"COMPARISON OF SPINAL ANAESTHESIA WITH HYPERBARIC LEVOBUPIVACAINE WITH FENTANYL AND HYPERBARIC BUPIVACAINE WITH FENTANYL IN ELECTIVE CESAREAN SECTIONS"

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In partial fulfilment of the requirements for the degree of

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IN
ANAESTHESIOLOGY

BY
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ABBREVIATIONS

ASA- American society of anaesthesiologists

CSF- Cerebrospinal fluid

IV- Intravenous

PDPH- Post dural puncture headache

OT- Operation theatre

LA- Local anaesthetics

CNS- Central nervous system

CVS- Cardiovascular system

SD- Standard deviation

ECG- Electrocardiogram

mcg- Microgram

Spo2- Percentage saturation of oxygen

SBP- Systolic blood pressure

DBP- Diastolic blood pressure

ABSTRACT

Background:

Racemic hyperbaric bupivacaine is the most commonly used local anesthetic for spinal anesthesia in women undergoing elective cesarean section. Many studies have been conducted to attain the same level of blockade with different drugs and dosages which offer less adverse effects. The introduction of hyperbaric levobupivacaine, the pure S (–) enantiomer of bupivacaine, has become more prevalent in India due to its lower risks of cardiotoxicity and neurotoxicity, as well as a shorter duration of motor block. In order to increase the analgesic duration without motor block additives are added in elective cesarean delivery.

Nonetheless, there is limited research on its effectiveness in obstetric anesthesia. Therefore, this study aimed to compare the sensory and motor block levels and side effects of equal doses of hyperbaric bupivacaine and levobupivacaine with the addition of intrathecal fentanyl in elective cesarean deliveries.

Materials and Methods:

Following the approval of the College Ethical Committee, 30 parturients with ASA class I-II undergoing elective cesarean sections were enrolled in the study after providing informed consent. They were randomly assigned to either Group BF, receiving 10 mg (2 ml) hyperbaric bupivacaine and 25 mcg (0.5 ml) fentanyl, or Group LF, receiving 10 mg (2 ml) isobaric levobupivacaine and 25 mcg (0.5 ml) fentanyl. Sensory and motor block characteristics were evaluated using pinprick, cold swab, and the Bromage scale; hemodynamic changes and side effects were also recorded. Neonatal outcomes were assessed with the APGAR score at 1 and 5 minutes.

Results:

Hemodynamic parameters like mean arterial pressure of Group BF were found to be lower. Group BF exhibited maximum motor block level with longer duration of analgesia. Whereas, in Group LF, shorter sensorial and motor block scores were seen with lesser side effects. Hemodynamic stability is similar in both the groups with no effects on neonate.

Conclusion:

The combination of intrathecal hyperbaric levobupivacaine and fentanyl is a viable alternative to the hyperbaric bupivacaine-fentanyl combination in cesarean surgeries, as it is less effective in producing motor block while maintaining hemodynamic stability at higher sensory block levels.

Key words: Cesarean sections, hyperbaric bupivacaine, hyperbaric levobupivacaine, fentanyl.

INTRODUCTION

INTRODUCTION:

Administering local anesthetics via the spinal route is favored for cesarean sections as it provides analgesia, anesthesia, and motor block. The effects are influenced by the volume, concentration, and dosage of the drug[1]. Racemic bupivacaine is the most frequently utilized local anesthetic for spinal anesthesia in women undergoing cesarean sections.

Hyperbaric solutions tend to produce cephalad spread which causes cardiothoracic fibers block leading to sudden bradycardia and arrest.They can also cause hemodynamic instability and bradycardia. Bupivacaine has a few adverse effects like cardiotoxicity and neurotoxicity. Levobupivacaine is the pure S enantiomer of bupivacaine and can be used in place of bupivacaine due to its lower cardiotoxicity and neurotoxicity. It also provides extended advantages because of its predictable spread after spinal anesthesia.

Incorporating low doses of opioids with local anesthetics during spinal anesthesia reduces the side effects associated with local anesthetics and prolongs their duration of action. It provides intra op and post op analgesia. Fentanyl can be added as it increases the duration of action and also spread of sensory blocks[2]. It also helps by reducing the dose of local anesthetic, thus reducing its side effects.

Therefore, the purpose of this study is to evaluate the sensory and motor block levels, along with the side effects resulting from equal doses of hyperbaric solutions of bupivacaine and levobupivacaine, when combined with intrathecal fentanyl, in elective cesarean sections.

AIMS AND OBJECTIVES

AIMS AND OBJECTIVES

AIM:

Our aim is to assess the effectiveness of using low-dose local anesthetics combined with an opioid in order to minimize the side effects typically associated with these local anesthetics.

OBJECTIVE:

PRIMARY OBJECTIVE:

- To evaluate and compare the sensory and motor block characteristics, as well as hemodynamic changes, of hyperbaric bupivacaine and levobupivacaine.
- To determine the duration of the block when fentanyl is added.

SECONDARY OBJECTIVE:

To evaluate side effects such as cardiotoxicity and neurotoxicity associated with bupivacaine and levobupivacaine.

REVIEW OF LITERATURE

- **Gulen Guler *et al*** evaluated the effectiveness of levobupivacaine and hyperbaric bupivacaine for spinal anesthesia in cesarean sections, noting that levobupivacaine presents a lower risk of cardiotoxicity and neurotoxicity. They divided 60 patients into two groups: one receiving hyperbaric bupivacaine and the other receiving isobaric levobupivacaine, with 25 mcg of fentanyl added to both groups. They found that levobupivacaine combined with fentanyl could be an excellent alternative to bupivacaine for elective cesarean sections due to a shorter motor block time and fewer side effects such as hypotension, bradycardia, and nausea[3].

- **Ak Singh *et al*** aimed to assess the efficacy and safety of isobaric levobupivacaine versus hyperbaric bupivacaine in lower limb orthopedic surgeries. The prospective, double-blinded cross-sectional study included 70 patients and compared the two anesthetics, finding that while bupivacaine had a faster onset of action, levobupivacaine resulted in a shorter duration of motor blockade[4].

- **Z, Kazak *et al*** sought to determine the effectiveness of perianal or saddle block using two different doses of hyperbaric levobupivacaine by evaluating reliability, anesthesia satisfaction, voiding time, and hospital stay in anal surgery with spinal anesthesia. In this double-blinded prospective study involving 78 patients aged 30 to 75 years, hyperbaric levobupivacaine was found to cause less motor blockade and faster dermatome regression, facilitating early ambulation and a shorter hospital stay, which is advantageous for outpatient surgery[5].

- ***J.F Luck et al*** conducted a study in 60 patients, and compared the clinical characteristics of 'hyperbaric' bupivacaine with their isomers levobupivacaine and ropivacaine[6] in spinal anesthesia. They found no significant differences between the three drugs, except that ropivacaine demonstrated more reliable action and a shorter duration of motor blockade.

- ***Akcaboy EY et al,*** evaluated the clinical effectiveness and quality of block of low-dose levobupivacaine against the low-dose bupivacaine when both were combined with fentanyl in transurethral resection of the prostate surgery[7].

- ***Capelleri et al,*** aimed to compare the unilateral spinal block produced by small doses of hyperbaric ropivacaine with hyperbaric levobupivacaine in 91 ASA I-II patients undergoing knee arthroscopy. Both groups provided adequate analgesia, but ropivacaine resulted in a shorter motor blockade, facilitating early discharge[8].

- ***M Mantouvalou et al,*** did a comparative study of the anesthetic efficacy and safety of three local anesthetic agents: racemic bupivacaine and its two isomers, ropivacaine and levobupivacaine, in patients undergoing lower abdominal surgery. The study concluded that the ropivacaine was the fastest-acting isomer and that bupivacaine required more use of vasoactive drugs compared to ropivacaine and levobupivacaine[9].

- ***Deori et al,*** compared the clinical effects (sensory block, motor block, hemodynamic effects, Apgar scores at 1 and 5 minutes, and adverse effects if any) of intrathecal 2.5 ml 0.5% isobaric levobupivacaine with 2.5 ml 0.5% hyperbaric bupivacaine for spinal anesthesia in lower segment cesarean sections. The study concluded that isobaric levobupivacaine provided better hemodynamic stability and faster mobility[10].

- ***Valery Piacherski et al,*** compared the clinical efficacy of spinal anesthesia using 0.5% isobaric bupivacaine, 0.5% isobaric levobupivacaine, and 0.5% hyperbaric bupivacaine[11-12]. They found that levobupivacaine had the slowest development of sensory and motor block, while isobaric bupivacaine and levobupivacaine provided the longest postoperative analgesia[11].

- ***Goel S et al,*** emphasized that the most often used local anesthetic in day care procedures is bupivacaine, and that higher intrathecal bupivacaine dosages might cause a greater degree of sensory and motor block, which can cause arterial hypotension and postpone hospital discharge. The minimal effective intrathecal fentanyl dose that, in conjunction with low-dose intrathecal bupivacaine, can provide sufficient surgical conditions without causing a prolonged recovery period was also assessed. They concluded that fentanyl 12.5 μg added to low-dose bupivacaine provided better surgical anesthesia with early mobility[12].

- ***HC Coppejans et al,*** aimed to compare bupivacaine with newer local anesthetics in equipotent doses combined with opioids for epidural and spinal anesthesia in elective cesarean sections. The research verified that the more recent local anesthetics may be used effectively and result in less motor blockage. Even yet, ropivacaine needed a dosage that was at least 50% more than that of bupivacaine or levobupivacaine[13].

- ***Gunusen et al***, identified levobupivacaine as the most commonly recommended local anesthetic for elective cesarean sections. The study looked at the block's properties, clinical effectiveness, the surgeon and patient's level of satisfaction, and the hemodynamic effects of various intrathecal plain levobupivacaine doses mixed with fentanyl, which prolongs parturients analgesia[14].

- ***Huang YF et al,*** did a comparison of the cardiovascular and central nervous system toxicity of levobupivacaine and bupivacaine among the sheep. They observed that levobupivacaine is less cardiotoxic, offering a greater safety profile[15].

- ***Casimiro et al***, examined the anesthetic epidural effects of levobupivacaine plus fentanyl against bupivacaine plus fentanyl in patients having lower limb surgery. They found no significant difference between the two groups, but the levobupivacaine group experienced a shorter duration of motor blockade[16].

CLINICAL ANATOMY

SPINAL ANAESTHESIA

Definition

Spinal anesthesia involves injecting a local anesthetic into the subarachnoid space, temporarily interrupting nerve transmission[17].

History

The term "spinal anesthesia" was coined by Leonard Corning in 1885 during his experiments with cocaine to address neurological issues[18]. His initial trials, beginning with a dog, resulted in temporary hind limb paralysis. Later, he administered the anesthesia to a human subject, initially with no effect, but successfully achieving numbness on a subsequent attempt. Corning's early work suggested the dog received spinal anesthesia, while the human likely received an epidural.

August Bier introduced modern spinal anesthesia in 1899 when his assistant[19], Dr. Hildebrandt, underwent a lumbar puncture. Despite initial difficulties, they persisted, and within 23 minutes of injection, observed complete sensory and motor block[20].

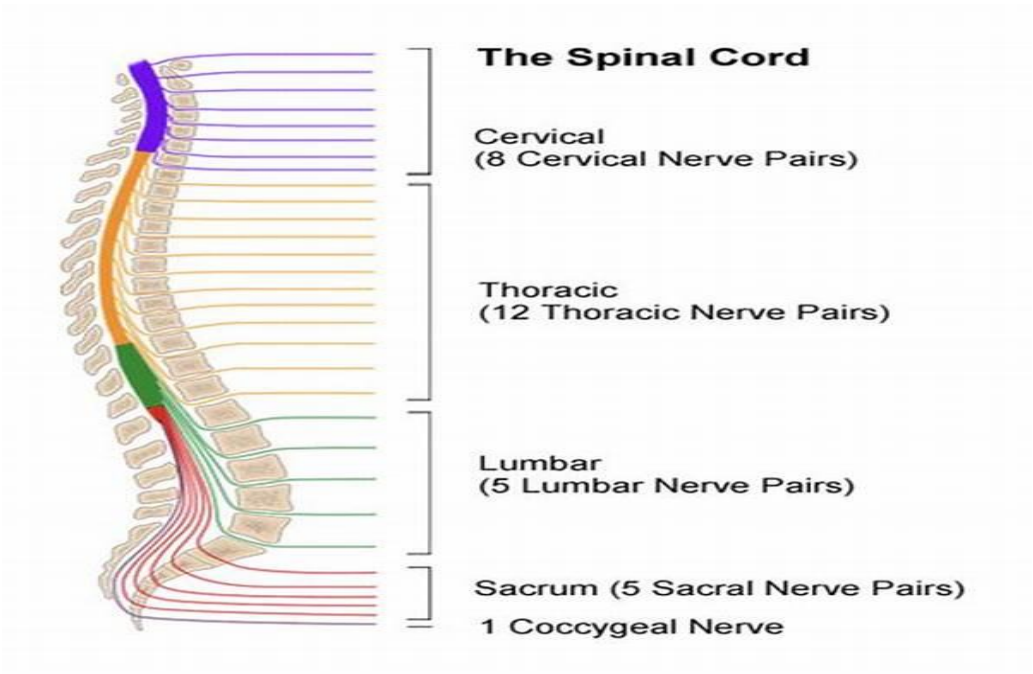
Anatomy

The spine consists of vertebral bones and fibrocartilaginous intervertebral discs, providing structural support and protecting the spinal cord and nerves. Each vertebral level has pairs of spinal nerves.

The spine forms a double C shape, convex anteriorly in the cervical and lumbar regions. Vertebrae are connected by fibrocartilaginous joints anteriorly and zygapophyseal joints posteriorly, with the central disc containing the nucleus pulposus[21].

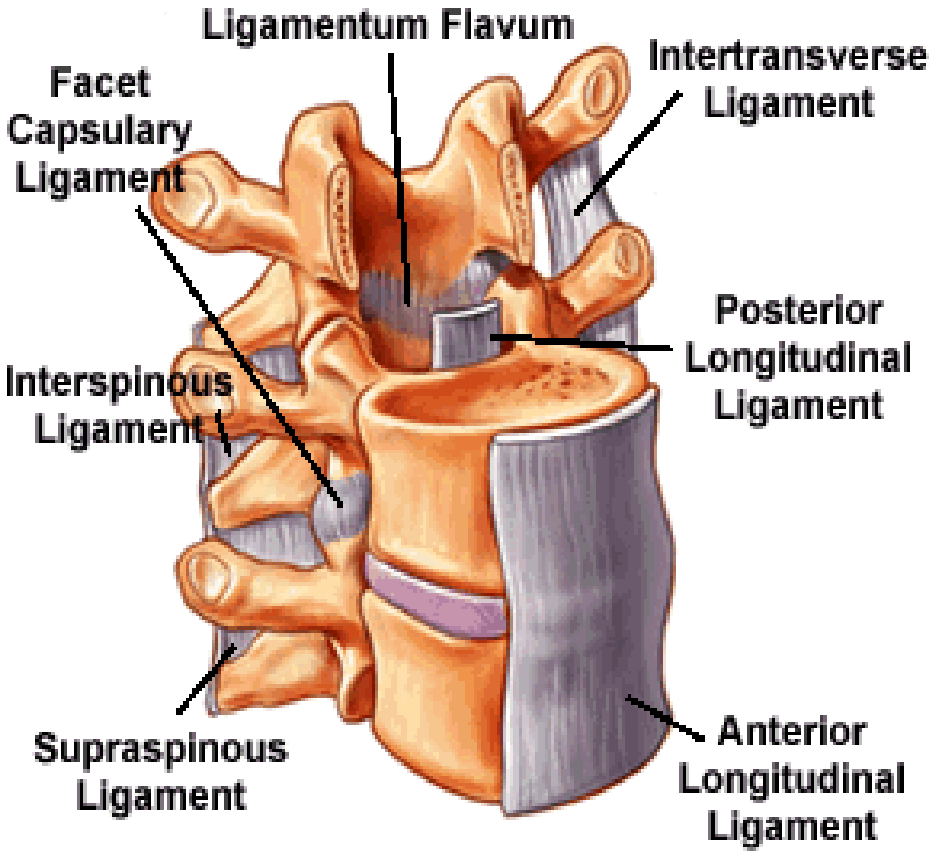
Notably, the thoracic spine has steeply angled spinous processes compared to the horizontal angulation of the lumbar spine, crucial for needle insertion.

Figure number 1: Number of spinal nerves



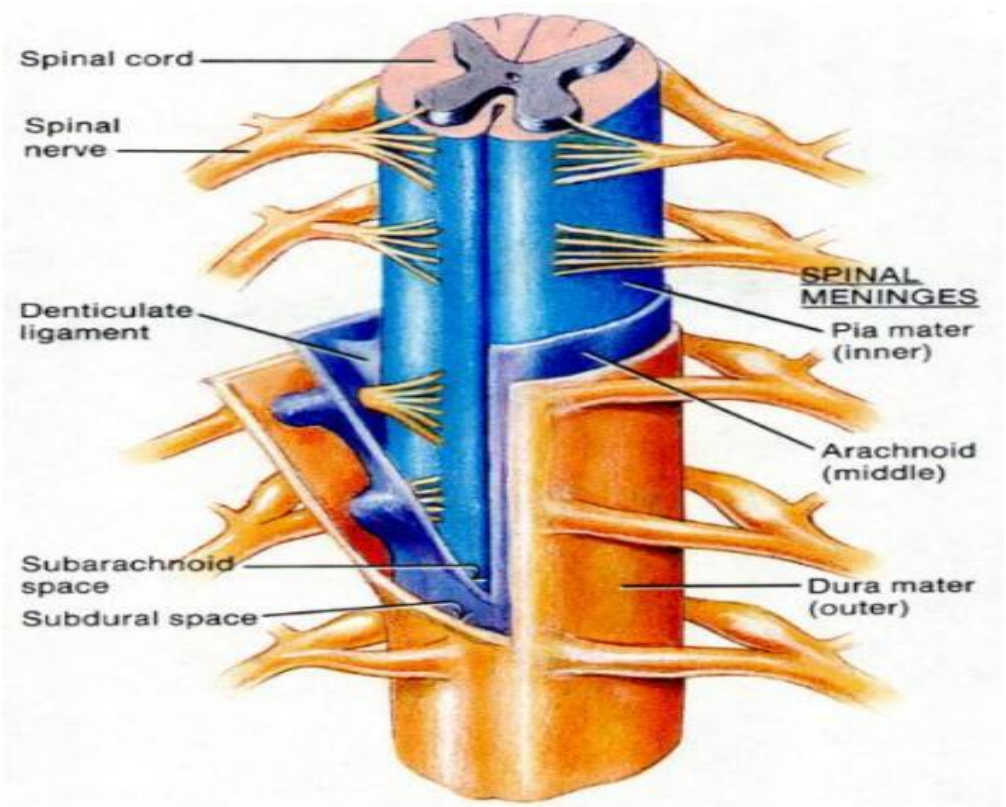
While the ligamentum flavum, interspinous ligament, and supraspinous[22] ligament give dorsal stability, the anterior and posterior longitudinal ligaments provide ventral support. The needle goes through these dorsal ligaments as well as the gaps between the next vertebrae's spinous processes and bony lamina when using a midline approach.

Figure Number 2: Ligaments in vertebral column



The spinal canal houses the spinal cord, its coverings (pia mater, arachnoid mater, and dura mater), fatty tissue, and a venous plexus. Cerebrospinal fluid (CSF) resides in the subarachnoid space.

Figure 3: Anatomy of spinal cord



Spinal cord

In adults, the spinal cord extends from the foramen magnum to the level of L1, and in infants, to the level of L3. The spinal cord terminates at conus medullaris, continued by filum terminale (fibrous extension) and cauda equina (neural extension).

Blood supply

1. **Anterior spinal artery** originating from the vertebral artery, supplies anterior 2/3rd of the spinal cord.

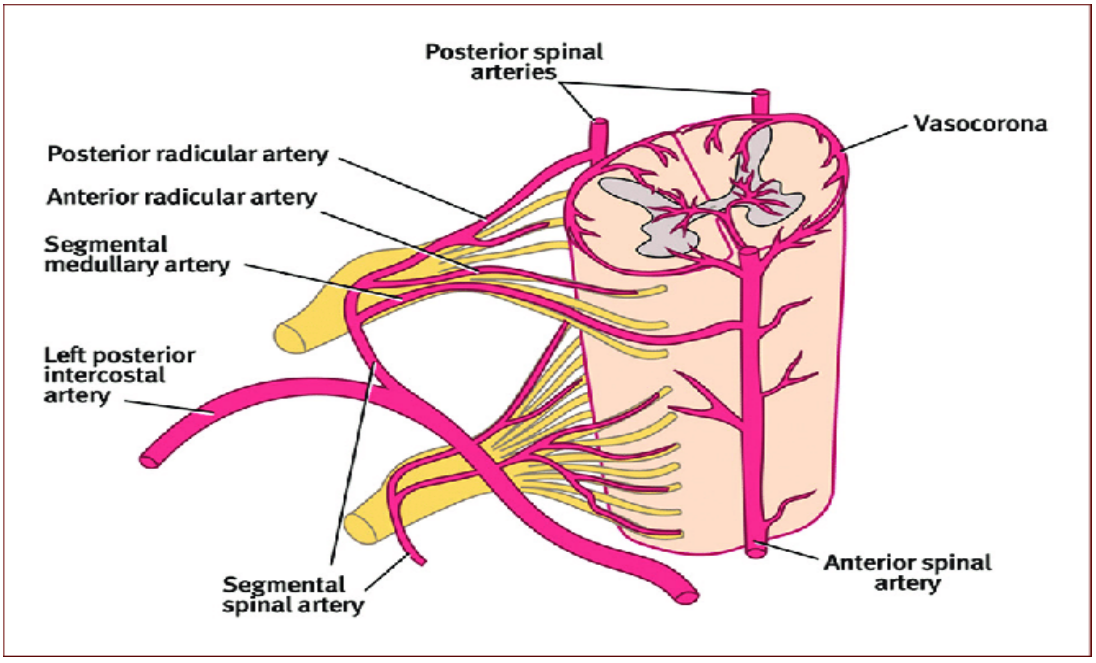
2. **Posterior spinal artery** originating from the posterior inferior cerebellar artery, supplies posterior 1/3rd of the spinal cord.

3. **Segmental arteries** originate from intercostal and lumbar arteries.

4. **Artery of Adamkiewicz**[23] is one major branch variably entering between T7 and L4 on the left side and supply anterior 2/3rd of the spinal cord in lower thoracic and lumbar regions.

   These arteries enter the spinal canal through each intervertebral foramen, where they branch out to supply the nerve roots and the spinal cord with medullary branches.[24].

Figure number 4: Blood supply of spinal cord



Mechanism of action

When injected intrathecally local anesthetics primarily bind to the spinal nerve roots and peripheral spinal cord regions. Rostral spread occurs via arterial pulsations from the skull, with lesser amounts reaching the central spinal cord region. Blockade of efferent motor and autonomic transmission results from anterior nerve fiber blockage, while somatic and visceral impulses are blocked by posterior nerve fiber blockade[25].

Somatic blockade

Spinal anesthesia achieves dense sensory and motor block with minimal anesthetic dose and volume. Smaller sympathetic fibers are more susceptible to blockade compared to larger sensory and motor fibers. Factors influencing drug penetration and uptake include drug mass, concentration of drug in CSF, the contact surface area, content of lipid, vascular supply of the local tissue, and size of the nerve root [25].

Clinical progression of differential nerve block in order is –

1. Autonomic fibres – sympathetic blockade occurs at two to six segments higher than the sensory block
2. Sensory fibres – cold > warm > pinprick >pain >touch >pressure
3. Motor fibres – two to three segments below the sensory block is when the motor block happens.

Differential nerve block depends on the following factors:

- Fiber arrangement in the nerve bundle
- Fiber diameter
- Inherent nerve fiber activity
- Variability in agent spread,
- Effects on ion channels other than Na+
- The specific local anesthetic drug used.

Autonomic blockade:

Spinal anesthesia predominantly blocks sympathetic and to a lesser extent, parasympathetic efferent transmission. Thoracolumbar is the sympathetic outflow; craniosacral is the parasympathetic outflow. Nonetheless, the neuraxial aneasthesia has no effect on the vagus nerve[25].

PHYSIOLOGICAL EFFECTS

Cardiovascular system:

Physiological effects of the spinal anesthesia resemble those induced by a combination of alpha 1 and beta-adrenergic receptor actions. Activation of beta 2 receptors leads to vasodilation, causing peripheral blood pooling and reduced venous return. This reduction in venous return subsequently decreases cardiac output. Sympathectomy predominantly induces venodilation due to the limited presence of smooth muscle in venules[26].

The primary causes of hypotension following spinal anesthesia are decreased cardiac output and systemic vascular resistance. Bradycardia may occur due to reduced right atrial filling or involvement of cardioaccelerator fibers from T1 to T4.

In case of hypotension –

- Trendelenburg position and leg elevation
- Oxygen supplementation
- Crystalloids and colloids administration
- Vasopressors like ephedrine, phenylephrine
- Atropine for bradycardia

Respiratory effects:

In healthy patients, pulmonary function remains largely unchanged with neuraxial blockade. Spinal anesthesia at mid-thoracic levels (without affecting the phrenic nerve) results in minimal or no alteration in tidal volume, respiratory rate, minute ventilation, or arterial blood gases[27]. Hemodynamic resuscitation can relieve apnea even in cases of complete spinal anesthesia, indicating that the reason may be brain stem hypoperfusion rather than phrenic nerve block.

However, caution is warranted when using neuraxial blocks in patients with respiratory compromise, as paralysis of respiratory muscles can impair effective coughing and secretion clearance[20], particularly affecting expiratory muscles.

Gastrointestinal effects:

Spinal anesthesia induces sympathetic blockade, leading to increased parasympathetic activity and subsequent gastrointestinal hyperperistalsis. This may cause patients to experience nausea and vomiting.

Hepatic blood flow decreases with reductions in mean arterial pressure resulting from any anesthesia technique[28].

Renal function:

Neuraxial blockade accompanies a decrease in renal blood flow, though the decline is not clinically significant. When perioperative urinary catheterization is unnecessary, it is advisable to use the smallest effective dose of short-acting drugs required for the surgical procedure and to limit intravenous fluid administration. Monitoring for urinary retention is essential postoperatively to prevent bladder distension following spinal anesthesia[21].

Central nervous system effects:

In neuraxial blockade there is reduced coronary blood flow, increased cerebral vascular resistance which reduces cerebral perfusion. no significant changes observed.

Metabolic and endocrine effects:

Surgery induces a neuroendocrine response characterized by the release of various substances. Neuraxial blocks effectively attenuate this response by reducing catecholamine release, potentially decreasing perioperative arrhythmias and ischemic events.

TECHNIQUE

Preparation:

- Explain the procedure to patient in brief
- Secure IV cannula with a large bore needle(20G/18G)
- Standard monitors to be attached
- Resuscitation equipment should be kept ready

Equipment

A standard spinal needle comprises a hub, a shaft terminating in a tip, and often includes a stylet.

The typical shaft length of a spinal needle is 9cm.

Various spinal needles are available, which can be classified according to:

i. Size of the needle –

Sizes are available from 18 to 30G. Large gauze spinal needles improves tactile sensation of needle placement, whereas complications related to CSF leaks and post dural puncture headache are less with finer needles.

ii. Shape of spinal needle tip –

1. Dura cutting needles
2. Dura splitting needles

Dura cutting needles-

These needles are bevelled tips with cutting edges

Cuts longitudinally aligned dural fibres

It causes more CSF loss and more likely to cause PDPH

Examples: Quincke, Atraucan, Greene.

Dura splitting needles-

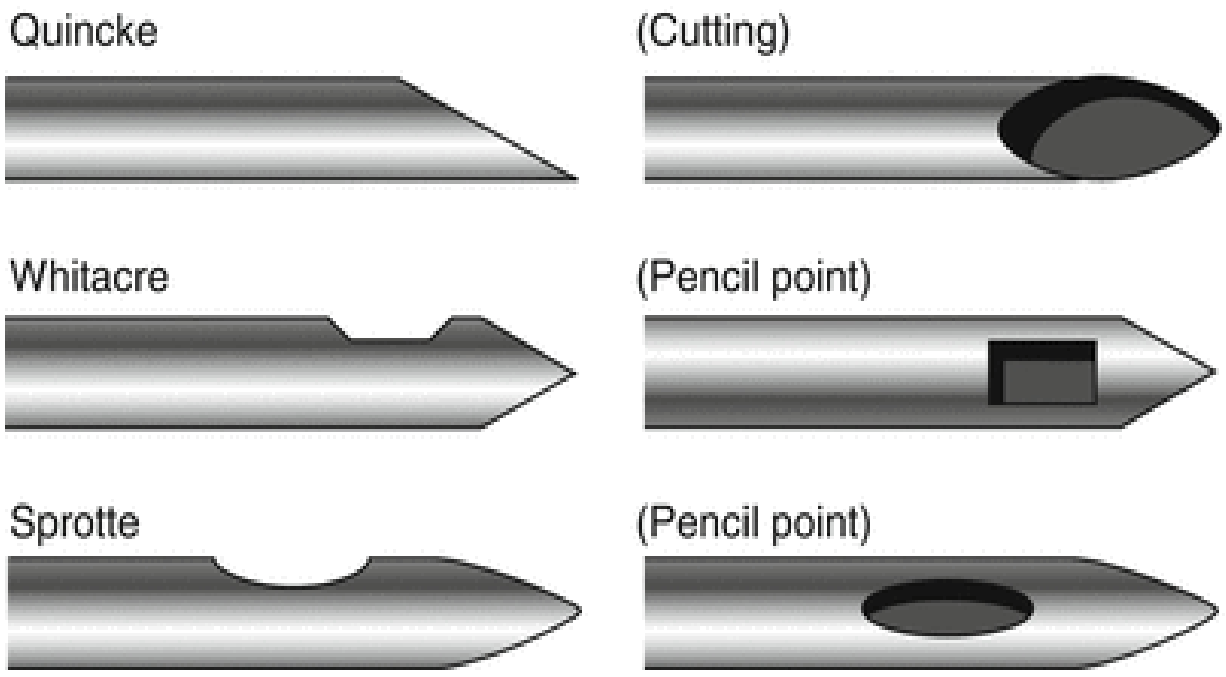
These are also called as pencil point tip needles.

The aperture is on the side of the shaft and require more time to insert.

Less amount of tissue coring and less likely to cause PDPH.

Examples: Whitacre, Sprotte, Eldor

Figure number 5: Common tip designs for spinal needles



1. Drug Factors

Mechanism of drug spread:

There are several factors which contribute to the level of blocka after a spinal anaesthesia. They are

Characteristics of the injected solution:

1. **Baricity:**

   Baricity refers to the density of local anesthetic solution relative to the density of cerebrospinal fluid (CSF), which is approximately 1.00059 g/liter. Solutions are classified based on their density:

   - Hypobaric – density < 1
   - Isobaric – density = 1
   - Hyperbaric – density >1, Hyperbaric drug spread is more predictable hence it is made hyperbaric by adding dextrose.
   - Gravity significantly influences the spread of hyper- and hypobaric solutions.

2. **Volume, dose and concentration**:

   - These factors are interconnected, with dose being the most critical determinant of local anesthetic spread[29].
   - Volume * concentration = dose

3. **Addition of other drugs:**

   - Vasoconstrictors – Vasoconstrictors prolong the duration of action by reducing systemic absorption, thereby enhancing the retention of the drug in the subarachnoid space[30].
   - Opioids – Opioids, when added to local anesthetics, exert a synergistic effect without affecting motor blockade.

2. **Patient factors**

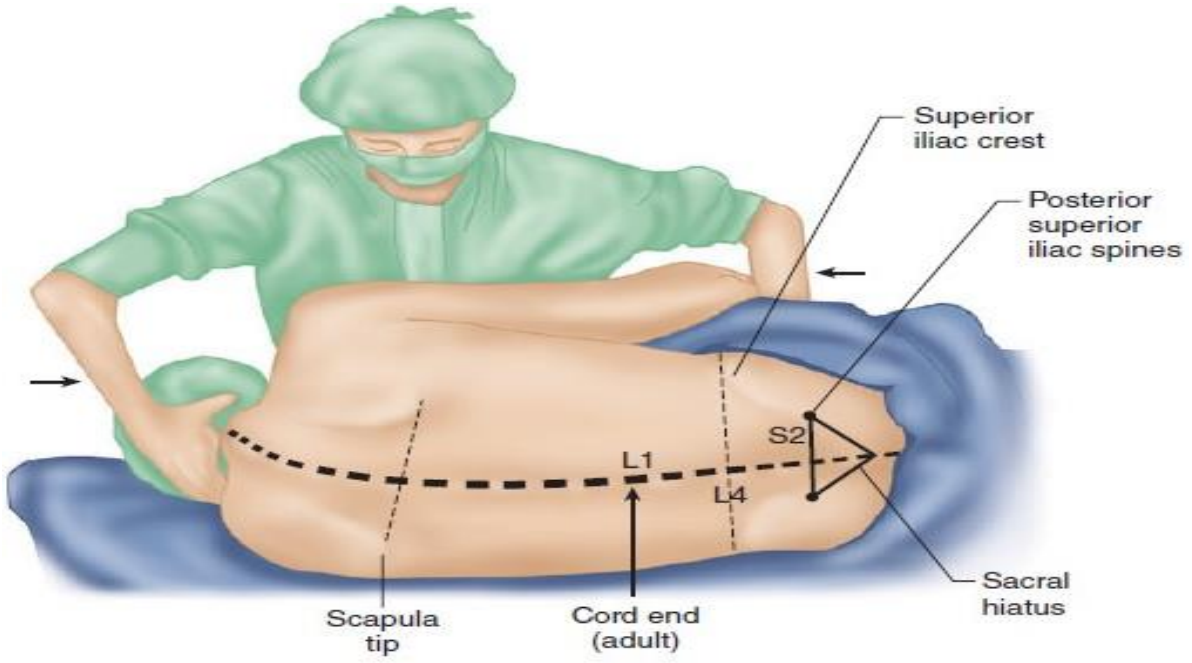
- **Age** – Advancing age correlates with reduced conduction velocity, axonal degeneration, fewer nerve fibers, and diminished CSF volume. Consequently, elderly patients require lower doses as the block height increases.
- **Height** – Height influences anesthesia spread, especially in cases of extreme variation.
- **Weight** – BMI affects anesthesia distribution; obese patients may experience increased spread due to reduced volume of CSF.
- **Position** –

1. **Lateral decubitus with universal flexion:**

Patient should be positioned with their back parallel to the OT table axis, thighs flexed upward, and neck forward (fetal position).

Head high/head low positioning can be utilized to leverage the baricity of spinal local anesthetics[31].

Figure number 6: Lateral decubitus with universal flexion

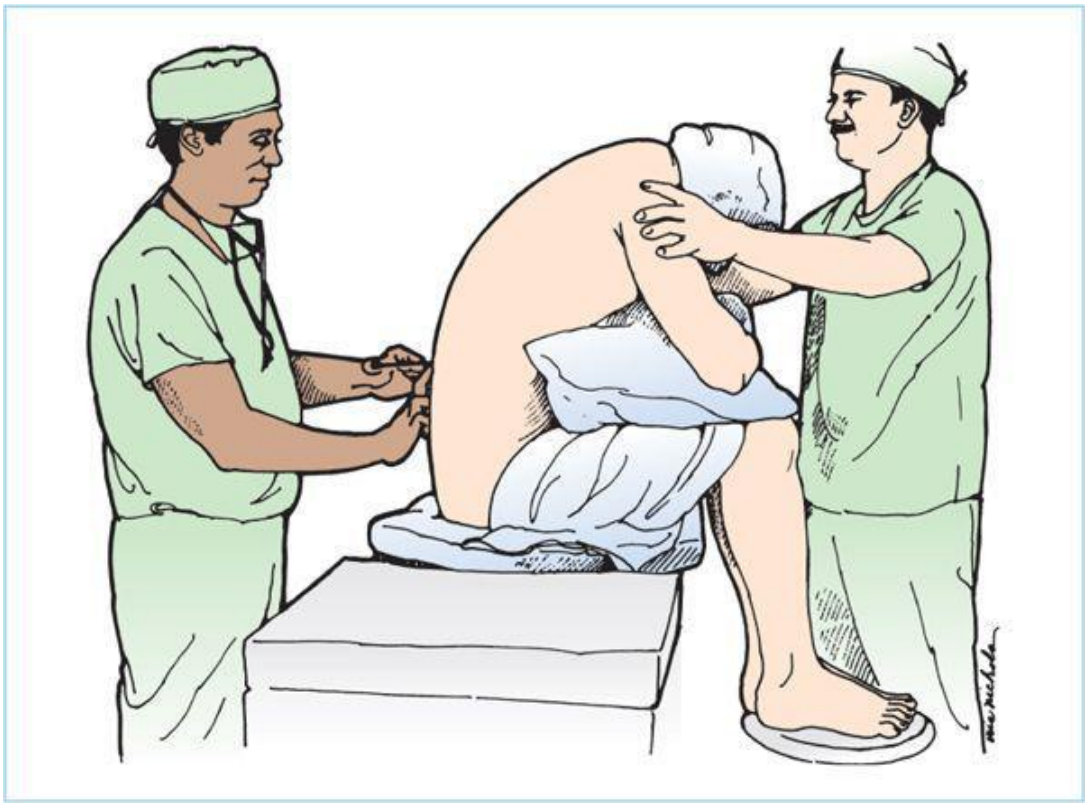


2. Sitting position:

The patient sits upright, back parallel to the OT table axis, feet supported, head flexed, arms supporting a pillow over the chest, and arching their back (C-shaped position).

This maximizes intervertebral space opening[32].

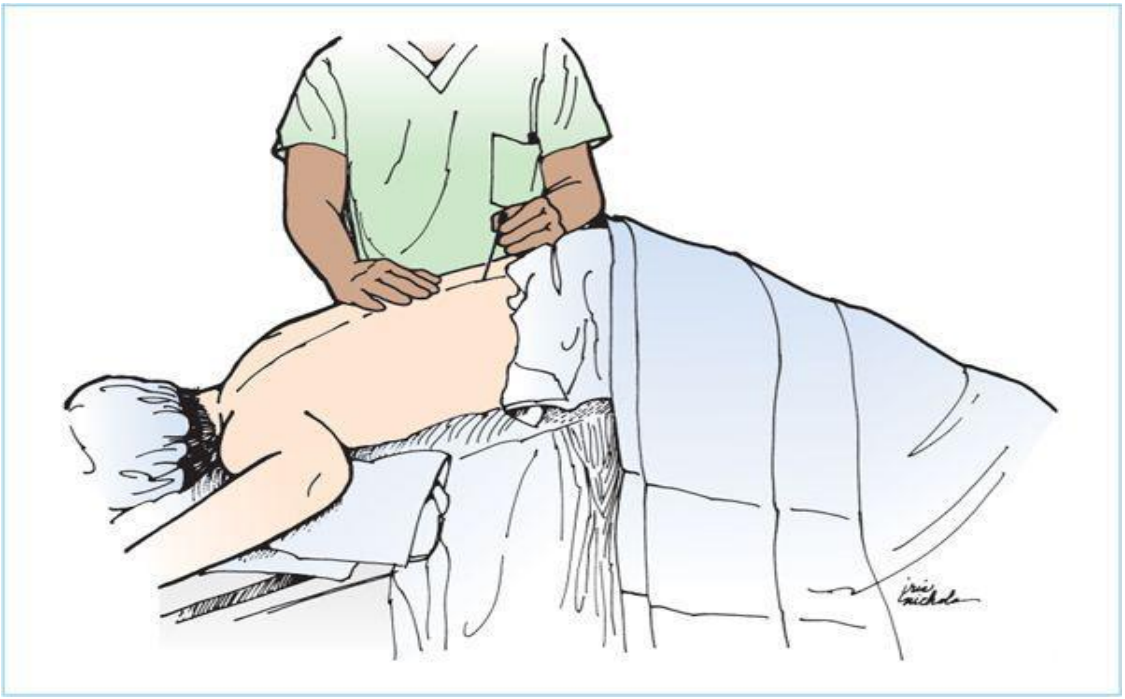
Figure number 7: Sitting position for spinal anesthesia



3. Prone position:

The prone position is used when the patient will be in this position for the surgical procedure (rectal, perineal and lumbar procedures). Hypobaric LAs are administered. Patient positions self, lumbar lordosis has to be minimized, a paramedian approach is often used[33].

Figure number 8: Prone position for spinal anesthesia



3.Procedures factors

1. **Patient position:**

   The baricity of the local anesthetic drug and the patient's posture both affect the degree of block. Whereas hypobaric solutions tend to ascend, hyperbaric solutions tend to settle downward.

2. **The injection level:**

   A larger spread is obtained by injecting with the plain solutions at higher levels.

3. **Type of needle:**

   Use of directional needles can influence the spread of anesthesia based on the direction of the needle aperture.

4. **Technique of injection:**

   This technique involves repeated aspiration of CSF and reinjection of the local anesthetic.

   Rate of injection:

   Rapid injections result in marked diffusion, leading to higher levels of blocks.

5. **Characteristics of spinal fluid:**

Factors such as volume, density, and pressure of CSF play a role in anaesthesia spread.

4. Projection and puncture

After ensuring the patient is correctly positioned, it is crucial to follow strict aseptic procedures. Betadine, a povidone-iodine solution, should be used to clean the back. Let it sit on the skin for at least two minutes, then wipe it off with dry gauze and cover it. Drawn between the iliac crests' greatest points, Tuffier's line typically corresponds to either the L4-L5 interspace or the L4 vertebral body. The subarachnoid space can be accessed in two ways:

- **Midline approach-**

- Advantages include an anatomically straightforward projection and a relatively avascular plane.
- The spinal needle is inserted midline, at a 15-20 degree cephalad angle, with the bevel parallel to the dura's longitudinal fibers, after local infiltration with 2% lignocaine.
- The dorsal to ventral structures that are punctured are the dura, supraspinous ligament, interspinous ligament, and skin.
- Upon passing through the ligamentum flavum and dura, there are noticeable "giveaways" or pops. The needle is placed in the subarachnoid space following the second giveaway. Following placement confirmation via CSF aspiration, 0.2 ml/s of local anesthetic is given.

- **Paramedian approach-**
  - This approach avoids anatomical limitations imposed by the spinous process by placing the needle laterally.
  - Aim for the midline 1 cm from the spinal needle, 10-15 degrees off the sagittal plane, in line with the mid space. As development proceeds, the dura gives way characteristically and CSF is acquired.

Contraindications of spinal anaesthesia:

Absolute

- Significant coagulopathy
- Localized sepsis
- Raised intracranial pressure
- Severe untreated hypovolemia
- Valvular heart diseases- fixed output lesions/stenotic lesions
- Septic shock
- Severe anemia
- Arachnoiditis, meningitis

Relative

- Neurological deficits and demyelinating diseases
- Spinal deformities
- Sepsis
- Thromboprophylaxis
- Inherited coagulopathy

PHYSIOLOGY OF PAIN

Pain can be acute or chronic. It can be a result of any injury, underlying morbidity, abnormal function of any organ. Long standing disease usually cause chronic pain. The visceral pain which is experienced at a location away from its actual site is called as referred pain due to the same embryological origin.

Pain has four components-

- Sensory-conscious perception
- Motor- withdrawal reflex
- Autonomic-tachycardia, perspiration
- Affective-anger

Changes in each organ system due to pain are-

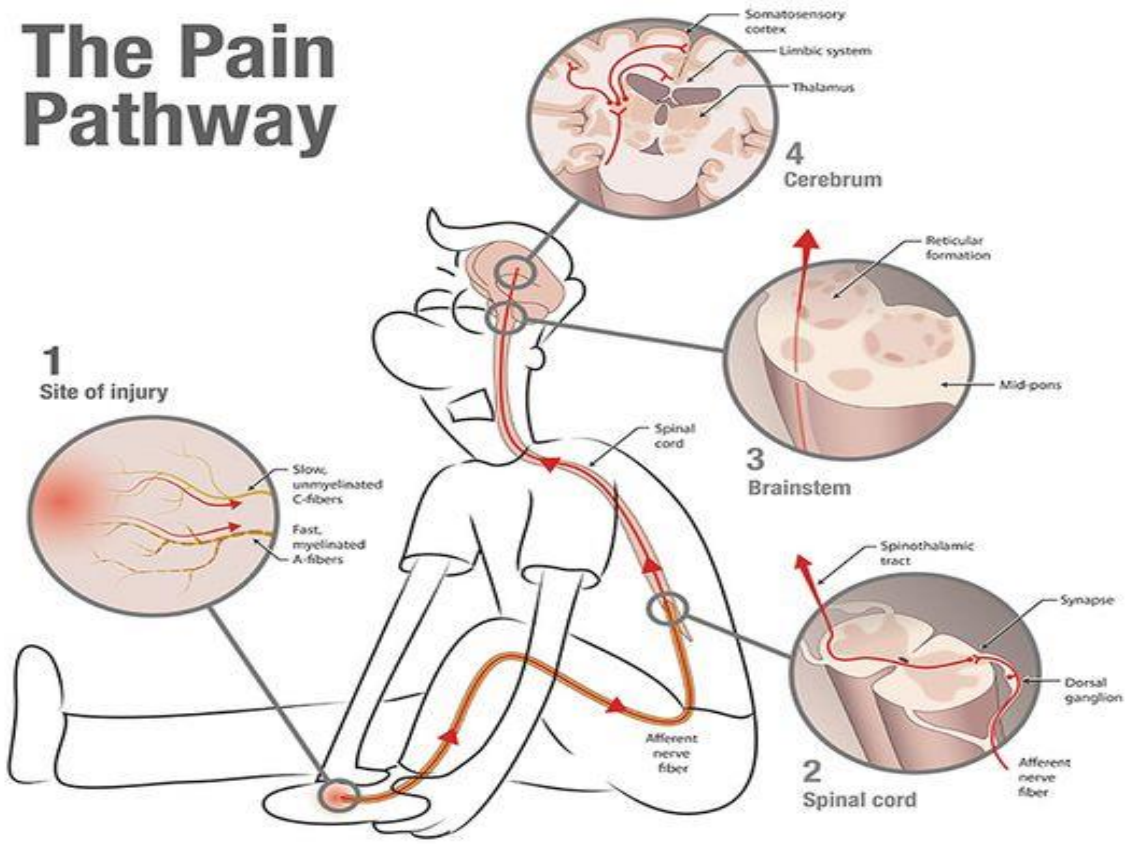
- Heart-tachycardia, hypertension, arrhythmias
- Lungs-oxygen consumption is increased, increase in respiratory rate
- Blood-thrombosis
- Gut-decreased gut motility, ulceration, urinary retention
- Endocrine-increased catecholamines
- Immunology-increased total count
- Psychology-anger, anxiety, decreased sleep

GATE THEORY

Ronald Melzack and Patrick wall, explained this theory. Here, the pain stimulus is not experienced if there is simultaneous stimulation by inhibitory impulses as well.

Pain is delivered by A-delta and C fibers. A-beta fibres can override the pain stimulus by delivering information about touch and pressure simultaneously. Brain can decrease the pain intensity by activating endogenous pain suppression pathways. Neurotransmitters involved are serotonin and enkephalin.

Figure number 9: Pain pathway



LOCAL ANAESTHETICS

Karl Coller introduced Cocaine in 1884, the first used local anaesthetic. These drugs cause reversible nerve blockages and decreases nerve sensation. They are used to decrease perioperative stress, for early recovery and to treat dysrhythmias.

The resting membrane potential of a nerve fibre is -60 to -70 mv. The main action of these drugs is by inhibiting voltage gated sodium channels, thereby preventing the influx of sodium through these channels. This delays the depolarization causing no action potential. Small diameter nerves are blocked before large diameter nerves. Myelinated nerves are more sensitive than the non-myelinated nerves. The Minimum Effective Concentration (Cm) is the lowest quantity of local anaesthetic required to block the nerves impulses.

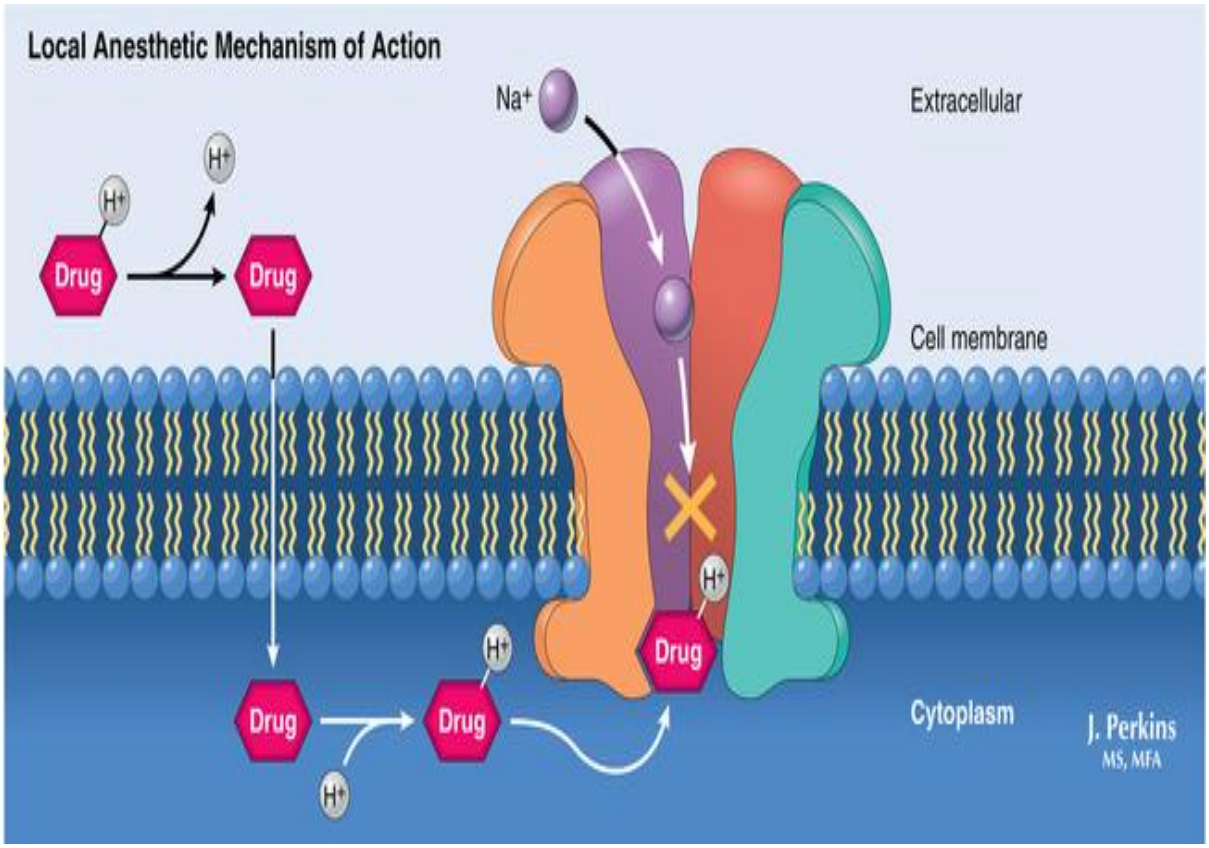
Sodium channels have alpha and the beta subunits. They exist in three stages open, closed, resting. Drugs bind the channels when they are in open state.

More the depolarization, more the probability of sodium channel blockade by the local anaesthetics. This is called as frequency or user dependent blockade. Motor fibres have twice the ‘Cm’ as that of sensory fibres. The A fibres and C fibres vary in diameter. The similar concentrations of local anaesthetics block both of them.

The structure of the local anaesthetics contains two groups. A lipophilic group and a hydrophilic group. These two groups are linked by an ester or amide linkage. Depending upon this link they are classifies as esters and amides. Pseudocholine esterase enzyme metabolizes esters and amides by the liver.

pKa is the pH at which there are equal amounts of unionized and ionized molecules. The drugs having low lipid solubility and less potency acts faster. Addition of sodium bicarbonate makes the drug more alkaline, making the onset faster.

Figure number 10: Local anesthetic mechanism of action



PHARMACOLOGY OF BUPIVACAINE

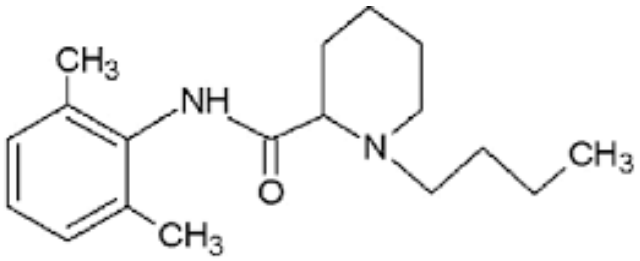
History

It is a widely used local anaesthetic drug, first synthesized by Ekenstam in 1957. It was used clinically by LJ Telivuo in 1963.

It is longacting amide type local anaesthetic chemically related to lignocaine and mepivacaine. It has two groups namely, an aromatic ring attached to a tertiary amine by an amide link. The aromatic ring gives lipophilic character. It is four times more potent than lignocaine.

The pKa value at 25degree celcius is 8.1, at physiological pH of 7.4, 15% is in unionized form and 85% is ionized.

Figure number 11: Chemical structure of bupivacaine



Pharmacokinetics:

Absorption

- The uptake of bupivacaine from its site of injection depends on-
- The drug concentration
- Volume of the drug
- Vascularity of the area
- Route of administration of the drug

Distribution

Bupivacaine is distributed throughout all body tissues, with varying concentrations in different organs; highly perfused organs exhibit higher concentrations compared to less perfused ones. It is rapidly cleared by lung tissue, causing a marked decrease in blood concentration as it passes through the pulmonary vasculature. The terminal half-life is approximately 30 minutes, and the steady-state volume of distribution is 72 liters.

Metabolism and excretion

Bupivacaine undergoes enzymatic degradation primarily in the liver. The main metabolic pathway involves N-dealkylation to pipecoloxylidine. Additional metabolites include N-desbutyl bupivacaine and hydroxy bupivacaine. Approximately 5% is excreted as pipecoloxylidine in urine, and 16% is excreted unchanged in urine. Clearance is approximately 7 ml/kg/min. Bupivacaine exhibits high plasma protein binding, predominantly to alpha-1 acid glycoprotein, with a binding capacity of 95%.

Pharmacological actions

Bupivacaine was the first local anesthetic noted for intermediate speed of onset of action with a long duration of action, and profound conduction block, with a significant separation between sensory and motor blockade.

Onset of action-

The onset of action is determined by pKa of individual agents since unionized form is local anaesthetic is responsible for diffusion across the nerve membranes. The amount of bupivacaine present in the unionized form is inversely proportional to its pKa. Hence bupivacaine has intermediate position in terms of pKa and latency of blockade. In vivo latency is also dependent on the concentration of drug used. 0.25% bupivacaine has slow onset of action but increasing to 0.75% results in increased anaesthetic effect.

Duration of action-

Duration of action is related to degree of protein binding because conduction blockade is believed to occur after the interaction with protein receptor within its protein receptor within the sodium channel. Compounds which have a greater affinity and bind more firmly to the receptor cause prolonged duration of block. Bupivacaine is removed extremely slow from the isolated nerves hence it has prolonged duration of action.

SYSTEMIC EFFECTS

Maximum dose of bupivacaine is 3mg/kg. It produces systemic effects after absorption. The rate and extent of absorption depends on dose, site of injection, volume and physiochemical properties of the drug. Bupivacaine is lipid soluble, more potent with less systemic absorption.

Central nervous system:

Bupivacaine crosses the blood-brain barrier, and systemic absorption or direct intravascular injection can lead to CNS toxicity. Dose-dependent effects include light-headedness, tinnitus, circumoral numbness, tongue paresthesia, seizures, unconsciousness, coma, respiratory arrest, and cardiovascular depression. In comparison to lidocaine (7.1), bupivacaine (3.5) has a reduced ratio of cardiovascular collapse (CC) to CNS toxicity (CC/CNS).

Cardiovascular system:

Bupivacaine depresses myocardial automaticity, shortens the refractory period, and reduces myocardial contractility and conduction velocity at higher concentrations. These effects are primarily due to direct blockade of cardiac Na+ channels and inhibition of the autonomic nervous system. Bradycardia, heart block, and hypotension may lead to cardiac arrest. High protein binding of bupivacaine complicates resuscitation efforts, especially in cases of pregnancy, respiratory acidosis, and hypoxemia.

Respiratory system:

Bupivacaine decreases the hypoxic drive. Apnea may result from phrenic nerve or intercostal nerve paralysis or by the depression of medullary respiratory center**.**

Hematological system:

Bupivacaine decreases coagulation, decreases platelet aggregation, enhances fibrinolysis and prevents thrombosis. Embolic events are reduced in patients receiving epidural bupivacaine.

ADVERSE EFFECTS:

Bupivacaine is relatively free of adverse effects when administered in appropriate doses. However systemic toxicity may occur when injected intravascularly or in large doses.

Toxicity:

CNS: Circumoral numbness, parasthesia, dizziness, tinnitus, blurred vision, followed by CNS excitatory features like restlesseness, agitation, tonic clonic seizures, followed by CNS depression like drowsiness, unconsciousness, coma, respiratory arrest.

CVS: Hypotension, AV block, dysrhythmia such as ventricular fibrillation, cardiac arrest.

Allergic reactions: Very rare. The preservative methylparaben may be responsible for the allergic reactions.

Musculoskeletal: Bupivacaine is myotoxic and can cause cystic degeneration, oedema and necrosis on direct injection in skeletal muscle.

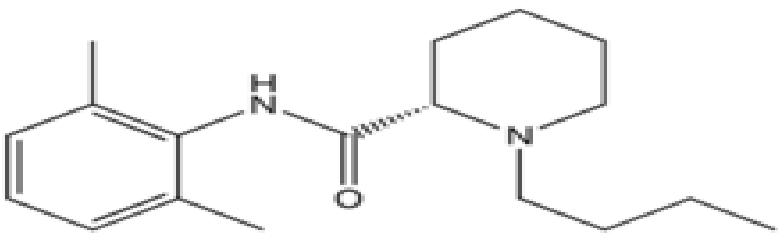
PHARMOCOLY OF LEVOBUPIVACAINE

Levobupivacaine is the S (−) isomer of racemic bupivacaine, exhibiting similar physicochemical properties. It is highly protein-bound, lipid-soluble, and shares a comparable pKa to bupivacaine.

Levobupivacaine's S enantiomer has exactly the same physicochemical characteristics, however it may have a different affinity for the site of action or have different adverse effects. The S-enantiomer exhibits significantly less neurological and cardiac damage than the R-enantiomer due to the enantiomer's distinct affinity for sodium, potassium, and calcium channels.

Levobupivacaine is as potent as bupivacaine and produces similar sensory and motor block. Some studies have shown more sensory blockade and less motor blockade compared to bupivacaine which may be related to the higher vasoconstrictive activity of levobupivacaine than that of R (+) enantiomer (dexbupivacaine) at lower doses[34].

Figure number 12: Chemical structure of levobupivacaine



Pharmacokinetics

Absorption

It depends on the route of administration, vascularity of the tissue, dose, volume and concentration. Absorption of epidural levobupivacaine is biphasic and influenced by factors such as age and drug concentration. Older patients may experience broader analgesic spread, up to three dermatomes, necessitating reduced dosing[35].

Distribution

Levobupivacaine is extensively bound to plasma proteins and widely distributed throughout the body.

Metabolism and excretion

Hepatic cytochrome P450 enzymes metabolize levobupivacaine to form 3-hydroxylevobupivacaine and desbutyl-levobupivacaine. Metabolites are excreted in the urine as glucuronic acid and sulfate ester conjugates.

Adverse effects

CNS:

Levobupivacaine induces less neurotoxicity compared to bupivacaine, yet CNS toxicity symptoms are similar. Its uptake by CNS cells is enantio-selective, enhancing safety profiles. Many animal models show that the convulsive threshold is higher than that of bupivacaine[36], which results in less CNS symptoms and excitatory alterations in the electroencephalogram in human volunteers following intravenous injection.

CVS:

The S (−) isomer exhibits weaker potassium channel blocking potency, reducing the likelihood of QTc interval prolongation. Stereoselective binding to sodium and potassium channels decreases the inhibitory effects, thereby lowering the overall toxicity potential compared to bupivacaine.

MATERIALS AND METHODS

- **Source of data:** This research was carried out in the Department of Anaesthesiology at B.L.D.E (Deemed to be University) Shri B. M. Patil Medical College, Hospital, and Research Centre, Vijayapura.

- **Study design**: This is a randomized double blind prospective comparative study.

- **Study period**: This study was conducted from September 2022 to march 2024

- **Study population**: This study will be done in 130 randomly selected parturient women scheduled for elective cesarean delivery of more than 37 weeks gestation, who belong to ASA (American society of anesthesiologist) class 1 and 2.

- **Statistical Analysis**:
- The Statistical Package for the Social Sciences (SPSS), Version 20, was used to analyze the data, which was entered into Microsoft Excel.
- Bar graphs, percentages, and Mean±SD were used to express the results.
- The independent t-test was applied for normally distributed continuous variables.
- The Mann-Whitney U test was used for non-normally distributed variables.
- The chi-square test was employed for categorical variables.
- A p-value of less than 0.05 was considered statistically significant.

INCLUSION CRITERIA:

1. Women more than 37 weeks period of gestation
2. ASA class I and II
3. Scheduled for elective cesarean delivery

EXCLUSION CRITERIA:

1. Refusing regional anaesthesia.
2. Having contraindications to spinal anaesthesia.
3. Body weight more than 100kg
4. Shorter than 150cm
5. Taller than 175cm
6. Women receiving medications other than perinatal vitamin, calcium, proteins and iron.
7. Mothers with previous Systemic diseases.
8. Expected mothers with foetal anomaly, placenta previa, abruption placenta.

METHODOLOGY

Preliminaries

- Written informed consent is taken.
- Nil per oral status confirmed.
- Intravenous access is secured with a 20gauge cannula.

Preanesthetic evaluation:

- Before taking the patient for surgery, detailed history, general and systemic examination is carried out the previous day.
- History of any significant medical illness is elicited and medication history taken.
- Airway, respiratory system and cardiovascular system are assessed.

Investigations:

- Complete blood count, Bleeding time, Clotting Time.
- Blood sugars.
- Serology.

PROCEDURE

- Patients are assessed preoperatively, nil per oral status confirmed on the day of surgery.
- Intravenous access is gained using a 20gauge iv cannula and Ringer's lactate fluid is started at 15ml/kg/hour.
- After shifting to surgical table standard monitoring devices like pulse oximetry, noninvasive blood pressure, ECG leads are attached and baseline values are recorded.

- Then patients are placed in left lateral decubitus position, under aseptic precautions painting and draping are done.
- Then subcutaneous infiltration is done with 1-2 ml of 2% lignocaine at L3-L4 interface.
- Then lumbar puncture is performed with 26G quincke's spinal needle and subarachnoid space is identified.
- Patients are randomly divided into two groups –
    - Group BF – 65 patients belonging to ASA class 1 and 2 received 10mg 0.5% (2 ml) of hyperbaric bupivacaine with 25mcg (0.5 ml) fentanyl.
    - Group LF – 65 patients belonging to ASA class 1 and 2 received 10mg 0.5% (2 ml) of hyperbaric levobupivacaine with 25mcg (0.5ml) fentanyl.
- Two group administered intrathecally within the 10 seconds. Subsequently, patients were turned to supine position. Oxygen at 4 L/min was administered through a facial mask.
- The sensory level of spinal anesthesia was assessed bilaterally in the mid clavicular line by pinprick, cold swab and motor level assessment with Bromage scale.
- Surgeons were permitted to operate once level of T4 to T6 is achieved.
- Spinal anesthesia Time will be noted and the following parameters are recorded every 2minutes from time 0 for the initial 60 minutes, then monitored every 30minutes till completion of surgery and every hourly for 24 hours.

Parameters:

- Pulse rate (PR)
- Systolic blood pressure (S.B.P.)
- Diastolic blood pressure (DBP)
- Mean Arterial pressure (M.A.P.)
- Oxygen saturation (SpO2)
- Using the intrathecal injection time as time zero, the duration of the sensory block, the time it takes to achieve its maximum level, the time it takes for the two dermatomes of the block to regression, and the time to initiation of the sensory block.
- It is noted when the sensory block level reverses from the maximum level to T12. The modified Bromage scale is used to measure the degree of motor block.
- Onset of sensory block was considered as duration between time of study drug given and loss of pain prick test at T10 dermatome level.
- Time of 2 segment regression of sensory block was taken as duration between time of onset of sensory block at T10 and sensory block regression to T12 dermatome level.
- Duration of sensory block was taken as duration between time of onset of sensory block and sensory block regression to S2 dermatome level.
- The time interval from study drug injection to motor paralysis equal to a Bromage score of 3 was used to determine the onset of motor block.
- From the moment a motor block started until all motor function returned to a Bromage score of 0, that was the duration of the motor block.
- Episode of bradycardia
- Episode of hypotension
- Episode of nausea and vomiting
- Adverse effects like shivering, itching, headache is noted.
- APGAR score noted at 1minute and 5 minutes.

INTERPRETATION:

CHARACTERISTICS OF ANESTHESIA:

SENSORY BLOCK

1. Onset of sensory block
2. Time to reach T10 level.
3. Time to reach T4 level.
4. Time for regression of two dermatomes.
5. Total duration of sensory block.

MOTOR BLOCK

1. Onset of motor block.
2. Time to reach maximum level.
3. Total duration of motor block.

DURATION OF ANALGESIA

SIDE EFFECTS:

Hypotension, bradycardia, headache, backache, nausea, vomiting, itching, sedation, shivering.

MODIFIED BROMAGE SCALE

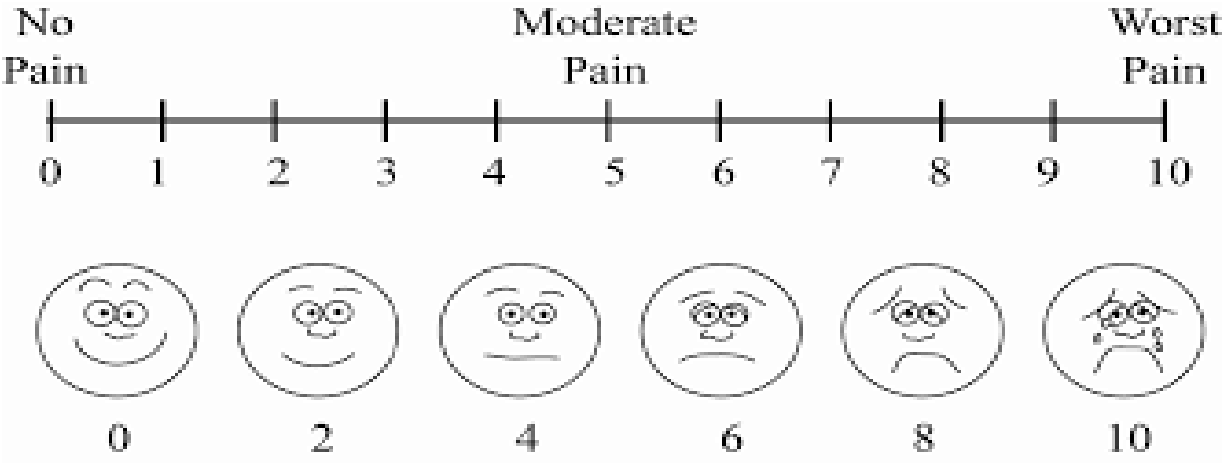
0 = No block

1 = Inability to raise extended leg

2 = Inability to flex knee

3 = Inability to flex ankle and foot

Figure number 13: Visual analogue scale (VAS)



OBSERVATION AND RESULTS

- This randomized double blind prospective comparative study was done on 130 parturients, belonging to ASA class 1 and 2, who is undergoing elective cesarean sections in B M patil medical college, Vijayapura from September 2022 to march 2024. Patients were randomized into 2 groups to receive hyperbaric bupivacaine and hyperbaric levobupivacaine.

- Group BF (n=65) received 2ml of hyperbaric bupivacaine 0.5% with 25mcg of fentanyl as additive.
- Group LF (n=65) received 2ml of hyperbaric levobupivcaine 0.5% with 25mcg of fentanyl as additive.
- Data was entered in Microsoft office excel sheet and was analyzed by standard statistical software.
- The results were summarized by routine descriptive statistics namely mean and standard deviation for numerical variables and counts and percentage for categorical variables.
- Numerical variables are compared between groups by Mann-whitney 'U' test.
- Chi square test was employed for intergroup comparison of categorical variables. Analysis done was 2 tailed and $p < 0.005$ was considered to be statistically significant.

1. AGE

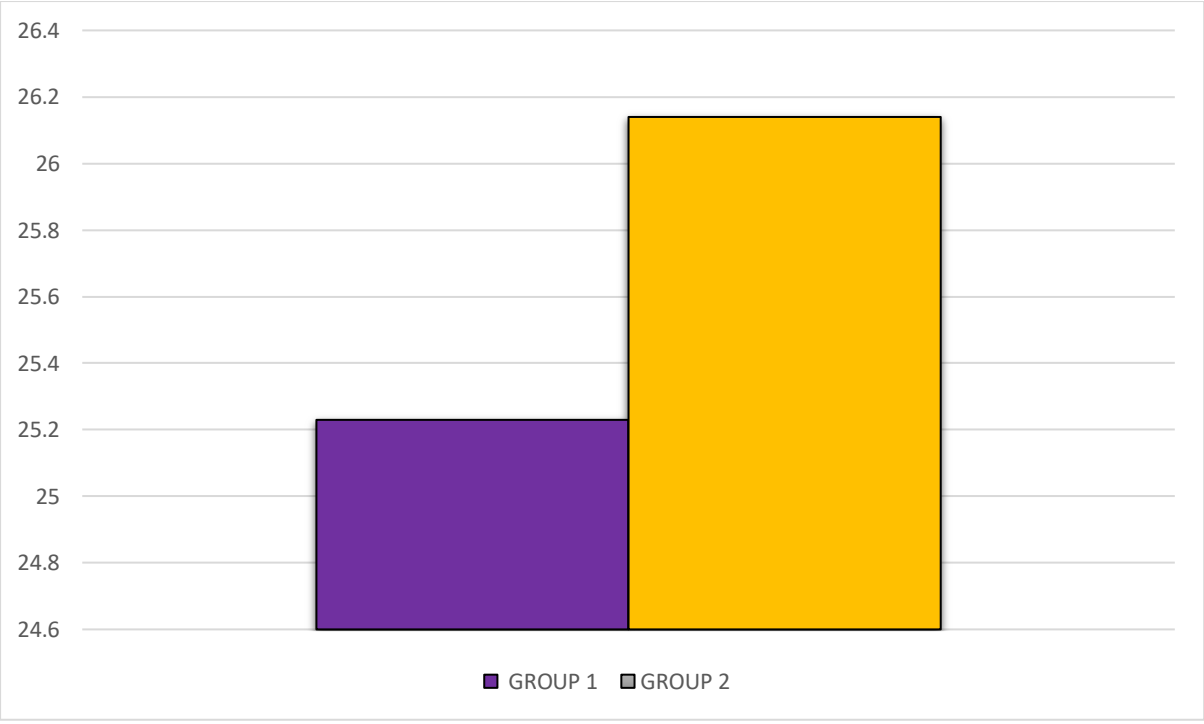
The following table 1 and bar diagram (graph 1) describe the age distribution of the patients in group 1 and group 2.

The mean age was similar in both groups (25.23 +/- 4.63 in group 1 and 26.14 +/- 4.86 in group 2)

Table 1 comparison of age (years)distribution

	GROUP 1		GROUP 2		MANN WHITNEY TEST	P VALUE
	MEAN	SD	MEAN	SD		
AGE	25.23	4.633	26.14	4.863	1840.5	0.204

Graph 1 comparison of age (years) distribution



2. ONSET OF SENSORY BLOCK IN MINUTES

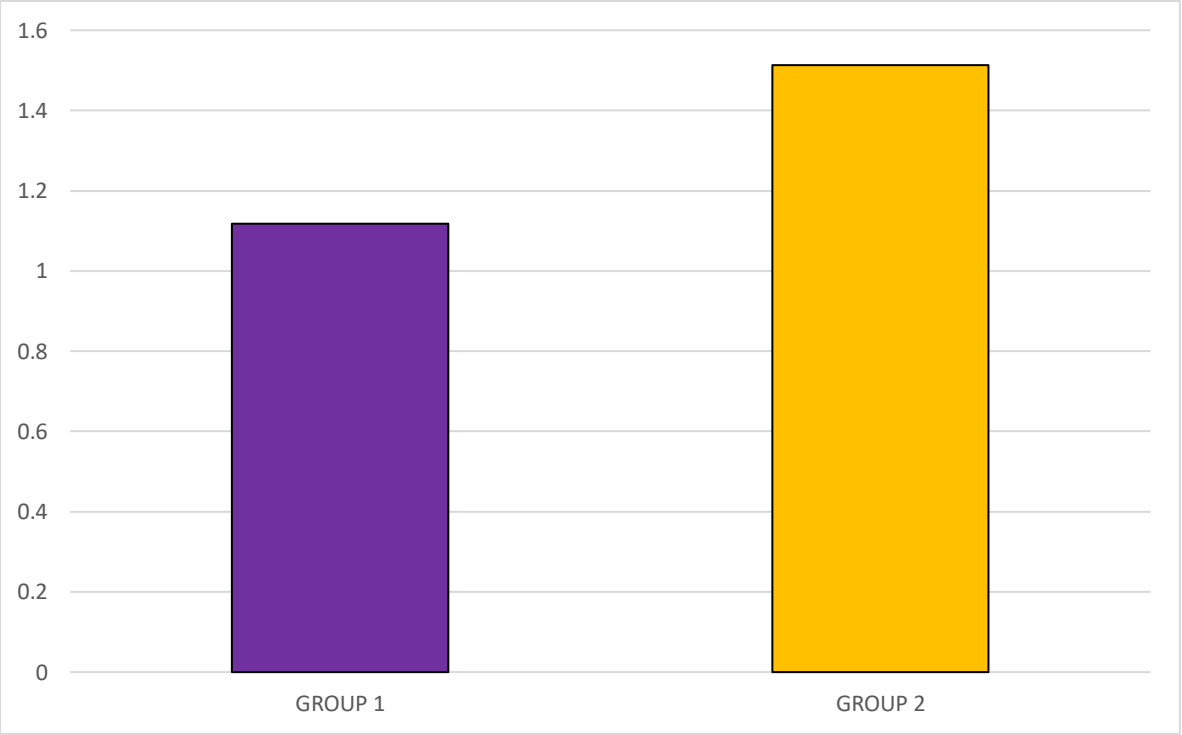
The following table 2 and graph 2 describe the mean onset of sensory block in group 1 and group 2.

The mean onset of sensory block was higher in group 2 levobupivacaine group (1.5131+/-0.86883) compared to group 1 bupivacaine group (1.1185+/-0.60023).

Table 2 comparison of onset of sensory blocks in group 1 and group 2

	GROUP 1		GROUP 2			
	MEAN	SD	MEAN	SD	MANN WHITNEY TEST	P VALUE
ONSET OF SENSORY BLOCK IN MINUTES	1.1185	0.60023	1.5131	0.86883	1578.5	0.11

Graph 2 comparison of onset of sensory blocks in group 1 and group 2



3. TIME TO REACH T10 IN MINUTES

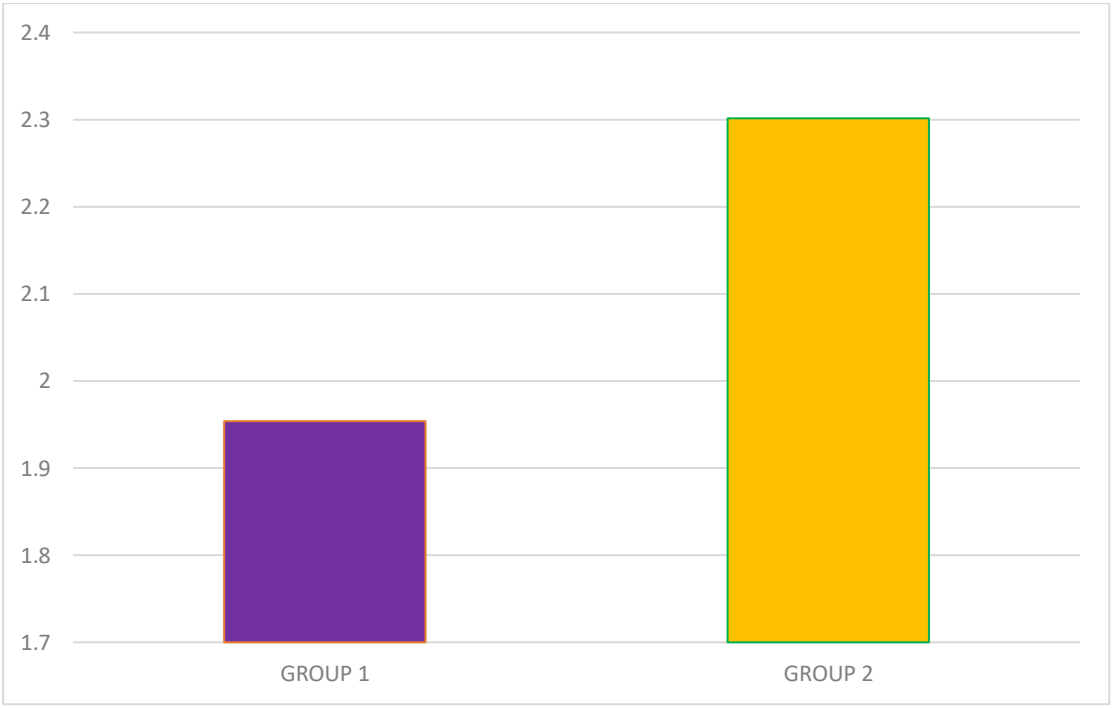
The following table 3 and bar diagram graph 3 describe mean onset of time to reach T10 in minutes in group 1 and group 2

The mean onset of time to reach T10 in minutes is more in group 2 levobupivacaine group (1.9538+/-1.25) compared to group 2 bupivacaine (2.3015+/-1.1818).

Table 3 comparison of time to reach T10 in minutes

TIME TO REACH T10 IN MINUTES	GROUP 1		GROUP 2		MANN WHITNEY TEST	P VALUE
	MEAN	SD	MEAN	SD		
	1.9538	1.25702	2.3015	1.1818	2027	0.517

Graph 3 comparison of time to reach T10 in minutes



4. TIME TO REACH T4 IN MINUTES

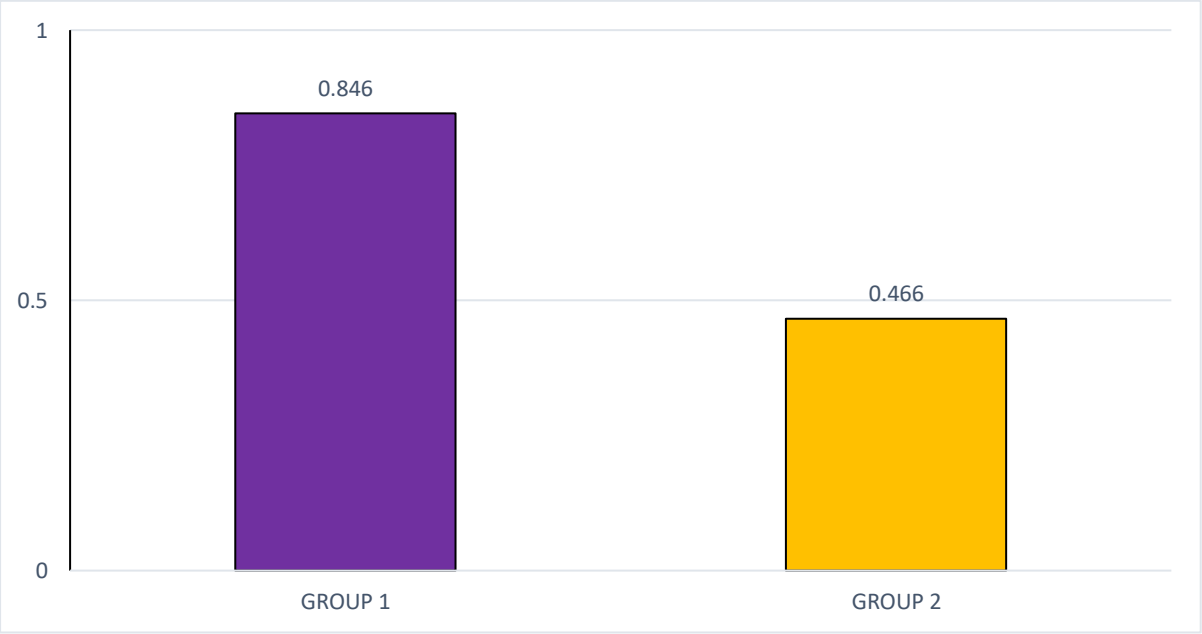
The following table 4 and graph 4 represents comparison of time to reach T4 in group 1 and group 2.

The means of comparison to reach T4 is slightly higher in group 1 bupivacaine group (0.846+/-2.89) compared to group 2 levobupivacaine (0.466+/-1.294)

Table 4 comparison of time to reach T4 in minutes

	GROUP 1		GROUP 2		MANN WHITNEY TEST	P VALUE
	MEAN	SD	MEAN	SD		
TIME TO REACH T4 IN MINUTES	0.846	2.8952	0.466	1.294	2027	0.517

Graph 4 comparison of time to reach T4 in minutes



5. TIME OF REGRESSION OF DERMATOME

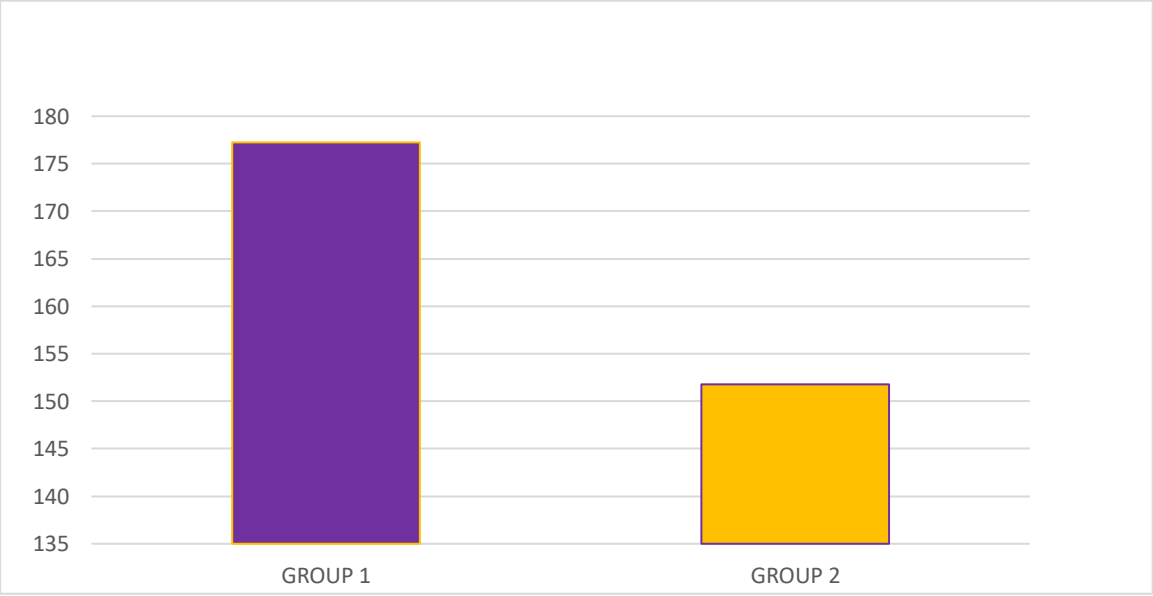
The following table 5 and graph 5 is comparison of regression of dermatome with group 1 and group 2.

The mean of regression shows significant difference between two group as p value is 0. The mean is higher in group 1 bupivacaine group (177.25+/-35.691) compared to group 2 levobupivacaine group (151.78+/-35.016).

Table 5 Comparison of regression of dermatome

	GROUP 1		GROUP 2			
	MEAN	SD	MEAN	SD	MANN WHITNEY TEST	P VALUE
TIME OF REGRESSION OF DERMATOME	177.25	35.691	151.78	35.016	2027	0

Graph 5 comparison of regression of dermatome



6. TOTAL DURATION OF SENSORY BLOCK

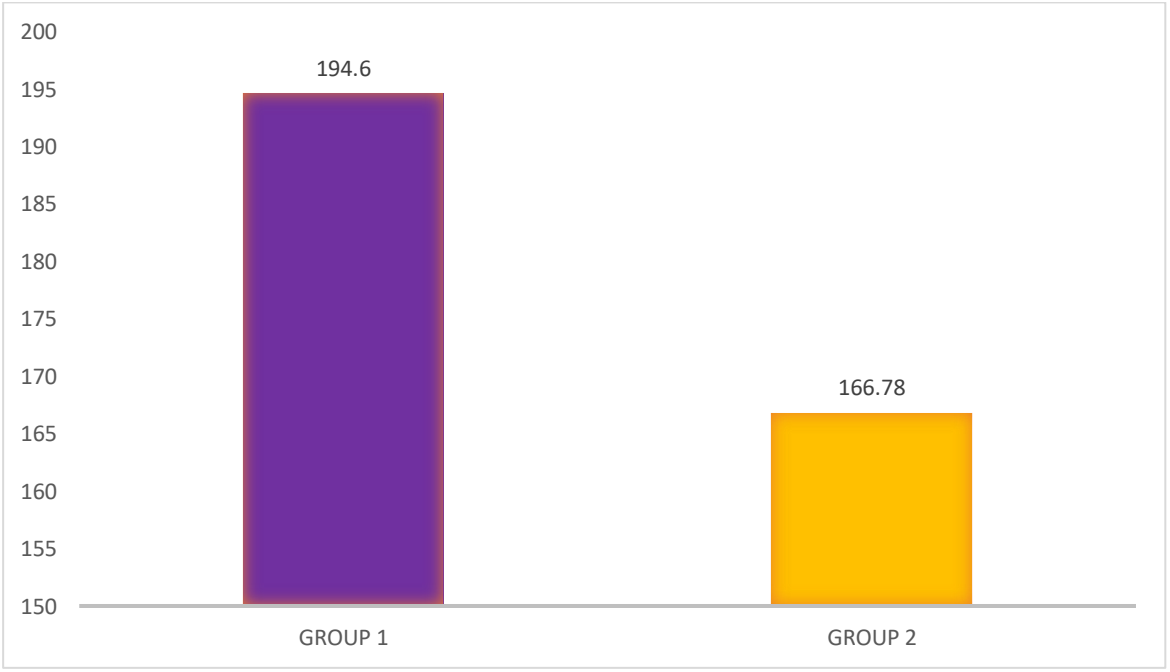
The following table 6 and graph 6 represents comparison of total duration of sensory block in group 1 and group 2.

The mean of comparison of total duration of sensory block is significantly more in group 1 bupivacaine group (194.6+/-30.543) compared to group 2 levobupivacaine group (166.78+/-31.978). p value is 0 which is significant.

Table 6 Comparison of total duration of sensory block

TOTAL DURATION OF SENSORY BLOCK IN MINUTES	GROUP 1		GROUP 2		MANN WHITNEY TEST	P VALUE
	MEAN	SD	MEAN	SD		
	194.6	30.543	166.78	31.978	1085	0

Graph 6 Comparison of total duration of sensory block



7. ONSET OF MOTOR BLOCK IN MINUTES

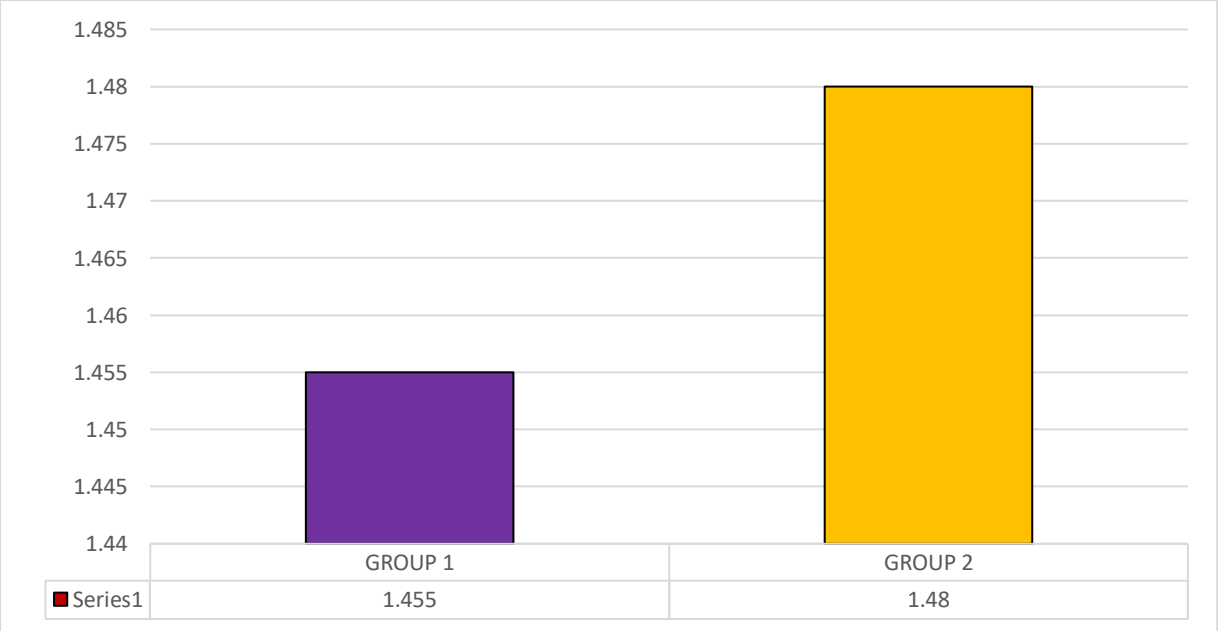
The following table 7 and graph 7 describes the comparison of onset of motor block in group 1 and group 2.

The mean of comparison of motor block in group 1 is (1.45+/-0.99) compared to group 2 (1.48+/-0.66).

Table 7 Comparison of onset of motor block

	GROUP 1		GROUP 2			
	MEAN	SD	MEAN	SD	MANN WHITNEY TEST	P VALUE
THE ONSET OF MOTOR BLOCK IN MINUTES	1.455	0.99	1.48	0.6636	1796	0.125

Graph 7 comparison of onset of motor block



8. TIME TO REACH MAXIMUM LEVEL IN MINUTES

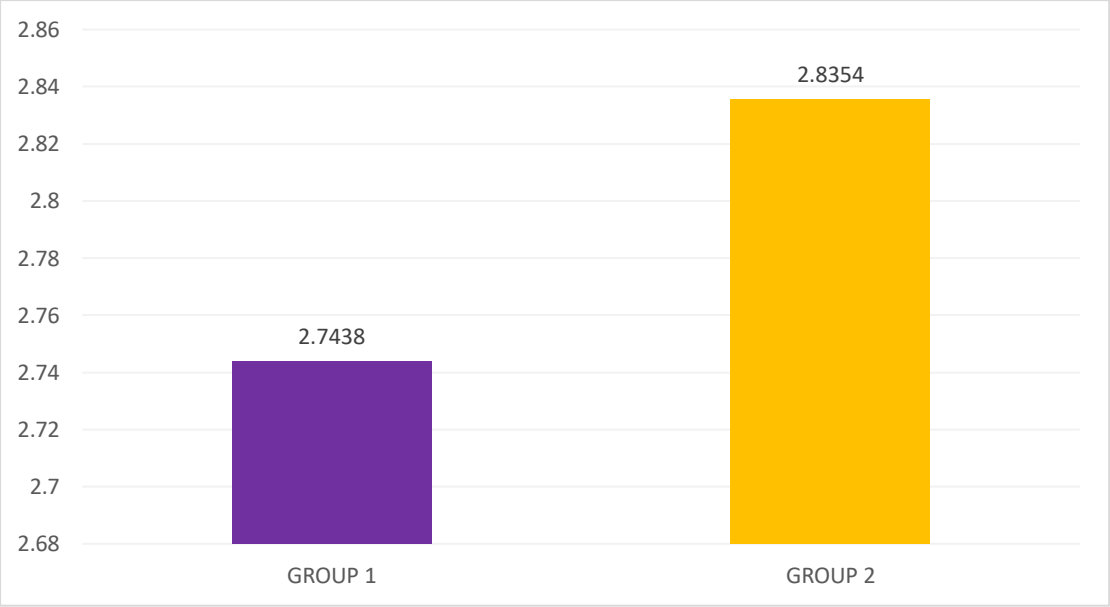
The following table 8 and graph 8 describes comparison between group 1 and group 2 the time to reach maximum level in minutes.

The mean of comparison of time to reach maximum level is similar in both groups. In group 1 it shows mean (2.7438+/-1.8255) and in group 2 it shows (2.834+/-1.1).

Table 8 comparison about time to reach maximum level in minutes

	GROUP 1		GROUP 2			
	MEAN	SD	MEAN	SD	MANN WHITNEY TEST	P VALUE
TIME TO REACH MAXIMUM LEVEL IN MINUTES	2.7438	1.8255	2.8354	1.1	1773.5	0.105

Graph 8 comparison about time to reach maximum level in minutes



9. DURATION OF ANALGESIA

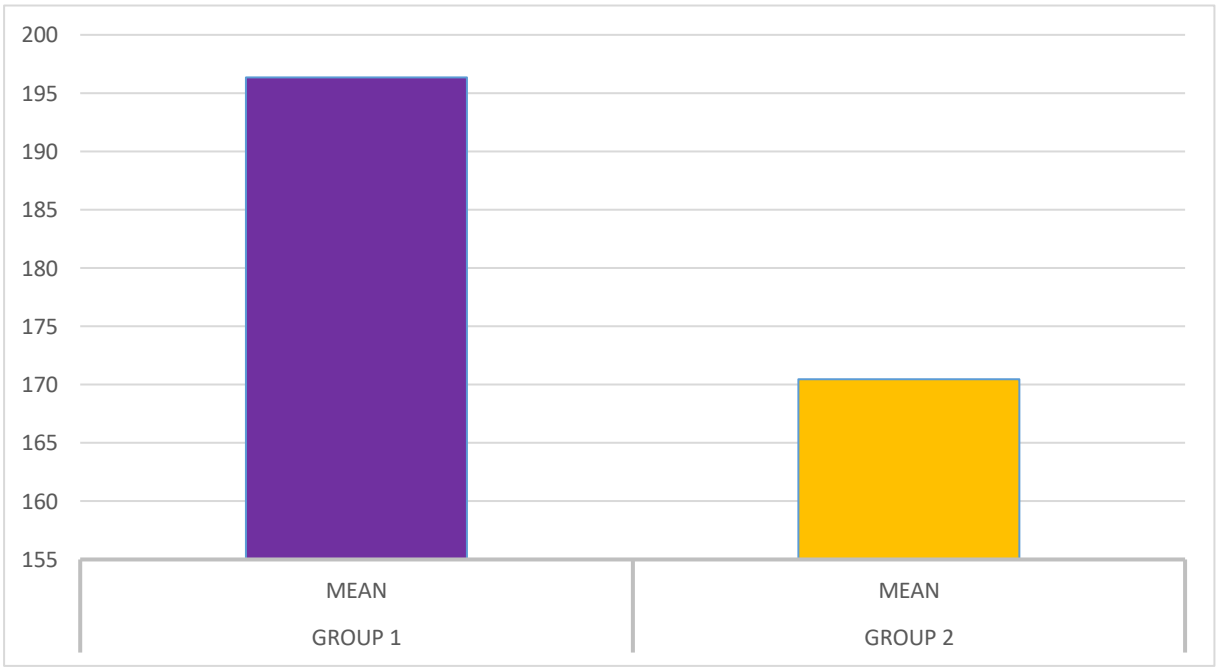
The following table 9 and graph 9 describes comparison of total duration of analgesia in two groups which is significant as p value is 0.

The mean hour in group 1 bupivacaine (196.35+/-29.65) is longer duration compared to group 2 levobupivacaine (170+/-34.425).

Table 9 Comparison of duration of analgesia

DURATION OF ANALGESIA IN HOURS	GROUP 1		GROUP 2		MANN WHITNEY TEST	P VALUE
	MEAN	SD	MEAN	SD		
	196.35	29.654	170.46	34.425	1318.5	0

Graph 9 Comparison of duration of analgesia



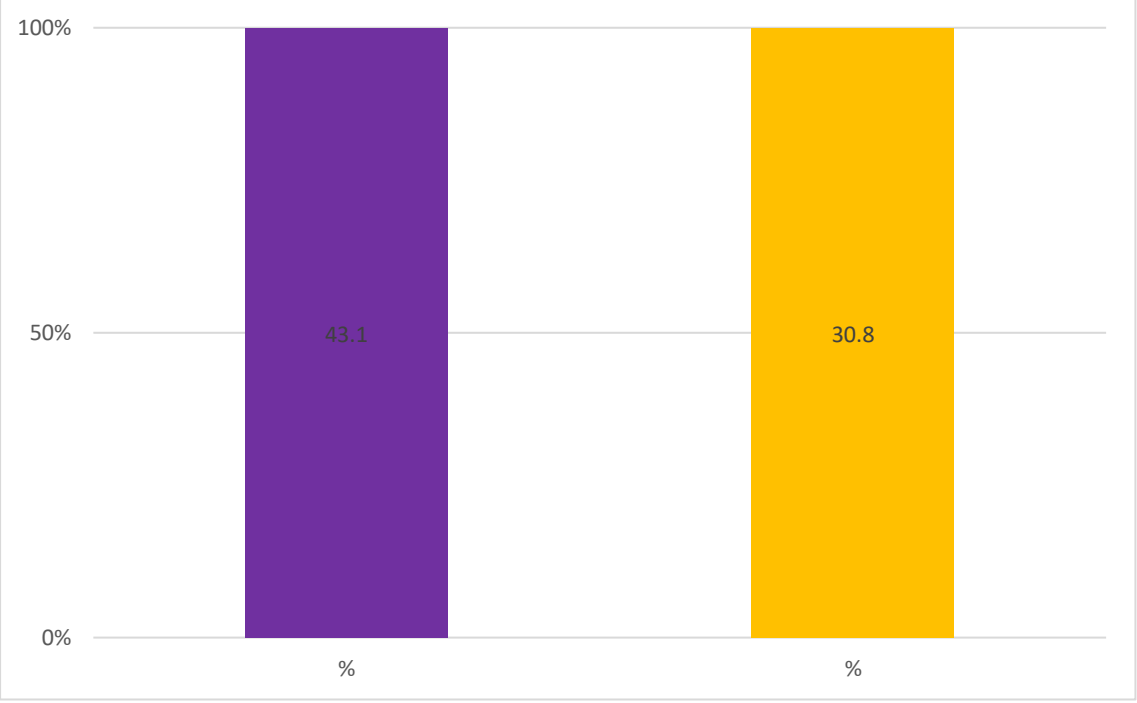
10.EPISODES OF HYPOTENSION

The following table 10 and graph 10 describes the episode of hypotension in group 1 and group 2. The incidence of hypotension is slightly higher in group 1 bupivacaine group compared to group 2 levobupivacaine.

Table 10 Comparison of episodes of hypotension

	GROUP 1		GROUP 2			
	n	%	n	%	CHI SQUARE TEST	P VALUE
HYPOTENSION	28	43.1	20	30.8	2.114	0.146

Graph 10 Comparison of episodes of hypotension



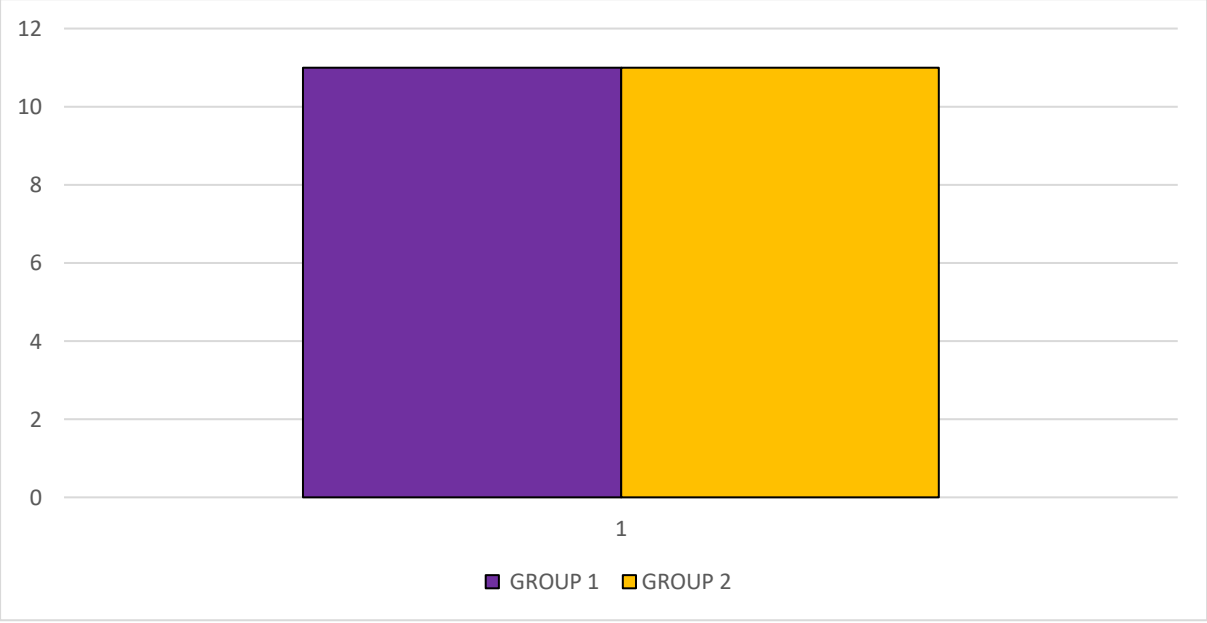
11.EPISODES OF BRADYCARDIA

The following table 11 and graph 11 represents the comparison of episodes of bradycardia in group 1 bupivacaine and group 2 levobupivacaine. There is no significant difference between two groups.

Table 11 Comparison of episode of bradycardia

BRADYCARDIA	GROUP 1		GROUP 2		CHI SQUARE TEST	P VALUE
	n	%	n	%		
	11	16.9	11	16.9	0	1

Graph 11 Comparison of episode of bradycardia



12. EPISODES OF NAUSEA AND VOMITING

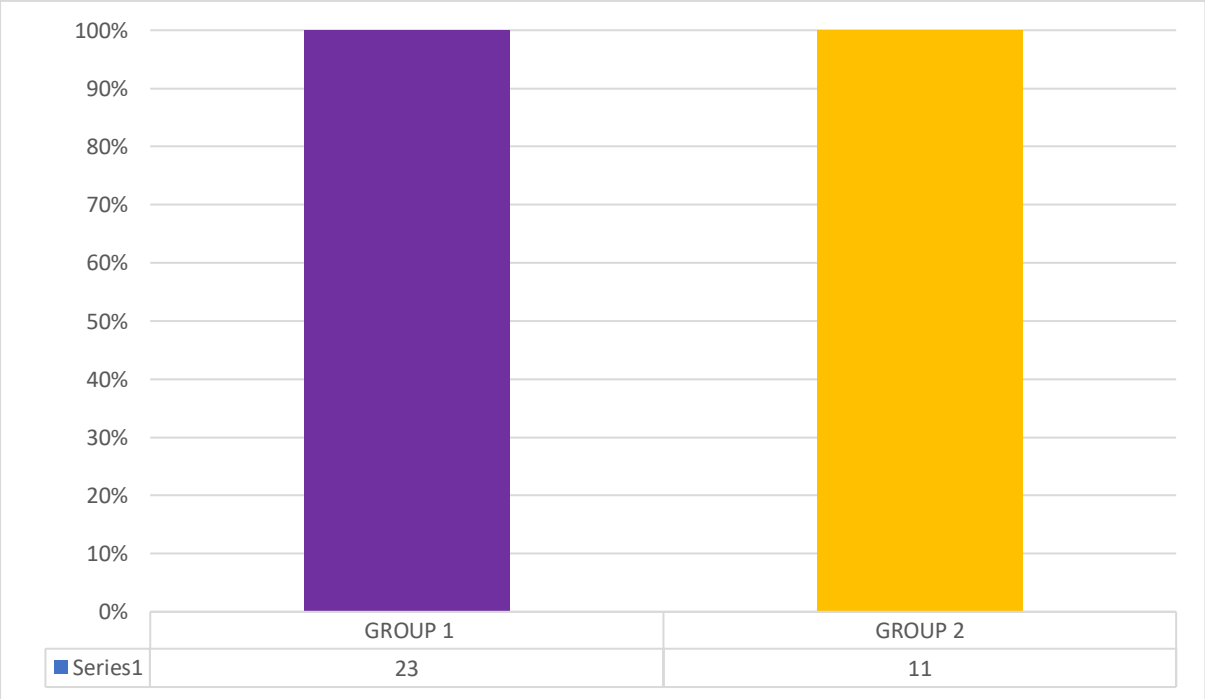
The following table 12 and graph 12 depicts the comparison of episodes of nausea and vomiting in group 1 and group 2.

It shows episodes of nausea and vomiting is more in group 1 bupivacaine group compared to group 2 levobupivacaine group.

Table 12 Comparison of nausea and vomiting

	GROUP 1		GROUP 2			
	n	%	n	%	CHI SQUARE TEST	P VALUE
NAUSEA VOMITING	23	35.4	11	16.9	5.735	0.017

Graph 12 Comparison of nausea and vomiting



13. EPISODES OF HEADACHE

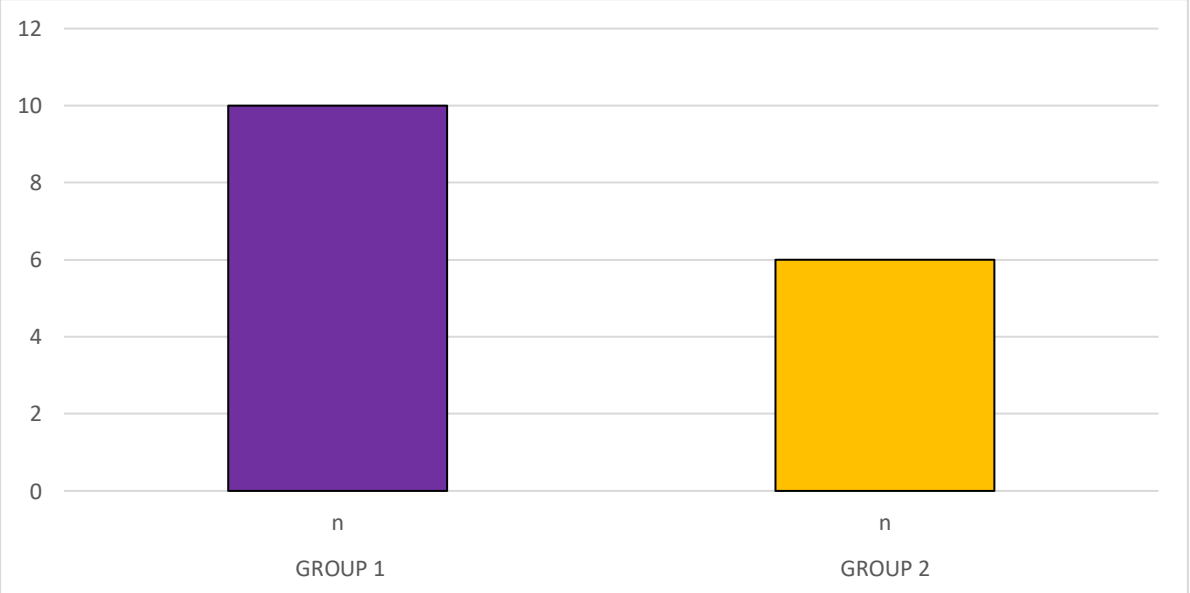
The following table 13 and graph 13 represents the comparison of episodes of headache in group 1 and group 2.

The comparison shows slightly more in group 1 bupivacaine group compared to group 2 levobupivacaine.

Table 13 Episodes of headache

HEADACHE	GROUP 1		GROUP 2		CHI SQUARE TEST	P VALUE
	n	%	n	%		
	10	15.4	6	9.2	1.146	0.286

Graph 13 Episodes of headache



14.EPISODES OF ITCHING

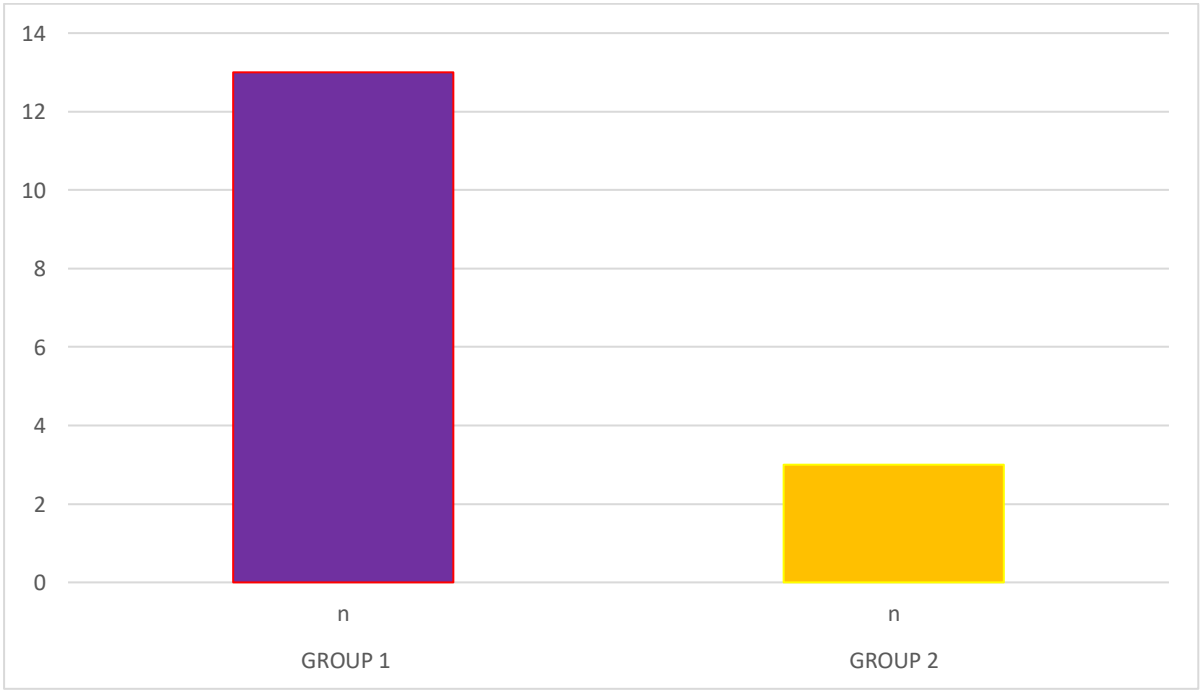
The following table 14 and graph 14 describes the comparison of episodes of itching in group 1 and 2.

It shows significant higher number of itching in group 1 bupivacaine compared to group 2 levobupivacaine.

Table 14 Comparison of itching

ITCHING	GROUP 1		GROUP 2		CHI SQUARE TEST	P VALUE
	n	%	n	%		
	13	20	3	4.6	7.127	0.008

Graph 14 Comparison of itching



15. EPISODES OF SHIVERING

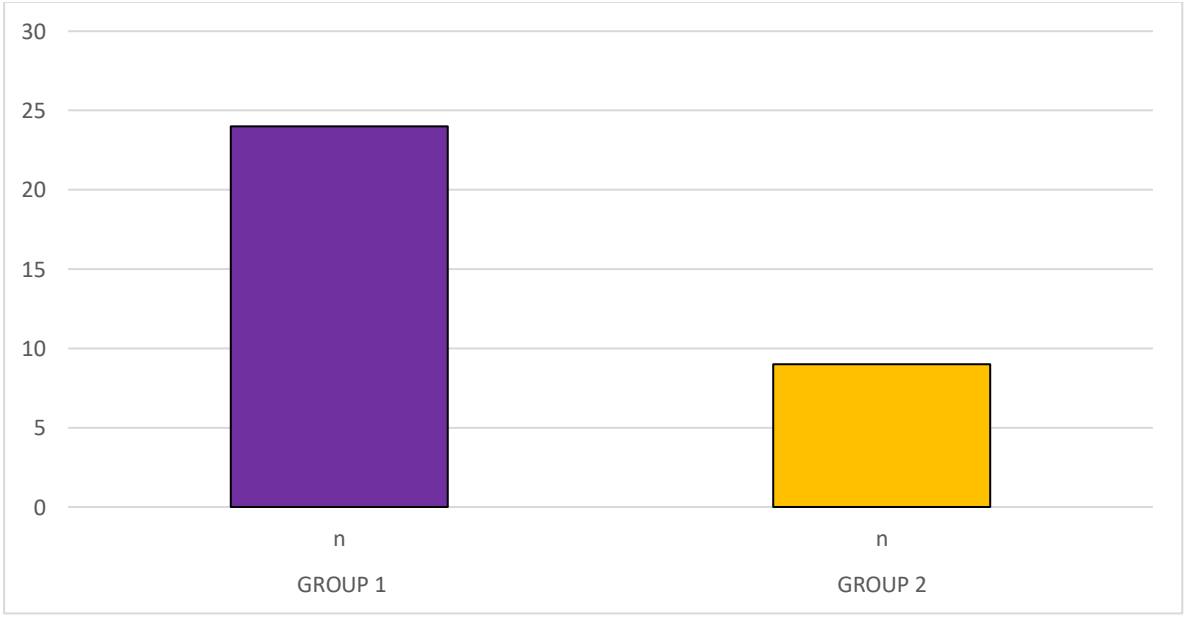
The following table 15 and graph 15 describes the comparison of episodes of shivering in group 1 and group 2.

It shows significant higher rate of shivering episodes in group 1 bupivacaine compared to group 2 in levobupivacaine.

Table 15 Comparison of shivering

SHIVERING	GROUP 1		GROUP 2		CHI SQUARE TEST	P VALUE
	n	%	n	%		
	24	36.9	9	13.8	9.138	0.003

Graph 15 Comparison of shivering



DISCUSSION

- This study compares the effects of hyperbaric bupivacaine 10mg and hyperbaric levobupivacaine 10mg, both combined with 25mcg fentanyl, in elective cesarean sections. Both drug combinations produce similar quality in the onset of sensory and motor blockade, with comparable maternal hemodynamic and neonatal outcomes.
- However, levobupivacaine has a shorter duration of sensory and motor blockade compared to bupivacaine. Bupivacaine offers a longer duration of analgesia.
- Intrathecal opioids enhance the efficacy of local anesthetics in neuraxial blockade by increasing the duration of analgesia and promoting hemodynamic stability through dose reduction of the local anesthetics[38].
- The duration of postoperative analgesia increases with higher doses of bupivacaine. Adding fentanyl to bupivacaine enhances postoperative analgesia, though it also prolongs motor recovery.
- Bogra et al. found that intrathecal fentanyl in elective cesarean sections creates a synergistic effect due to its rapid onset and short duration, with fewer respiratory issues[39].
- Lee et al[40] reported that using levobupivacaine 0.5% with fentanyl in urological surgery is as effective as using levobupivacaine alone.
- Bidikar et al[41] compared levobupivacaine 0.5% 10mg with a lower dose plus fentanyl and found that the combination extended sensory block duration and delayed the need for additional analgesia without prolonging motor block.

- In a study by Atienzar et al [42] compared the analgesic efficacy of bupivacaine, levobupivacaine, and ropivacaine in labor analgesia, concluding all were effective but pain scores were higher with levobupivacaine. Motor block was more significant with bupivacaine.
- In a study by Bremerich et al[43] conducted study to compare hyperbaric bupivacaine 0.5% with hyperbaric levobupivacaine 0.5% with addition of opioid as either fentanyl 10mcg or 20 mcg or sufentanil 5mcg in order of sensory and motor block characteristics and analgesic effects. The study found that levobupivacaine produced shorter and a less pronounced motor blockade than the bupivacaine, regardless of the opioid added. No parturient experienced intraoperative pain. Adding sufentanil 5 μg to either local anaesthetic significantly prolonged duration of effective analgesia compared to supplemental fentanyl 10 or 20 μg.
- In a study by Esraa et al[44] compared levobupivacaine and bupivacaine in cesarean sections, finding that both provide adequate surgical anesthesia. Levobupivacaine intrathecally offers a safer option due to lower incidences of cardiotoxicity and neurotoxicity, although hypotension is common during spinal anesthesia due to CSF displacement caused by pregnancy-related engorgement of epidural veins.
- Hypotension is most common side effect seen with more than 50% of parturients during spinal anaesthesia, due to engorgement of epidural veins from aortocaval compression in pregnancy, which causes displacement of CSF and causes more cephalad spread of local anaesthetics. This increases risk of hypotension.
- In the current study, decreases in systolic and diastolic blood pressure were within acceptable ranges (bupivacaine group 43.1% and levobupivacaine group 30.8%).

- The incidence of hypotension was similar in both groups, with levobupivacaine plus fentanyl providing better hemodynamic stability. Hypotension is considered when SBP is less than 90mmhg.
- Bradycardia is produced when there is cephalad spread of blockade more than T4 level. The percentage of bradycardia is similar in both groups.
- Itching is most common side effects associated with addition of fentanyl. The adverse effects are more in bupivacaine group 20% compared to levobupivacaine group 4.6%. Shivering is also seen more in number in bupivacaine group 36.9% and in levobupivacaine group 13.8%.
- In our study the onset of sensorial and motor blockade is similar in both group without much significant difference, but duration of sensory and motor blockade is shorter with levobupivacaine.
- The duration of analgesia is increased with addition of fentanyl which provides synergistic effect with bupivacaine. Hence duration of analgesia is longer with bupivacaine group (196.35) compared to levobupivacaine group (170.46).
- The study which is comparing the study of fentanyl with bupivacaine and levobupivacaine in elective cesarean sections similar to our study is Goyal A et al[45]. They compared hyperbaric bupivacaine(10mg) with 25mcg fentanyl and isobaric levobupivacaine(10mg) with fentanyl 25mcg in elective cesarean sections.
- They assessed sensory and motor blockade characteristics with side effects associated with bupivacaine. Levobupivacaine with fentanyl in the study provides early ambulation in elective sections by reducing motor block time, reducing side effects such hypotension and bradycardia, and improving hemodynamic stability.
- In our study, the neonatal effects of both drug combinations were similar, as measured by APGAR scores at 1 and 5 minutes, indicating no significant impact of the opioids or local anesthetics on neonates[46].

SUMMARY

Our study's objective was to determine whether using an opioid in conjunction with low-dose local anesthetics could lessen the adverse effects of the anesthetics.

Spinal anesthesia with levobupivacaine provides potential advantages over bupivacaine with better hemodynamic stability and lesser side effects.

In this context a randomized double blind prospective comparative study was conducted in 130 parturients, who belong to ASA grade I and II posted for elective cesarean sections.

They are randomized into two groups Group BF and Group LF each having 65 patients, to receive hyperbaric bupivacaine 10mg with 25mcg fentanyl and hyperbaric levobupivacaine 10mg with 25mcg fentanyl in Group BF and Group LF respectively.

Then pre op, intra op and post operative parameters are recorded and comparison between two groups was further done using standardized statistical methods.

The mean of regression of dermatome shows significant difference between two group. The mean is higher in group 1 bupivacaine group (177.25+/-35.691) compared to group 2 levobupivacaine group (151.78+/-35.016).

The mean of comparison of total duration of sensory block is significantly more in group 1 bupivacaine group (194.6+/-30.543) compared to group 2 levobupivacaine group (166.78+/-31.978). Motor blockade was less in the levobupivacaine group.

Duration of analgesia was significantly more in the bupivacaine group compared to levobupivacaine group. The mean hour in group 1 bupivacaine (196.35+/-29.65) is longer duration compared to group 2 levobupivacaine (170+/-34.425).

The episodes of itching and shivering was significantly lower in levobupivacaine group. There was no incidence of block failure in both the study groups.

CONCLUSION

Ultimately, it can be concluded that hyperbaric levobupivacaine and hyperbaric bupivacaine both quickly and successfully induce surgical anesthetic for elective cesarean sections without having a negative impact on newborns.

However, combination of fentanyl with levobupivacaine offers shorter sensory and motor block time with better hemodynamic stability and lesser side effects thus minimizing the risk and provides early mobility in parturients after the elective procedure.

Therefore, the combination of levobupivacaine with fentanyl is the preferred alternative for elective cesarean sections.

REFERENCES

1. Bajwa SJ, Kaur J. Clinical profile of levobupivacaine in regional anesthesia: A systematic review. Journal of Anaesthesiology Clinical Pharmacology. 2013 Oct 1;29(4):530-9.

2. Goyal A, Shankaranarayan P, Ganapathi P. A randomized clinical study comparing spinal anesthesia with isobaric levobupivacaine with fentanyl and hyperbaric bupivacaine with fentanyl in elective cesarean sections. Anesthesia Essays and Researches. 2015 Jan 1;9(1):57-62.

3. Guler G, Cakir G, Ulgey A, Ugur F, Bicer C, Gunes I, Boyaci A. A comparison of spinal anesthesia with levobupivacaine and hyperbaric bupivacaine for cesarean sections: A randomized trial.

4. Singh AK, Palaniappan S, Selvaraju K. To Evaluate Efficacy and Safety of Isobaric Levobupivacaine Versus Hyperbaric Bupivacaine in Lower Limb Orthopaedic Surgeries. European Journal of Molecular and Clinical Medicine. 2022 Jan 30;9(3):310-7.

5. Kazak Z, Ekmekçi P, Kazbek K. Hyperbaric levobupivacaine in anal surgery: Spinal perianal and spinal saddle blocks. Anaesthesist. 2010.

6. Luck JF, Fettes PD, Wildsmith JA. Spinal anaesthesia for elective surgery: a comparison of hyperbaric solutions of racemic bupivacaine, levobupivacaine, and ropivacaine. British journal of anaesthesia. 2008 Nov 1;101(5):705-10.

7. Akcaboy EY, Akcaboy ZN, Gogus N. Low dose levobupivacaine 0.5% with fentanyl in spinal anaesthesia for transurethral resection of prostate surgery. Journal of research in medical sciences: the official journal of Isfahan University of Medical Sciences. 2011 Jan;16(1):68.

8. Cappelleri G, Aldegheri G, Danelli G, Marchetti C, Nuzzi M, Iannandrea G, Casati A. Spinal anesthesia with hyperbaric levobupivacaine and ropivacaine for outpatient knee arthroscopy: a prospective, randomized, double-blind study. Anesthesia & Analgesia. 2005 Jul 1;101(1):77-82.

9. Mantouvalou M, Ralli S, Arnaoutoglou H, Tziris G, Papadopoulos G. Spinal anesthesia: comparison of plain ropivacaine, bupivacaine and levobupivacaine for lower abdominal surgery. Acta Anaesthesiologica Belgica. 2008 Jan 1;59(2):65-71.

10. Deori AK, Das A, Borgohain D, Bora D, Saikia A, Tiwari PK. A comparative study of spinal anaesthesia with levobupivacaine and hyperbaric bupivacaine for cesarean sections. International Journal of Contemporary Medical Research. 2016;3(7):1902-5.

11. Piacherski V, Muzyka L. Comparison of the efficacy of 0.5% isobaric bupivacaine, 0.5% levobupivacaine, and 0.5% hyperbaric bupivacaine for spinal anesthesia in lower limb surgeries. Scientific Reports. 2023 Feb 15;13(1):2736.

12. Goel S, Bhardwaj N, Grover VK. Intrathecal fentanyl added to intrathecal bupivacaine for day case surgery: a randomized study. European journal of anaesthesiology. 2003 Apr;20(4):294-7.
13. Coppejans HC, Vercauteren MP. Low-dose combined spinal-epidural anesthesia for cesarean delivery: a comparison of three plain local anesthetics. Acta Anaesthesiologica Belgica. 2006 Jan 1;57(1):39-43.
14. Gunusen I, Karaman S, Sargin A, Firat V. A randomized comparison of different doses of intrathecal levobupivacaine combined with fentanyl for elective cesarean section: prospective, double-blinded study. Journal of anesthesia. 2011 Apr;25: 205-12.
15. Huang YF, Pryor ME, Mather LE, Veering BT. Cardiovascular and central nervous system effects of intravenous levobupivacaine and bupivacaine in sheep. Anesthesia & Analgesia. 1998 Apr 1;86(4):797-804.
16. Casimiro C, Rodrigo J, Mendiola MA, Rey F, Barrios A, Gilsanz F. Levobupivacaine plus fentanyl versus racemic bupivacaine plus fentanyl in epidural anaesthesia for lower limb surgery. Minerva anestesiologica. 2008 Apr 18;74(7-8):381-91.
17. Butterworth IV JF, Mackey DC, Wasnick JD. Morgan & Mikhail's. Clinical Anesthesiology. 2013.

18. Mandabach MG. The early history of spinal anesthesia. InInternational Congress Series 2002 Dec 1 (Vol. 1242, pp. 163-168). Elsevier.

19. Whiteside J, Wildsmith T. Spinal anaesthesia. Principles and Practice of Regional Anaesthesia. 2012 Nov 22:124.

20. Van Zundert A, Goerig M. August Bier 1861-1949. Regional anesthesia and pain medicine. 2000;25(1):26.

21. Salinas FV, Sueda LA, Liu SS. Physiology of spinal anaesthesia and practical suggestions for successful spinal anaesthesia. Best Practice & Research Clinical Anaesthesiology. 2003 Sep 1;17(3):289-303.

22. Halaszynski TM, Hartmannsgruber MW. Anatomy and physiology of spinal and epidural anesthesia. InSeminars in Anesthesia, Perioperative Medicine and Pain 1998 Mar 1 (Vol. 17, No. 1, pp. 24-37). WB Saunders.

23. Hoehmann CL, Hitscherich K, Cuoco JA. The artery of Adamkiewicz: vascular anatomy, clinical significance and surgical considerations. J Cardiovasc Res 5: 6. doi: 10.4172/2324. 2016 8602:2.

24. Melissano G, Bertoglio L, Rinaldi E, Leopardi M, Chiesa R. An anatomical review of spinal cord blood supply. Journal of Cardiovascular Surgery. 2015;56(5):699-706.

25. Miller RD, Eriksson LI, Fleisher LA, Wiener-Kronish JP, Cohen NH, Young WL. Miller's anesthesia e-book. Elsevier Health Sciences; 2014 Oct 20.

26. Mark JB, Steele SM. Cardiovascular effects of spinal anesthesia. International anesthesiology clinics. 1989 Apr 1;27(1):31-9.

27. Butterworth J. Physiology of spinal anesthesia: what are the implications for management. Regional anesthesia and pain medicine. 1998 Jul 1;23(4):370-3.

28. Giugliano F, Lippera M, Brugnolo MP, Busca G, Fogliardi A, Carbini MA, Uguccioni S, Roberti L, Sanchioni A. Cervical peridural anesthesia in the surgery of the carotid. First experience. Minerva anestesiologica. 1991 Sep;57(9):460-1.

29. Veering BT, Stienstra R. Duration of block: drug, dose, and additives. Regional anesthesia and pain medicine. 1998 Jul 1;23(4):352.

30. Pitkänen M, Rosenberg PH. Local anaesthetics and additives for spinal anaesthesia—characteristics and factors influencing the spread and duration of the block. Best Practice & Research Clinical Anaesthesiology. 2003 Sep 1;17(3):305-22.

31. Manouchehrian N, Moradi A, Torkashvand L. Comparative study of effect of spinal anesthesia in sitting and lateral positions on the onset time of sensory block and hemodynamic condition in cesarean section: a randomized clinical trial. Anesthesiology and Pain Medicine. 2021 Feb;11(1).

32. Mohammadi SS, Piri M, Khajehnasiri A. Comparing three different modified sitting positions for ease of spinal needle insertion in patients undergoing spinal anesthesia. Anesthesiology and Pain Medicine. 2017 Oct;7(5).

33. Chang CH, Nam YT, Jeong JY, Choi SI, Lee YW. Comparative Study of Isobaric Bupivacaine Spinal Anesthesia in the Supine and Prone Positions. Korean Journal of Anesthesiology. 2003 May 1;44(5):605-11.

34. Foster RH, Markham A. Levobupivacaine: a review of its pharmacology and use as a local anaesthetic. Drugs. 2000 Mar;59(3):551-79.

35. Heppolette CA, Brunnen D, Bampoe S, Odor PM. Clinical pharmacokinetics and pharmacodynamics of levobupivacaine. Clinical Pharmacokinetics. 2020 Jun;59(6):715-45.

36. Athar M, Ahmed SM, Ali S, Siddiqi OA. Levobupivacaine: A safer alternative. Journal of Current Research in Scientific Medicine. 2016 Jan 1;2(1):3-9.

37. Leone S, Di Cianni S, Casati A, Fanelli G. Pharmacology, toxicology, and clinical use of new long acting local anesthetics, ropivacaine and levobupivacaine. Acta Biomed. 2008 Aug 1;79(2):92-105.

38. Techanivate A, Urusopone P, Kiatgungwanglia P, Kosawiboonpol R. Intrathecal fentanyl in spinal anesthesia for appendectomy. JOURNAL-MEDICAL ASSOCIATION OF THAILAND. 2004 May 1;87(5):525-30.

39. Bogra J, Arora N, Srivastava P. Synergistic effect of intrathecal fentanyl and bupivacaine in spinal anesthesia for cesarean section. BMC anesthesiology. 2005 Dec;5:1-6.

40. Lee YY, Muchhal K, Chan CK, Cheung AS. Levobupivacaine and fentanyl for spinal anaesthesia: a randomized trial. European Journal of Anaesthesiology. 2005 Dec;22(12):899-903.

41. Bidikar M, Mudakanagoudar MS, Santhosh MC. Comparison of intrathecal levobupivacaine and levobupivacaine plus fentanyl for cesarean section. Anesthesia Essays and Researches. 2017 Apr 1;11(2):495-8.

42. Atiénzar MC, Palanca JM, Torres F, Borràs R, Gil S, Esteve I. A randomized comparison of levobupivacaine, bupivacaine and ropivacaine with fentanyl, for labor analgesia. International journal of obstetric anesthesia. 2008 Apr 1;17(2):106-11.

43. Bremerich DH, Fetsch N, Zwissler BC, Meininger D, Gogarten W, Byhahn C. Comparison of intrathecal bupivacaine and levobupivacaine combined with opioids for Caesarean section. Current medical research and opinion. 2007 Jan 1;23(12):3047-54.

44. Abd-El Wahab EH, Soliman SM, Amen SM, El-Shehdwy SR. Comparitive study between levobupivacaine versus bubivacaine in spinal anesthesia for cesarean sections. Tanta Medical Journal. 2018 Jul 1;46(3):232-8.

45. Goyal A, Shankaranarayan P, Ganapathi P. A randomized clinical study comparing spinal anesthesia with isobaric levobupivacaine with fentanyl and hyperbaric bupivacaine with fentanyl in elective cesarean sections. Anesthesia Essays and Researches. 2015 Jan 1;9(1):57-62.

46. Misirlioglu K, Sivrikaya GU, Hanci A, Yalcinkaya A. Intrathecal low-dose levobupivacaine and bupivacaine combined with fentanyl in a randomised controlled study for caesarean section: blockade characteristics, maternal and neonatal effects. Hippokratia. 2013 Jul;17(3):262.

ANNEXURE I

INSTITUTIONAL ETHICAL COMMITTEE

BLDE
(DEEMED TO BE UNIVERSITY)
Declared as Deemed to be University u/s 3 of UGC Act, 1956
Accredited with 'A' Grade by NAAC (Cycle-2)
The Constituent College
SHRI B. M. PATIL MEDICAL COLLEGE, HOSPITAL & RESEARCH CENTRE, VIJAYAPURA

BLDE (DU)/IEC/ 785/2022-23 30/8/2022

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Ethical Committee of this University met on **Friday, 26th August, 2022 at 3.30 p.m. in the Department of Pharmacology** scrutinizes the Synopsis of Post Graduate Student of BLDE (DU)'s Shri B.M.Patil Medical College Hospital & Research Centre from ethical clearance point of view. After scrutiny, the following original/ corrected and revised version synopsis of the thesis/ research projects has been accorded ethical clearance.

TITLE: "Comparison of spinal anaesthesia with hyperbaric Levobupivacaine with fentanyl and hyperbaric Bupivacaine with fentanyl in elective cesarean Sections".

NAME OF THE STUDENT/PRINCIPAL INVESTIGATOR: Dr.Sinchana A S

NAME OF THE GUIDE: Dr.Vijaykumar T K, **Dept. of Anaesthesiology**

Dr. Santoshkumar Jeevangi
Chairperson
IEC, BLDE (DU),
VIJAYAPURA

Chairman,
Institutional Ethical Committee,
BLDE (Deemed to be University)
Vijayapura

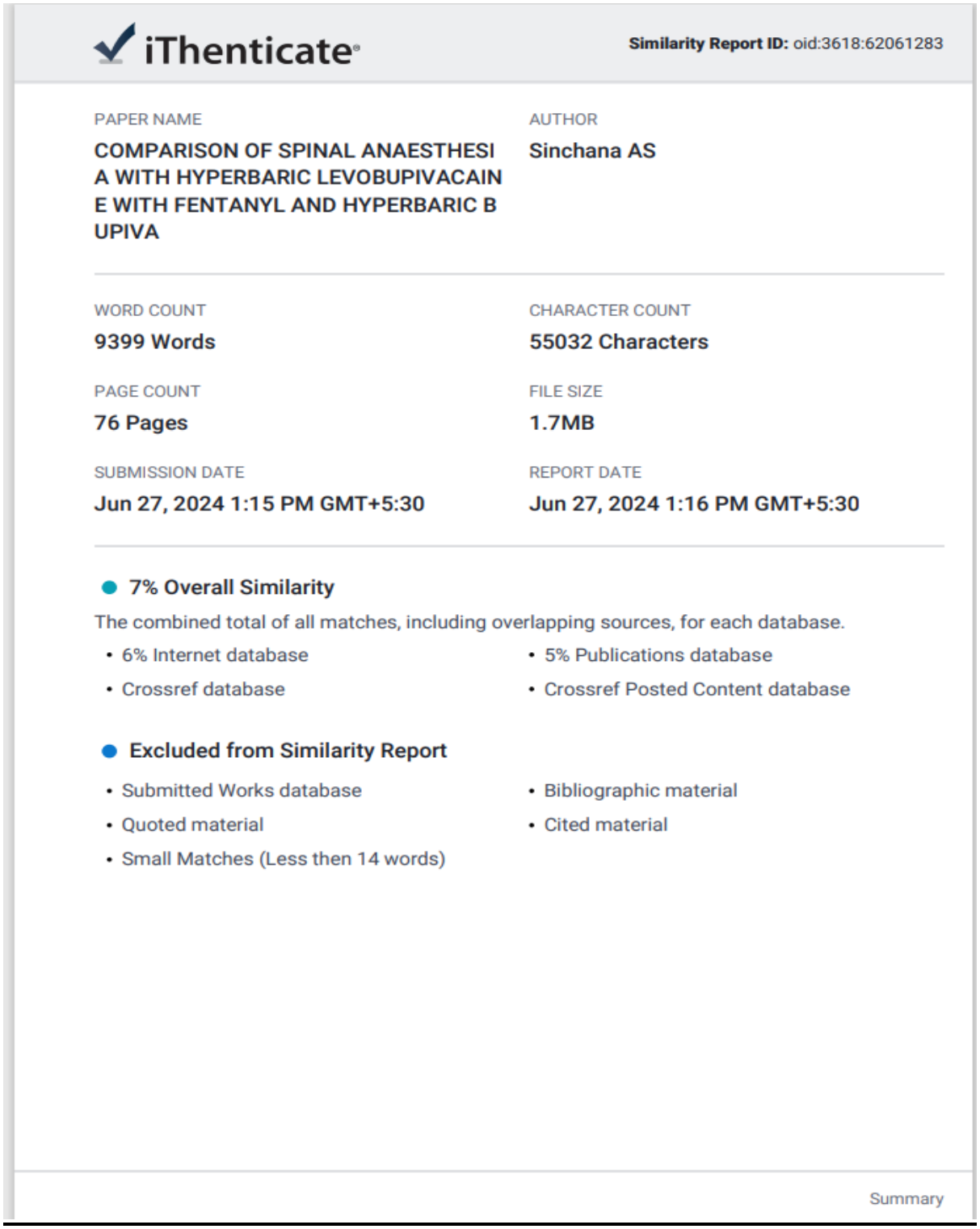
Dr.Akram A. Naikwadi
Member Secretary
IEC, BLDE (DU),
VIJAYAPURA

MEMBER SECRETARY
Institutional Ethics Committee
BLDE (Deemed to be University)
Vijayapura-586103. Karnataka

Following documents were placed before Ethical Committee for Scrutinization

- Copy of Synopsis/Research Projects
- Copy of inform consent form
- Any other relevant document

ANNEXURE – II



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Summary

ANNEXURE – III

SAMPLE INFORMED CONSENT FORM:

B.L.D.E.(DU) SHRI B.M. PATIL MEDICAL COLLEGE HOSPITAL AND RESEARCH CENTRE, VIJAYAPURA – 586103, KARNATAKA

TITLE OF THE PROJECT : **"COMPARISON OF SPINAL ANAESTHESIA WITH HYPERBARIC LEVOBUPIVACAINE WITH FENTANYL AND HYPERBARIC BUPIVACAINE WITH FENTANYL IN ELECTIVE CESAREAN SECTIONS"**

PRINCIPAL INVESTIGATOR: Dr. SINCHANA A S
Post graduate,
Department of Anaesthesiology
sinchusambhrama@gmail.com

P. G. GUIDE : Dr. Vijaykumar T Kalyanagoppagol
Professor,
Dept of Anaesthesiology, B.L.D. E(DU)
Shri B.M. Patil Medical College Hospital
Vijayapura

PURPOSE OF RESEARCH

I have been informed that this study is "**COMPARISON OF SPINAL ANAESTHESIA WITH HYPERBARIC LEVOBUPIVACAINE WITH FENTANYL AND HYPERBARIC BUPIVACAINE WITH FENTANYL IN ELECTIVE CESAREAN SECTIONS**"

I have been well explained in the language I best understand about the procedure, purpose of the study, effects and possible adverse effects of the drugs by the doctor.
I hereby voluntarily give my consent for the participation in the study. I have been explained that I have the right to withdraw the participation from the study at any point I want. And the treatment will not be changed from the standard treatment being followed in the hospital for the denial of participation in the study.

I allow the clinical information related to me to be used for research and academic purpose. I have been explained that my name and identity was concealed throughout the process and the clinical information related to me will not be shared with or given to anyone except _____ and the concerned clinician.

I have been well explained that I will not be provided with any incentives or compensation in any form for the participation in this study.

I have been explained about the reason for doing this study and selecting me/my ward as a subject for this study. I have also been given free choice for either being included or not in the study.

CONFIDENTIALITY:

I understand that medical information produced by this study was come a part of this Hospital records and was subjected to the confidentiality and privacy regulation of this hospital. If the data are used for publication in the medical literature or for teaching purpose, no names was used and other identifiers such as photographs and audio or video tapes was used only with my special written permission. I understand that I may see the photograph and videotapes and hear audiotapes before giving this permission.

REQUEST FOR MORE INFORMATION:

I understand that I may ask more questions about the study at any time. Dr. SINCHANA A S is available to answer my questions or concerns. I understand that I was informed of any significant new findings discovered during the course of this study, which might influence my continued participation.

If during this study, or later, I wish to discuss my participation in or concerns regarding this study with a person not directly involved, I am aware that the social worker of the hospital is available to talk with me.

And that a copy of this consent form was given to me for careful reading.

REFUSAL OR WITHDRAWL OF PARTICIPATION:

I understand that my participation is voluntary and I may refuse to participate or may withdraw consent and discontinue participation in the study at any time without prejudice to my present or future care at this hospital.

I also understand that Dr. SINCHANA A S will terminate my participation in this study at any time after he has explained the reasons for doing so and has helped arrange for my continued care by my own physician or therapist, if this is appropriate

INJURY STATEMENT:

I understand that in the unlikely event of injury to me/my ward, resulting directly due to my participation in this study, such injury was reported promptly, then medical treatment would be available to me, but no further compensation was provided.

I understand that by my agreement to participate in this study, I am not waiving any of my legal rights.

I have explained to _____ the purpose of this research, the procedures required and the possible risks and benefits, to the best of my ability in patient's own language.

Patient's Name: Age/Sex:

Parents name:

Date: DR. SINCHANA A S

(Investigator)

Signature of the Parents:

Name:

Relation:

Address: Witness to above signature

Phone Number:

STUDY SUBJECT CONSENT STATEMENT:

I confirm that **Dr. SINCHANA A S** has explained to me the purpose of this research, the study procedure that I will undergo and the possible discomforts and benefits that I may experience, in my own language.

I have been explained all the above in detail in my own language and I understand the same. Therefore, I agree to give my consent to participate as a subject in this research project.

_____ _____

(Patient) Date

_____ _____

(Witness to above signature) Date

ANNEXURE IV

PROFORMA

STUDY: COMPARISON OF SPINAL ANAESTHESIA WITH HYPERBARIC LEVOBUPIVACAINE AND HYPERBARIC BUPIVACAINE WITH FENTANYL IN ELECTIVE CESAREAN SECTION.

Patient Details IP NO DATE

Name Age sex weight

Diagnosis

Surgical procedure

Past History

General physical examination:

Pallor icterus cyanosis

clubbing lymphadenopathy edema

Mallampatti Grade:

Vital parameters:

Pulse blood pressure

respiratory rate temperature

SYSTEMIC EXAMINATION

CVS CNS

RS PA

INVESTIGATIONS

HB TC PLATELET

HIV HBSAG HCV ASA GRADE

PARAMETERS TO BE OBSREVERD:

parameters	Group LF/Group BF Levo/bupivacaine group
SENSORY BLOCK	
The onset of sensory block	
Time to reach T10	
Time to reach T4	
Time of regression of dermatome	
The total duration of sensory block	
MOTOR BLOCK	
The onset of motor block	
Time to reach maximum level	
Duration of analgesia	
Side effects	
hypotension	
bradycardia	
Nausea, vomiting	
headache	
itching	
shivering	
APGAR SCORE	
1MIN	
5MIN	

VITALS MONITORING

TIME	PR	BP	MAP	SPO2
2MIN				
4MIN				
6MIN				
8MIN				
10MIN				
12MIN				
14MIN				
16MIN				
18MIN				
20MIN				
22MIN				
24MIN				
26MIN				
28MIN				
30MIN				
45MIN				
1HR				
1.30HR				
2^{nd} HR				
2.30HR				
3^{rd} HR				
4^{th} HR				
6^{th} HR				
12^{th}HR				
24HR				

BIO-DATA

Guide Name: Dr. Vijaykumar T Kalyanappagol

Date of Birth: 08/09/1964

Education : M.B.B.S. from M R Medical College Kalaburgi
M D from Shri B.M.P.A.T.I.L. Medical college vijayapur
D A from J.N. Medical College Belgaum

Designation : Professor in Anesthesiology

Teaching: Total work experience 30 years
P.G. teaching for 22years
P.G. guide 13 years

Address: Plot No.43, Basaveshwara Nagar, Opposite BLDE Hospital, Ashram Road, Vijayapura.

INVESTIGATOR

Name : Dr. Sinchana. A. S

Qualification: M.B.B.S.
Vijayanagar institute of medical sciences, Bellary

Registration No. : 134744

Address : SHREESHA, gundibail, Doddanagudde road,
shivalli village
UDUPI

MASTER CHART – BUPIVACAINE GROUP

SI NU MB ER	NAME	AGE	OF SENSO RY BLOCK	TO REACH T10(MI NUTES	TO REAC H T4(MI	OF REGRES SION OF	DURA TION OF SENSO	ONS ET OF MOT	TO REAC H MAXI	ATIO N OF ANA GESI	AL BLO OD PRES	AL BLO OD PRES	1 MIN SBP	1 MIN DBP	2 MIN SBP	2 MIN DBP	3 MIN SBP	3 MIN DBP	4 MIN SBP	4 MIN DBP	5 MIN SBP	5 MIN DBP	10 MIN SBP	10 MIN DBP	15 MIN SBP	15 MIN DBP	20 MIN SBP	20 MIN DBP	30 MIN SBP	30 MIN DBP	45 MIN SBP	45 MIN DBP	1 HOU R SBP	1 HOUR DBP	HYPOTE NSION	BRADYC ARDIA	NAUSEA, VOMITIN G	HEADAC HE	ITCHING	SHIVERIN G	APGAR AT 1 MIN	APGAR AT 5 MIN
1	POOJA	22	0.6	0.8	0	195	180	1	2	180	120	80	100	50	100	60	101	60	110	70	112	60	120	70	110	60	118	64	110	70	117	70	122	80	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
2	KAVITHA	28	2	5	20	120	150	4	5	180	148	86	142	84	130	86	132	86	140	85	140	80	130	80	140	80	140	80	142	86	144	90	148	92	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
3	LAKSHMI	20	1	8	0	170	180	4	10	180	140	70	136	80	140	80	130	80	132	69	120	58	121	66	132	76	130	70	132	81	142	81	148	90	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
4	POORNIMA	28	0.6	1	5	120	180	0.8	1	220	130	82	138	84	130	80	108	76	102	72	96	68	100	70	110	80	112	78	100	80	120	71	125	83	PRESENT	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
5	SHARADA	39	1	0.8	2	165	180	1	1.1	165	142	110	138	98	141	105	140	99	122	94	129	94	116	83	122	88	119	91	112	92	110	90	114	86	PRESENT	ABSENT	ABSENT	ABSENT	PRESENT	PRESENT	7	8
6	SAVITHA	22	1	1.1	0	120	150	2	2	150	120	80	110	70	100	60	90	60	110	70	100	70	112	68	116	78	120	70	118	72	118	68	100	56	PRESENT	ABSENT	PRESENT	ABSENT	ABSENT	ABSENT	8	9
7	UKATHAVV	22	2	5	0	150	180	1	10	180	110	80	110	55	100	50	110	70	115	70	110	58	112	60	113	64	110	70	91	52	98	47	112	71	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	PRESENT	8	9
8	ZEENAT	31	2	3	0	120	180	3	4	180	130	70	134	89	122	87	134	83	120	80	122	78	119	78	119	73	116	80	108	66	115	70	120	83	ABSENT	ABSENT	ABSENT	ABSENT	PRESENT	ABSENT	8	9
9	LAKSHMI	20	1	2	0	180	210	2	3	180	120	80	110	55	93	53	111	54	116	83	123	69	113	59	122	59	118	70	102	43	127	61	131	41	PRESENT	ABSENT	ABSENT	PRESENT	ABSENT	ABSENT	8	9
10	KAVERI	27	2	2	0	180	180	1	3	180	110	70	97	64	96	51	89	49	114	74	121	68	122	72	114	63	118	68	120	71	120	76	121	76	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
11	AZRA BEGU	29	1	2	0	200	220	0.8	2	210	130	90	130	70	98	60	96	60	109	71	103	71	111	71	102	65	98	54	99	58	105	66	109	69	PRESENT	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	7	8
12	SHILPA	23	1	2	0	170	180	2	2.5	240	110	70	124	75	106	70	80	40	95	47	83	39	110	71	112	82	120	80	137	64	115	50	117	70	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	7	8
13	RENUKA	23	1	2	0	240	210	1	3	240	120	80	110	70	90	60	116	68	112	66	120	76	108	70	104	66	106	68	120	78	110	68	118	70	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	PRESENT	7	8
14	'ANNAWW	27	2	3	0	240	230	2	3	240	120	90	110	60	112	70	120	80	124	82	130	72	110	80	102	78	112	78	130	80	120	82	139	90	ABSENT	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
15	POOJA	22	2	3	0	120	150	4	5	180	120	80	134	96	133	90	128	83	123	77	122	72	124	79	125	77	123	76	110	80	120	86	122	92	ABSENT	ABSENT	ABSENT	ABSENT	PRESENT	ABSENT	8	9
16	LAKSHMI	35	1	2	0	210	240	1	3	180	120	80	128	80	126	74	121	79	115	89	121	78	126	70	125	65	117	79	105	61	112	72	114	65	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	PRESENT	8	9
17	KAVERI	22	2	2.1	0	180	210	2	3	240	120	80	140	90	130	70	90	60	97	50	110	60	110	67	107	50	105	60	118	60	113	60	123	72	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	7	8
18	SUREKHA	23	1.5	2	0	180	240	2	3	240	120	80	130	84	132	80	131	71	126	84	124	45	80	39	90	60	121	47	117	58	120	80	118	70	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
19	SANGEETHA	22	1	1.2	0	180	210	0.8	2	210	136	84	120	80	111	78	97	47	106	58	113	66	127	76	98	59	102	41	108	52	119	63	122	71	ABSENT	ABSENT	PRESENT	ABSENT	ABSENT	PRESENT	8	9
20	MAHADEVI	21	0.8	1	0	150	180	2	3	180	120	80	124	78	134	80	133	79	131	84	135	86	129	79	130	85	124	81	108	63	111	66	113	70	ABSENT	ABSENT	PRESENT	ABSENT	ABSENT	PRESENT	7	8
21	SUCHITRA	23	2	3	0	190	180	2	3	180	110	80	124	76	106	70	80	40	90	52	95	47	83	39	100	82	112	84	123	91	137	91	113	60	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	PRESENT	8	9
22	BHARATI	27	1	2	0	210	240	1	3	180	120	80	128	80	121	79	115	89	121	78	126	78	120	65	119	82	117	84	105	61	112	72	114	65	ABSENT	ABSENT	PRESENT	ABSENT	ABSENT	ABSENT	8	9
23	KAVERI	22	1	2	0	240	210	1	3	240	120	80	110	70	90	60	116	68	112	66	120	76	108	70	104	68	111	70	120	78	110	68	114	72	PRESENT	ABSENT	ABSENT	PRESENT	ABSENT	ABSENT	8	9
24	KAVITHA	24	2	3	0	120	150	4	5	180	150	80	142	84	130	86	132	86	140	85	140	80	150	80	141	80	142	82	140	80	144	90	148	92	ABSENT	ABSENT	ABSENT	ABSENT	PRESENT	ABSENT	8	9
25	SUFIAN	21	2	3	0	120	150	4	5	180	140	90	136	96	134	90	128	83	123	77	122	72	121	72	123	74	125	77	120	86	122	92	124	94	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
26	PUSHPA	24	0.3	1	0	210	240	1.3	2	240	130	80	123	76	105	61	123	74	111	65	115	63	114	62	116	70	118	70	126	82	130	81	132	82	ABSENT	ABSENT	PRESENT	PRESENT	ABSENT	ABSENT	8	9
27	BHARATI	20	0.8	1.5	0	170	180	1	2	180	110	70	120	80	111	78	97	47	106	58	113	66	127	76	98	59	114	43	119	65	122	71	124	64	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
28	ABHILASHA	27	1	1.5	0	180	195	1	2	180	120	80	128	82	118	70	100	60	98	55	92	50	102	62	112	68	118	68	120	70	122	72	132	82	ABSENT	ABSENT	PRESENT	ABSENT	ABSENT	ABSENT	7	8
29	HAKUNTAL	26	1	2	0	180	215	2	2.3	240	110	70	109	59	106	55	109	64	125	70	117	69	102	59	117	69	102	59	117	62	108	55	113	57	PRESENT	PRESENT	PRESENT	ABSENT	ABSENT	PRESENT	8	9
30	FIRDOZ	23	0.8	1.15	0	120	140	1	2	160	110	70	113	85	132	82	114	72	104	61	122	78	108	62	120	36	120	65	117	63	109	78	113	79	ABSENT	ABSENT	PRESENT	ABSENT	ABSENT	ABSENT	7	8
31	SHRUTHI	23	1	2	0	170	200	0.8	1	186	130	80	115	66	108	55	100	55	130	80	111	65	120	82	105	72	110	70	122	82	124	83	118	84	ABSENT	ABSENT	ABSENT	PRESENT	ABSENT	ABSENT	8	9

32	JAYASHREE	31	0.5	1	2	225	230	1	2	240	120	90	126	79	131	80	140	77	141	74	138	78	136	70	128	72	126	69	132	76	128	72	124	78	PRESENT	ABSENT	ABSENT	ABSENT	PRESENT	ABSENT	8	9
33	SANGEETA	20	1	2	0	175	190	0.8	1.2	180	150	90	139	86	136	76	129	72	118	64	124	71	130	74	121	66	122	71	113	69	116	72	120	72	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	PRESENT	7	8
34	SAVITRI	24	0.3	1	0	150	180	1	1.5	170	110	70	116	67	101	57	102	62	98	59	102	60	91	57	93	47	80	48	117	63	130	72	117	70	PRESENT	PRESENT	PRESENT	ABSENT	ABSENT	PRESENT	8	9
30	HAKUNTAL	23	0.3	1	0	220	195	1	2	180	130	80	124	72	125	76	123	61	124	59	125	66	124	59	110	50	128	78	126	80	130	72	131	80	ABSENT	ABSENT	PRESENT	ABSENT	ABSENT	PRESENT	8	9
36	SAVITHA	23	2	2	0	230	235	0.5	1	226	120	70	139	89	131	76	143	88	139	90	149	89	148	96	139	88	131	76	140	80	137	77	122	75	ABSENT	ABSENT	ABSENT	ABSENT	PRESENT	ABSENT	8	9
37	HAGYASHRI	19	1	2	0	120	180	3	4	180	130	80	134	89	133	79	128	83	123	83	122	77	121	73	124	79	125	79	120	85	110	80	120	86	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
38	PRIYANKA	24	1	2	5	210	230	1	3	180	110	70	126	74	121	79	115	89	121	80	126	70	125	65	120	66	117	79	105	61	112	72	114	65	ABSENT	ABSENT	PRESENT	ABSENT	ABSENT	ABSENT	6	7
39	KAVERI	21	2	2.5	0	170	220	2	3	240	112	72	130	70	90	60	97	50	110	60	112	67	107	50	105	60	102	46	120	60	113	60	123	72	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	PRESENT	7	8
40	AJESHWAR	23	0.8	1	0	170	195	2	3	210	140	80	130	84	132	80	131	71	126	84	124	45	90	50	90	61	117	58	122	81	120	80	118	70	ABSENT	ABSENT	PRESENT	ABSENT	ABSENT	ABSENT	8	9
41	UJWALA	38	0.8	1	0	192	240	0.3	1.15	240	130	90	120	80	128	84	129	84	124	86	129	88	130	80	132	91	130	88	123	76	125	81	132	78	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	7	8
42	KAUSHALYA	22	0.8	1	2	190	180	1	1.3	180	150	92	124	75	121	79	130	59	125	77	126	79	128	77	117	74	102	50	127	81	124	78	122	80	ABSENT	ABSENT	PRESENT	ABSENT	ABSENT	ABSENT	7	8
43	DIVYA	29	1	2	0	160	180	0.2	1	180	140	90	126	77	127	78	123	73	138	78	129	89	128	77	126	80	125	78	123	72	118	78	121	80	ABSENT	ABSENT	PRESENT	ABSENT	ABSENT	PRESENT	7	8
44	PRIYA	34	1	2	0	175	190	0.8	1	186	140	100	120	78	110	70	90	60	110	80	120	80	110	90	112	80	121	80	131	78	128	80	126	84	ABSENT	ABSENT	ABSENT	ABSENT	PRESENT	ABSENT	7	9
45	RATNA	31	0.8	1	2	228	215	0.5	1	250	120	60	99	64	84	52	92	60	100	60	112	80	121	78	126	82	118	82	120	80	123	90	128	86	PRESENT	PRESENT	PRESENT	PRESENT	ABSENT	PRESENT	7	8
46	ANGAMMA	29	0.5	1.2	0	250	180	1	3	220	112	70	108	63	102	60	80	55	75	33	90	60	101	62	111	63	108	61	121	72	123	62	126	74	PRESENT	ABSENT	ABSENT	ABSENT	PRESENT	PRESENT	7	8
47	REKHA	24	0.5	1	0	160	130	0.8	2	165	140	90	120	52	98	58	110	74	128	75	129	73	125	73	127	69	100	66	125	83	114	79	109	74	ABSENT	ABSENT	ABSENT	ABSENT	PRESENT	ABSENT	7	8
48	IJAYALSHM	23	2	5	0	100	90	3	6	120	110	70	110	74	103	65	101	64	103	63	109	74	105	61	106	67	101	58	103	62	108	70	110	68	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
49	KUCHATAI	28	1	2	0	155	170	0.6	1	175	130	70	120	78	110	70	90	60	110	80	120	80	110	90	121	81	131	80	131	78	122	80	126	82	ABSENT	PRESENT	ABSENT	ABSENT	ABSENT	PRESENT	7	8
50	KAVITHA	32	0.5	1	0	140	174	1	1.5	170	130	90	101	57	102	62	98	57	102	60	91	57	93	47	80	48	117	63	119	74	120	73	113	71	PRESENT	PRESENT	PRESENT	ABSENT	ABSENT	PRESENT	8	9
51	HARSHITA	28	1	2	0	220	230	1	3	190	120	80	126	71	121	79	115	89	121	78	126	70	119	82	116	72	118	74	120	80	122	72	124	76	ABSENT	ABSENT	ABSENT	ABSENT	PRESENT	ABSENT	8	9
52	AMBIKA	22	0.5	1.3	0	190	195	1	1.5	180	120	80	128	82	118	70	100	60	98	55	92	50	102	62	118	68	120	70	130	78	131	86	132	82	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
53	PALLAVI	23	0.8	1	0	150	180	0.5	1	220	120	70	125	83	135	85	134	84	128	84	141	99	130	78	142	95	147	102	146	100	138	101	130	90	ABSENT	ABSENT	PRESENT	PRESENT	ABSENT	PRESENT	7	8
54	IDYASHREE	21	0.5	1	3	225	210	1	4	240	110	70	100	70	90	60	84	58	92	62	98	60	100	70	114	68	116	58	118	72	120	78	121	72	PRESENT	PRESENT	PRESENT	PRESENT	ABSENT	ABSENT	7	8
55	LAKSHMI	27	0.8	1	0	195	210	0.5	1.3	230	112	72	103	52	90	43	86	42	96	60	100	61	105	60	99	57	118	73	122	80	121	70	118	60	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	PRESENT	8	9
56	ROOPA	22	0.5	1	0	185	215	1	3	180	120	80	110	60	112	70	120	80	124	84	130	72	132	72	112	78	130	81	137	100	132	92	128	89	ABSENT	ABSENT	PRESENT	ABSENT	ABSENT	ABSENT	7	8
57	POOJA	26	0.8	2	0	166	210	0.5	1	220	130	80	127	78	123	73	138	78	129	82	125	72	126	80	119	79	123	72	118	78	120	76	128	72	ABSENT	ABSENT	ABSENT	ABSENT	PRESENT	PRESENT	7	8
58	TULSIBAI	36	0.3	0.8	0	170	220	0.8	2	180	100	70	120	80	111	78	97	47	90	38	86	42	106	58	113	66	127	76	98	59	111	51	100	43	PRESENT	ABSENT	PRESENT	PRESENT	ABSENT	PRESENT	7	8
59	SANGEETA	26	0.5	1	2	225	230	0.8	2	220	120	80	126	79	131	80	140	77	132	78	136	70	128	72	126	72	110	70	130	80	128	72	124	74	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	PRESENT	8	9
60	PUSHPA	24	2	3	0	170	165	2	6	150	100	80	110	80	102	60	104	59	90	50	86	60	108	80	110	70	118	91	121	74	128	89	130	80	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
61	ASHWINI	19	0.8	1	2	180	220	1	2	180	130	80	124	76	106	70	80	40	90	52	95	47	83	39	100	82	123	91	130	92	136	64	113	60	PRESENT	ABSENT	ABSENT	PRESENT	ABSENT	ABSENT	8	9
62	KAVERI	21	3	4	0	165	180	2	5	180	140	110	130	80	123	76	116	70	122	76	126	78	130	80	124	76	128	78	114	55	124	60	124	74	ABSENT	ABSENT	PRESENT	ABSENT	ABSENT	ABSENT	8	9
63	Siddamma	31	1	1.45	10	200	230	1	2	240	110	70	90	50	80	40	70	32	83	36	86	47	96	52	100	58	108	65	119	80	120	80	118	70	PRESENT	PRESENT	PRESENT	PRESENT	PRESENT	PRESENT	7	8
64	Bhagirathi	28	2	2.3	0	180	190	3	3	180	111	55	90	50	88	46	91	60	98	60	100	61	109	80	98	62	98	59	102	62	100	62	106	62	PRESENT	ABSENT	PRESENT	ABSENT	ABSENT	PRESENT	7	8
65	Kavitha	22	1	1.3	0	180	220	0.5	1	180	130	90	124	82	110	66	94	66	106	71	96	54	106	70	150	99	130	86	128	70	120	70	120	68	PRESENT	PRESENT	ABSENT	ABSENT	PRESENT	ABSENT	8	9

MASTER CHART – LEVOBUPIVACAINE GROUP

SI .N UM BER	NAME	:IN YE	OF SENSO RY BLOCK (MINU	TO REACH T10(MI NUTES)	TO REAC H T4(MI NUTE	OF REGRES SION OF DERMA	DURA TION OF SENSO RY	ONS ET OF MOT OR	TO REAC H MAXI MU	ATIO N OF ANA GESI A(HO	AL BOO D PRES SURE	AL BLO OD PRES SUR	1 MIN SBP	1 MIN DBP	2 MIN SBP	2 MIN DBP	3 MIN SBP	3 MIN DBP	4 MIN SBP	4 MIN DBP	5 MIN SBP	5 MIN DBP	10 MIN SBP	10 MIN DBP	15 MIN SBP	15 MIN DBP	20 MIN SBP	20 MIN DBP	30 MIN SBP	30 MIN DBP	45 MIN SBP	45 MIN DBP	1 HOUR SBP	1 HOUR DBP	HYPOTE NSION	BRADYC ARDIA	NAUSEA, VOMITIN G	HEADAC HE	ITCHING	SHIVERIN G	APGAR AT 1 MIN	APGAR AT 5 MIN
1	sunita	32	1.3	2	2.3	160	180	0.6	1	135	130	70	120	80	100	60	90	70	110	70	112	68	118	72	110	60	110	62	100	56	130	70	126	68	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	7	10
2	veda	26	1	0.8	0	180	180	1	2	195	120	80	120	80	110	50	93	54	111	56	113	59	116	63	123	69	121	72	118	70	120	68	127	61	PRESENT	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
3	Gurubai	27	1	0.8	0	150	120	3	4	120	130	90	100	70	90	60	100	60	101	68	100	62	100	65	110	70	122	76	128	70	100	60	90	60	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
4	Jayashree	35	1	1.1	0	120	150	0.8	1.3	120	130	90	130	80	128	78	120	70	126	80	128	80	120	70	126	80	137	76	136	70	133	78	140	80	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
5	Jyoti	26	2	2.3	0	180	180	1	2	150	116	64	110	70	90	60	119	68	125	63	121	64	117	63	118	68	100	67	116	70	115	72	123	78	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
6	bhagyashre	22	1	1	0	180	165	1.3	2	210	130	80	102	57	124	82	110	66	94	66	106	71	96	54	150	100	136	86	128	70	120	68	121	65	PRESENT	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
7	sujata	25	2	3	0	150	180	2	3	180	120	70	105	44	130	70	118	72	130	72	126	72	116	64	124	64	132	62	128	68	126	68	138	72	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
8	shameena	22	2	2.3	0	120	180	3	3	180	120	70	111	55	90	50	88	46	91	60	98	60	100	60	98	62	102	62	92	50	107	53	106	62	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	9	9
9	Nikita	30	0.8	1	0	120	180	0.6	2	210	120	90	140	80	120	70	115	72	114	71	107	58	100	60	111	55	112	59	110	70	120	82	116	76	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
10	Kalavati	35	3	4	0	180	180	2	4	210	130	80	117	69	107	63	114	61	118	64	110	60	109	64	133	77	134	78	119	74	150	95	140	94	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
11	Lalitha	22	0.5	0.8	0	180	180	1	1	240	110	90	109	78	109	59	102	89	102	74	107	70	100	64	106	66	103	67	120	80	131	88	135	91	PRESENT	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
12	Gurudevi	28	0.3	0.8	0	150	180	0.3	1	180	110	70	110	70	110	73	89	54	103	75	107	78	111	78	110	82	107	80	104	72	110	76	112	80	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	7	9
13	Roopali	19	0.8	1	0	180	210	1.3	2	230	120	70	114	67	114	70	120	70	122	75	126	69	107	50	112	66	110	67	120	82	118	82	110	69	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
14	Savitri	22	0.5	0.8	0	120	120	1	2	220	110	80	97	55	97	68	113	72	122	77	115	72	109	61	111	72	110	63	110	62	107	61	118	70	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	7	8
15	Nivedita	25	0.8	1	0	180	240	1	2	210	110	70	128	80	128	64	113	68	113	63	112	68	108	61	103	64	110	70	100	62	112	76	120	81	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	7	8
16	Siddamma	21	0.8	1	0	120	180	0.6	2	180	140	90	130	80	130	80	90	60	92	58	96	62	100	60	102	68	109	68	106	60	102	58	110	68	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	7	8
17	Vijaya	41	0.5	1	0	110	150	1	1.2	150	120	80	100	58	101	62	102	65	110	70	112	72	110	70	118	73	116	78	118	64	120	72	118	68	ABSENT	ABSENT	ABSENT	PRESENT	ABSENT	ABSENT	6	7
18	Renuka	28	0.5	1	0	135	180	1	1.3	180	150	90	140	80	131	70	132	68	128	72	126	70	134	82	136	72	129	68	134	80	135	81	141	80	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	7	8
19	Jamuna	26	0.8	2	0	120	135	1	3	150	110	70	100	70	90	60	84	58	92	62	98	60	102	68	110	69	114	68	118	72	120	76	122	78	PRESENT	ABSENT	PRESENT	ABSENT	ABSENT	ABSENT	8	9
20	Pooja	26	2	2.3	0	180	180	1	2	195	110	70	90	60	119	68	125	63	121	64	117	63	118	68	116	70	98	64	116	70	115	72	123	78	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
21	Rajashree	22	1	1.3	0	120	180	1.2	2	180	130	90	123	70	115	72	114	71	117	70	107	58	100	60	111	55	112	59	110	70	120	82	116	76	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
22	Ashwini	24	0.8	1.3	3	210	210	1	3	200	120	80	120	70	74	60	84	60	104	69	124	73	123	76	112	70	113	53	101	44	97	44	88	42	PRESENT	PRESENT	PRESENT	ABSENT	ABSENT	ABSENT	8	9
23	Basamma	36	2	3	0	120	130	3	4	150	130	90	108	63	112	64	101	58	105	63	101	55	104	59	105	59	113	63	119	68	150	90	152	100	ABSENT	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
24	Vimala	21	0.6	1	0	135	150	0.8	1	160	130	70	134	74	134	75	110	60	112	62	95	60	98	55	115	60	105	55	120	70	122	72	127	76	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	PRESENT	7	9
25	Hajaratbai	26	1	2	0	120	150	2	3	170	120	80	133	81	133	72	126	72	123	72	126	75	123	75	118	72	120	61	115	60	118	65	120	67	ABSENT	ABSENT	PRESENT	ABSENT	ABSENT	ABSENT	7	8
26	Anitha	25	0.8	1.4	0	175	210	2	3	180	110	64	104	68	101	70	111	77	133	79	131	82	130	86	126	76	127	79	126	68	114	56	134	72	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
27	Lalitha	24	2	2.3	0	151	185	2	3	180	110	70	90	55	88	46	91	60	98	60	100	60	109	80	98	62	102	62	92	56	106	62	126	82	PRESENT	ABSENT	ABSENT	ABSENT	PRESENT	ABSENT	8	9
28	Tejaswini	33	0.8	1	0	110	162	0.6	2	212	110	80	123	70	115	72	114	71	117	70	107	58	100	60	111	55	120	56	112	59	110	70	120	82	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
29	Lakshmi	24	2	3	0	160	150	2	4	220	120	90	117	69	107	63	115	61	118	64	110	60	109	64	134	78	119	74	151	96	145	94	150	95	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
30	Prema	26	0.6	1	0	170	190	0.8	2	185	120	80	131	67	123	52	121	66	130	73	127	64	131	66	129	74	150	93	151	91	153	92	150	97	ABSENT	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9

31	Saraswati	23	3	5	0	152	178	2	5	180	120	70	129	69	103	58	114	73	111	51	114	62	113	65	112	64	107	64	104	65	122	80	126	82	ABSENT	ABSENT	PRESENT	ABSENT	ABSENT	ABSENT	8	9
32	Yallawwa	24	2	3	0	190	180	1	3	180	120	90	120	80	116	47	135	74	139	61	126	64	115	46	119	52	140	70	136	81	132	82	138	84	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
33	Priyanka	24	2	2.3	0	152	180	1	3	180	110	70	135	94	133	93	146	84	133	88	132	87	134	89	124	77	123	75	131	76	130	78	119	81	ABSENT	ABSENT	ABSENT	PRESENT	PRESENT	PRESENT	8	9
34	Mahananda	28	1	2	0	170	210	2	3	170	120	80	120	50	89	53	80	56	114	76	92	51	102	64	103	63	110	80	108	72	120	80	122	72	ABSENT	ABSENT	PRESENT	ABSENT	ABSENT	ABSENT	7	8
35	Nagamma	27	0.8	1	0	120	135	2	3	140	130	80	125	83	134	85	134	87	128	83	128	76	141	99	135	88	146	93	140	93	142	92	147	102	ABSENT	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
36	hankramm	28	0.8	2	0	140	150	1	2	152	110	80	130	59	120	59	134	61	125	50	109	70	131	57	117	53	123	50	117	53	120	48	120	50	PRESENT	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
37	Shanta	28	1	3	4	180	195	2	4	210	120	80	135	76	110	72	120	70	110	74	126	72	114	70	110	74	124	70	116	68	115	69	127	78	ABSENT	ABSENT	PRESENT	ABSENT	ABSENT	ABSENT	8	9
38	Chaitra	22	2	3	0	165	180	2	3	180	130	80	139	89	131	78	143	88	139	90	149	89	149	90	143	88	140	83	137	77	122	75	141	79	ABSENT	ABSENT	PRESENT	ABSENT	ABSENT	ABSENT	8	9
39	Nassin	19	1	2	3	210	220	2	3	180	120	72	132	98	126	81	111	83	132	95	115	70	149	98	135	90	131	91	140	101	150	91	143	103	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
40	Suvarna	27	0.8	2	0	110	150	1	2	180	130	80	114	72	119	69	136	69	124	70	122	67	111	65	129	83	124	86	128	78	136	70	130	82	ABSENT	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
41	Arati	32	2	4	0	145	160	2	4	180	130	80	111	55	108	58	107	59	107	52	117	77	108	61	87	51	76	41	111	55	106	58	107	59	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	7	8
42	ijayalakshn	34	0.8	2	0	120	160	1	3	170	121	84	100	70	90	60	84	58	92	62	98	60	102	68	110	69	114	68	118	72	120	78	120	76	PRESENT	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
43	Rohini	28	0.8	1	0	150	180	1	2	180	120	70	106	61	12	62	103	54	99	54	100	51	99	54	100	51	99	55	107	56	103	59	106	59	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
44	Mabeena	25	1	3	0	170	180	2	3	180	114	80	130	90	125	85	120	80	123	86	126	86	130	90	140	90	138	86	141	84	138	86	140	70	ABSENT	ABSENT	PRESENT	ABSENT	ABSENT	ABSENT	8	9
45	hagyashre	19	2	3	0	140	160	2.3	4	150	110	70	110	70	110	78	112	60	100	60	96	60	110	78	121	84	119	86	122	82	120	84	128	80	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
46	Danamma	22	2	3	0	128	148	2	3	150	120	80	120	70	110	60	100	60	123	73	125	80	126	83	126	76	128	82	126	78	128	76	126	72	ABSENT	ABSENT	PRESENT	PRESENT	ABSENT	ABSENT	8	9
47	Savitri	31	2	2	0	120	120	1	2	120	110	70	106	58	108	67	118	70	108	66	122	76	119	76	128	76	110	70	118	60	113	73	118	60	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
48	Nagamma	26	2	3	4	210	180	2	3	180	102	60	100	62	101	68	97	63	104	69	115	71	93	52	109	66	105	65	109	71	120	68	109	62	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
49	Nagamma	37	2	2.5	0	136	120	1	1.5	152	120	80	110	70	80	50	110	70	120	90	126	80	132	80	110	90	126	70	118	82	120	70	130	80	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	PRESENT	8	9
50	Chandrika	23	2	3	0	120	135	2	3	120	120	80	111	81	118	58	110	53	113	65	111	51	120	73	118	82	122	78	130	81	121	78	118	82	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
51	Mallamma	22	2	3	0	165	180	1	3	180	160	100	150	110	112	72	103	52	90	43	124	63	120	62	110	70	119	68	118	72	122	80	130	80	PRESENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	7	8
52	Ranjita	20	2.3	3	4	220	180	2	5	180	120	80	116	80	90	40	80	32	112	36	136	75	109	58	116	57	120	70	125	79	126	76	118	76	ABSENT	ABSENT	PRESENT	ABSENT	PRESENT	PRESENT	7	8
53	Pooja	26	3	3	0	225	178	2	3	185	120	80	135	87	123	69	106	74	136	72	135	67	126	67	128	70	118	78	121	80	118	78	112	80	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
54	Priyanka	31	5	6	0	60	60	3	6	45	110	70	110	68	111	68	120	63	126	71	96	53	92	68	120	75	128	91	130	96	132	86	128	78	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	7	9
55	Arati	20	1	2	0	135	118	2	3	180	130	80	120	78	80	40	112	58	118	76	101	62	124	73	116	68	127	79	106	50	109	55	123	63	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	PRESENT	7	8
56	Shabana	24	3	3.5	5	230	240	2	5	225	110	80	115	60	111	62	96	57	86	42	99	57	104	59	99	59	109	62	115	64	108	73	112	70	PRESENT	ABSENT	ABSENT	PRESENT	ABSENT	PRESENT	7	8
57	Jyoti	25	1.5	2	0	142	186	1	3	172	140	90	150	110	112	72	103	52	90	45	110	70	120	63	105	60	116	63	119	68	118	72	121	70	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	7	8
58	Tejaswini	21	3	3	0	190	186	1	3	182	110	70	120	70	103	67	104	64	106	67	107	73	118	70	109	81	120	82	120	80	121	78	124	78	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	PRESENT	8	9
59	Lakshmibai	29	2	3	5	230	210	1	4	180	120	70	115	60	111	62	90	57	80	46	69	40	78	45	99	55	98	60	109	62	102	70	120	85	PRESENT	PRESENT	PRESENT	PRESENT	ABSENT	ABSENT	8	9
60	Sushmitha	23	2	3	0	120	125	1	3	135	120	80	130	82	120	72	118	68	118	64	114	61	109	64	110	68	108	60	118	72	110	68	125	85	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	PRESENT	8	9
61	Renuka	32	1.15	5	0	110	120	1	2	120	140	80	147	92	140	94	128	82	131	81	125	78	109	71	98	55	106	66	115	72	109	64	115	65	ABSENT	ABSENT	ABSENT	PRESENT	ABSENT	ABSENT	8	9
62	Pushpa	24	2	3	0	120	130	1	4	120	120	80	110	80	112	70	100	60	102	68	112	70	120	80	121	78	110	70	118	85	113	75	110	71	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	PRESENT	7	8
63	Deepavali	24	1.2	3	0	120	145	2	5	120	120	80	130	70	134	89	133	90	128	83	123	77	122	72	121	71	123	74	110	80	120	92	128	88	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
64	Sunita	19	3	5	0	135	160	2	3	120	130	80	110	70	90	60	116	68	112	66	111	70	120	78	110	68	118	70	114	72	122	88	120	78	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9
65	Sangamitra	33	1	3	0	150	135	2	4	120	127	78	113	85	132	82	113	72	140	83	104	61	122	78	114	71	116	77	120	86	120	65	117	63	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT	8	9