Hospital

- Private hospital
- Mission hospital
- Ministry of Medical Services Hospital
- Municipality hospital

6. Where was your knowledge on peripheral nerve blocks acquired from? Tick all the appropriate responses.

- Specialist training
- Masters of medicine in anaesthesia training
- Post graduate diploma in Anaesthesia training
- Training workshops
- Others (specify) .....

7. How would you rate your training in peripheral nerve blocks ?

- Very good
- Good
- Adequate
- Poor
- Very poor

8. If less than adequate why? If adequate or more skip to question 9. Tick all appropriate responses.

- No exposure during post MBChB training
- Inadequate exposure during post MBChB training
- Lack of interest
- 
- Others (specify) .....

For the next set of questions please tick at the appropriate box.

9. Is performance of bilateral interscalene blocks recommended?			
10. Does a negative aspiration test abolish the possibility of intravascular injection?			
11. Can peripheral nerve blocks be used as the sole method of anaesthesia and analgesia during surgery?			
12. Do peripheral nerve blocks have inferior pain control compared to general anaesthesia?			

	Very Important	Important	Somewhat Important	Not Important
13. Do you believe patient education on procedure of peripheral nerve blocks is important?				
14. Do you think nerve blocks are important in the field of anaesthesia?				
15. Do you believe sedation is important when performing peripheral nerve blocks?				
16. Do you believe knowledge of relevant anatomy is important when performing nerve blocks?				

Yes

No

18. If yes, which one; if no skip to question 19. Tick all appropriate responses.

Spinal

Epidural

Caudal

Intravenous

Peripheral nerve blocks

19. How many peripheral nerve blocks do you do in a month?

none

< 4

Between 5 -10

>10

20. Which peripheral nerve blocks do you do often? Tick all appropriate responses.

Upper limb

Lower limb

Trunk

Others (specify).....

- Lack of equipment
- Lack of appropriate drugs
- Delay in performing block
- Delay in achieving adequate anaesthesia and analgesia
- Lack of the skills required
- Unreliability of results
- Not interested
- Others .....

22. Do you think your practice of peripheral nerve blocks will increase in the future?

- Yes
- No
- Do not know

# CONSENT EXPLANATION

## KNOWLEDGE, ATTITUDE AND PRACTICE OF ANAESTHESIOLOGISTS' PRACTICING IN KENYA TOWARD PERIPHERAL NERVE BLOCKS .

### Introduction

I am Dr. Stephen M. Mwangi, a third year resident in the Master of Medicine in Anaesthesia program at The University of Nairobi. I am conducting a survey on the knowledge, attitude and practice of anaesthesiologists practicing in Kenya toward peripheral nerve blocks, as part of my post-graduate program requirements. I will strive to answer any queries that may arise before and during the course of the intended study.

### Purpose of the research

The objective of this survey is to determine the knowledge, attitude and practice of peripheral nerve blocks among anaesthesiologists practicing in Kenya.

### Research Intervention

This research will not involve any interventions

### Participant selection

Every anaesthesiologist practicing in Kenya and registered with Kenya society of anaesthesiologists will be recruited into the study.

### Voluntary Participation

Your participation in this research is entirely voluntary. You are free to withdraw from the study at

#### Duration

The research is intended to take place between October 2012 and December 2012. During that time questionnaires will be administered to all consenting participants.

#### Risks

By participating in this research you will not be exposed to any risk.

#### Benefits

There are no known benefits from the study to the participants however knowledge gathered will be helpful in understanding usage of Peripheral Nerve Blocks in the country.

#### Confidentiality

The information that I collect from this research project will be kept confidential. Any information about you will have your initials to which a serial number will be assigned instead of your name.

#### Who to Contact

If you have any questions you may ask them now, during the period of the study or even after the study is over. If you wish to ask questions later, please use the contacts below:

Dr. Stephen M. Mwangi (Researcher) – **0720 806694** [stmuchiri@yahoo.com](mailto:stmuchiri@yahoo.com)

Dr. Mark Gacii (Supervisor) – **0733 709953** [gaciimark@gmail.com](mailto:gaciimark@gmail.com)

KNH/UON-ERC [uonknh\\_erc@uonbi.ac.ke](mailto:uonknh_erc@uonbi.ac.ke) , [www.uonbi.ac.ke/activities/KNHUoN](http://www.uonbi.ac.ke/activities/KNHUoN)



I have read the foregoing information. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I hereby consent to participate in this research.

Serial no. of Participant:.....

Date:.....

Statement by the researcher

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

Name of Researcher.....

Signature: .....Date: .....



UNIVERSITY OF NAIROBI  
COLLEGE OF HEALTH SCIENCES

P O BOX 19676 Code 00202  
Telegrams: varsity  
(254-020) 2726300 Ext 44355

Ref: KNH-ERC/A/311

KNH/UON-ERC

Email: [unikh\\_erc@uonbi.ac.ke](mailto:unikh_erc@uonbi.ac.ke)  
Website: [www.uonbi.ac.ke](http://www.uonbi.ac.ke)

Link: [www.uonbi.ac.ke/activities/KNHUoN](http://www.uonbi.ac.ke/activities/KNHUoN)



KENYATTA NATIONAL HOSPITAL

P O BOX 29723 Code 00202

Tel: 726300-9

Fax: 725272

Telegrams: MEDSUP, Nairobi

12<sup>th</sup> November 2012

Dr. Stephen Muchiri Mwangi  
Dept of Surgery  
School of Medicine  
University of Nairobi



Dear Dr. Muchiri

RESEARCH PROPOSAL: "A SURVEY OF ANAESTHESIOLOGISTS' PRACTICING IN KENYA ON KNOWLEDGE, ATTITUDE AND PRACTICE TOWARDS THE USE OF PERIPHERAL NERVE BLOCKS" (P134/03/2012)

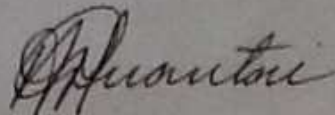
This is to inform you that the KNH/UoN-Ethics & Research Committee (KNH/UoN-ERC) has reviewed and **approved** your above revised proposal. The approval periods are 12<sup>th</sup> November 2012 to 11<sup>th</sup> November 2013.

This approval is subject to compliance with the following requirements:

- a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
- b) All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH/UoN-ERC before implementation.
- c) Death and life threatening problems and severe adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH/UoN-ERC within 72 hours of notification.
- d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH/UoN-ERC within 72 hours.
- e) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*)
- f) Clearance for export of biological specimens must be obtained from KNH/UoN-Ethics & Research Committee for each batch of shipment.
- g) Submission of an *executive summary* report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/or plagiarism.

For more details consult the KNH/UoN-ERC website: [www.uonbi.ac.ke/activities/KNHUoN](http://www.uonbi.ac.ke/activities/KNHUoN)

Yours sincerely



**PROF. A.N. GUANTAI**  
**SECRETARY, KNH/UON-ERC**

c.c.      The Deputy Director CS, KNH  
            The Principal, College of Health Sciences, UoN  
            The Dean, School of Medicine, UoN  
            The Chairman, Dept. of Surgery, UoN  
            The HOD, Records, KNH  
            Supervisor: Dr. Mark Gacii, Dept. of Surgery, UoN