RESEARCH PAPER

Intrathecal Dexmedetomidine as an Adjuvant to Bupivacaine for Spinal Anaesthesia in Lower Abdominal and Lower Limb Surgeries: A Comparative Clinical Study

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ABSTRACT

Background: Spinal anaesthesia is a widely practiced regional anaesthetic technique for lower abdominal and lower limb surgeries. Bupivacaine is commonly used for subarachnoid block; however, when used alone, it provides limited duration of postoperative analgesia. The use of intrathecal adjuvants has been explored to enhance the quality and duration of spinal anaesthesia. Dexmedetomidine, a highly selective alpha-2 adrenergic agonist, has gained attention as an effective intrathecal adjuvant because of its analgesic, sedative, and sympatholytic properties

Methods: A total of 60 patients aged between 20–60 years, belonging to ASA physical status I and II, undergoing lower limb surgeries and caesarean section under spinal anaesthesia were included in the study. The patients were randomly divided into two groups. Group A (n=30): Received 3 ml of 0.5% hyperbaric bupivacaine intrathecally. Group B (n=30): Received 3 ml of 0.5% hyperbaric bupivacaine with 5 µg dexmedetomidine intrathecally.

Results: The addition of dexmedetomidine to intrathecal bupivacaine resulted in faster onset of sensory block. Prolonged duration of sensory and motor block Significantly longer duration of postoperative analgesia Lower VAS pain scores postoperatively. Hemodynamic parameters remained stable in both groups, and adverse effects were minimal and manageable.

Conclusion: Dexmedetomidine is a safe and effective adjuvant to intrathecal bupivacaine, as it prolongs the duration of spinal anaesthesia and provides better postoperative analgesia without significant side effects.

Keywords: Spinal anaesthesia, Bupivacaine, Dexmedetomidine, Intrathecal adjuvant.

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INTRODUCTION

Spinal anaesthesia (subarachnoid block) is a widely used technique for lower abdominal, pelvic, and lower limb surgeries due to its rapid onset, dense sensory/motor block, and high success rate. Hyperbaric bupivacaine (0.5%) is a common local anesthetic agent used for spinal blocks, as it provides potent sensory and motor blockade by inhibiting voltage-gated sodium channels in the nerve roots. However, the duration of spinal anaesthesia with bupivacaine is limited (often lasting 2–3 hours), leading to early postoperative pain once the block regresses. Prolonging the duration of analgesia is therefore a key goal in perioperative management.

Spinal anaesthesia (SA) is the preferred method during

most surgical operations, especially C-section. Because of the dense and predictable block associated with SA, this technique exhibits a quicker onset and fewer complications compared with other anesthetic protocols. However, the adverse effects of neuraxial analgesia, such as maternal hypotension, shivering, vomiting or nausea, and a faint feeling, cannot be underestimate.

Spinal anaesthesia is widely used in various operations because it provides adequate analgesia, muscular relaxation with simple operation, and rapid onset of action. However, use of local anesthetics alone has a short duration and is inadequate for visceral pain.Various intrathecal adjuvants, such as morphine, fentanyl, ketamine, midazolam, and clonidine, are used to improve the quality and duration of analgesia. . Among local anaesthetic agents, 0.5% hyperbaric bupivacaine is one of the most established drugs for spinal anaesthesia because of its predictable spread in cerebrospinal fluid and ability to provide adequate surgical anaesthesia. Despite its efficacy, when used alone it offers a limited duration of postoperative analgesia, necessitating early analgesic intervention and contributing to patient discomfort in the postoperative period. To overcome this limitation, numerous intrathecal adjuvants have been studied to enhance the quality, duration, and comfort of spinal anaesthesia, including opioids, midazolam, neostigmine, sodium bicarbonate, hyaluronidase and α-2 adrenergic agonists . Among these adjuvants, α-2 adrenergic receptor agonists have shown particular promise due to their synergistic effects when combined with local anaesthetics. Clonidine, the earlier agent in this class, has been demonstrated to prolong both sensory and motor blockade when co-administered with local anesthetics .

Dexmedetomidine is a highly selective alpha 2-adrenoceptor agonist with sedative, anxiolytic, sympatholytic, and analgesic-sparing effects and minimal depression of respiratory function.Dexmedetomidine acts on pre-, and post-synaptic sympathetic nerve terminals and the central nervous system, decreasing the sympathetic outflow and noradrenaline release and causing sedation, anxiolytic, analgesic, and sympatholytic effects. It lacks opioid-like properties, so opioidrelated adverse side effects are not found. It was first used intrathecally in humans for transurethral resection of prostate .

Neuroaxial opioids have some adverse effects like pruritis, nausea and vomiting, urinary retention and depression of ventilation. So other adjuvants like tramadol, a partial opioid agonist (weak μ agonist) and midazolam a benzodiazepine are also tried in this respect but these are not devoid of adverse effects. The main reason for using adjuvant in subarachnoid block is to achieve a prolongation of duration of analgesia which may be beneficial in intraoperative as well as post operative period. Adjuvants potentiate the action of local anaesthetics and allow a decrease in the required dose.

The purpose of the study was to study the comparison of Intrathecal Dexmedetomidine as an Adjuvant to Bupivacaine versus Bupivacaine Alone in Patients Undergoing Surgeries under Spinal Anaesthesia

AIM OF THE STUDY

A study on the comparison of dexmedetomidine as an adjuvant to intrathecal bupivacaine versus bupivacaine alone in lower abdominal & lower limb surgeries.

OBJECTIVES OF THE STUDY

1. To evaluate the efficacy of dexmedetomidine as an adjuvant to intrathecal bupivacaine versus bupivacaine alone in lower abdominal & lower limb surgeries
2. To assess clinically the sensory and motor blockade in all the patients.
3. To compare the incidence of complications in both groups
4. To observe the hemodynamic stability in both groups

HYPOTHESIS

Null Hypothesis:

The clinical, sensory and motor blockade in group I was better than in group II. The incidence of complications in group I was less than in group II, and the hemodynamic stability in group I was better than in group II.

Alternate Hypothesis:

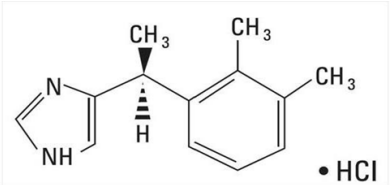
The clinical, sensory and motor blockade in group II will be better than in group I. The incidence of complications in group II will be less than in group I, and the hemodynamic stability in group II will be better than in group I.

RELEVANT PHARMACOLOGY

DEXMEDETOMIDINE:

Dexmedetomidine is a highly selective α2-adrenergic agonist used for sedation, analgesia, and anxiolysis in anaesthesia and ICU settings. It provides sleep-like sedation with minimal respiratory depression and helps maintain hemodynamic stability, making it useful as an adjuvant in various anaesthetic techniques.

1. **Name**
   - Generic name: Dexmedetomidine
   - Brand names: Precedex (common)
2. **Class**
   - Highly selective α2-adrenergic receptor agonist
   - Sedative, anxiolytic, analgesic (non-opioid) agent
3. **Structure**



Chemical Structure of Dexmedetomidine

Image 2: Vial of Dexmedetomidine

4. Mechanism of Action
- Acts on α2 receptors (especially α2A subtype) in CNS
- ↓ Norepinephrine release → sedation & anxiolysis
- Acts on locus coeruleus → produces natural sleep-like sedation
- In spinal cord → inhibits pain signal transmission → analgesia
- ↓ Sympathetic outflow → bradycardia & hypotension

5. Pharmacokinetics
- Rapid distribution phase
- High protein binding (~94%)
- Linear pharmacokinetics in therapeutic dose range
- Context-sensitive half-time increases with duration of infusion

6. Route of Administration
- Intravenous (IV) – most common
- Intranasal (off-label)
- Oral (limited use due to first-pass metabolism)

7. Absorption
- IV: 100% bioavailability
- Intranasal: good absorption (≈65–90%)
- Oral: low bioavailability due to extensive first-pass metabolism

8. Distribution
- Highly lipophilic → rapid CNS penetration
- Volume of distribution: ~1.3–2 L/kg
- Protein binding: ~94% (albumin & α1-acid glycoprotein)

9. Metabolism
- Extensive hepatic metabolism
- Mainly via:
  - Glucuronidation (major pathway)
  - Cytochrome P450 (CYP2A6 minor role)
  - Produces inactive metabolites

10. Excretion
- Mainly excreted in urine (~95%)
- Small amount via faeces (~4%)
- Elimination half-life: ~2–3 hours

11. Pharmacodynamics

A. Cardiovascular System (CVS)
- Bradycardia (↓ HR)
- Hypotension (↓ sympathetic tone)
- Initial transient hypertension (due to peripheral α2B stimulation)
- ↓ cardiac output (mild)

B. Respiratory System
- Minimal respiratory depression (major advantage)
- Maintains airway reflexes

C. Central Nervous System
- Sedation (resembles natural sleep)
- Anxiolysis
- Analgesia (opioid-sparing effect)

D. Other Effects
- Decreased salivation (dry mouth)
- Reduced shivering
- Decreased intraocular pressure
-

12. Indications
- ICU Sedation
- Procedural Sedation
- Adjunct in General Anaesthesia
- Regional and Neuraxial Anaesthesia
- Premedication
- Postoperative Analgesia
- Sedation in Non-intubated Patients
- Delirium Management (ICU)
- Attenuation of Stress Response
- Paediatric Sedation

13. Adverse Effects (A/E)
- Bradycardia (most common)
- Hypotension
- Hypertension (initial phase)
- Dry mouth
- Nausea
- Excessive sedation
- Rare: sinus arrest, AV block

14. Contraindications (C/I)
- Severe bradycardia
- Advanced heart block (unless paced)
- Hypotension/shock
- Severe ventricular dysfunction
- Hypersensitivity to the drug

15. Formulation
- Available as a clear, colourless IV solution
- Common strength: 100 mcg/mL (concentrate)
- Diluted before infusion

16. Dose

- **Loading dose:** 1 mcg/kg IV over 10 minutes (optional)
- **Maintenance infusion:** 0.2 – 0.7 mcg/kg/hr
  - Can be increased up to 1.5 mcg/kg/hr (ICU settings)
- Dose adjustment required in:
  - Hepatic impairment
  - Elder
  - ly patients

BUPIVACAINE:

Bupivacaine is a long-acting amide-type local anaesthetic widely used for regional and neuraxial anaesthesia. It provides prolonged sensory and motor blockade by inhibiting nerve impulse conduction, making it especially useful in surgical procedures and postoperative pain management. Due to its high potency and duration of action, it is commonly used in spinal, epidural, and peripheral nerve blocks.

1. **Name**
   - Generic name: Bupivacaine
   - Brand names: Marcaine, Sensorcaine

2. **Class**
   - Amide-type local anaesthetic
   - Long-acting local anaesthetic

3. **Structure.**

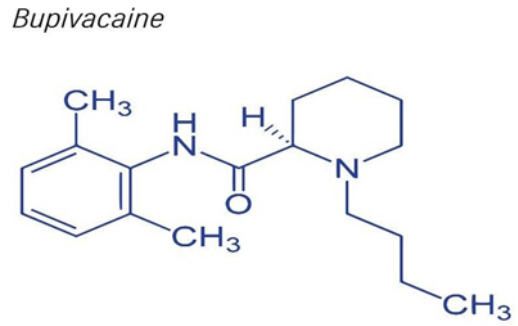


Image 3: Chemical Structure of Bupivacaine

Image 4: Vial of Bupivacaine 0.5%

4. **Mechanism of Action**
   - Blocks voltage-gated sodium (Na^+) channels
   - Prevents depolarization of the nerve membrane
   - Inhibits initiation and conduction of nerve impulses
   - Produces sensory and motor blockade

5. **Pharmacokinetics**
   - Slow onset, long duration of action
   - High protein binding (~95%)
   - Duration depends on dose, site, and vascularity

6. **Route of Administration**
   - Spinal (intrathecal)
   - Epidural
   - Peripheral nerve block
   - Local infiltration
   - Caudal block

7. **Absorption**
   - Depends on site vascularity
   - Faster absorption → higher systemic toxicity
   - Addition of adrenaline ↓ absorption

8. **Distribution**
   - Highly protein bound (~95%)
   - Widely distributed in tissues
   - Crosses placenta and BBB

9. **Metabolism**
   - Hepatic metabolism (liver)
   - Via CYP450 enzymes (amide hydrolysis)
   - Produces inactive metabolites

10. **Excretion**
    - Mainly excreted via kidneys (urine)
    - Small amount unchanged
    - Elimination half-life: ~2.5–3.5 hours

11. Pharmacodynamics

A. Cardiovascular System (CVS)
- Decreases cardiac conduction and contractility
- Can cause arrhythmias
- Severe cardiotoxicity (more than lignocaine)
- Hypotension

B. Central Nervous System
- Initial CNS excitation (tremors, seizures)
- Followed by CNS depression

C. Other Systems
- Skeletal muscle relaxation
- Minimal effect on respiration at therapeutic doses

12. Indications
- Spinal Anaesthesia
- Epidural Anaesthesia
- Caudal Anaesthesia
- Peripheral Nerve Blocks
- Local Infiltration Anaesthesia
- Obstetric Analgesia (Labour Epidural)
- Postoperative Pain Management
- Chronic Pain Management
- Regional Anaesthesia for Orthopaedic Procedures

13. Adverse Effects (A/E)
- CNS toxicity (tinnitus, seizures)
- Cardiotoxicity (arrhythmias, cardiac arrest)
- Hypotension
- Allergic reactions (rare)
- Local tissue irritation

14. Contraindications (C/I)
- Hypersensitivity to amide local anaesthetics
- Severe cardiac conduction abnormalities
- Hypotension/hypovolemia (for spinal/epidural)
- Infection at the injection site

15. Formulation
- Available as 0.25%, 0.5%, 0.75% solutions
- Hyperbaric (with dextrose) for spinal use
- Plain or with adrenaline

16. Dose
- Maximum dose (without adrenaline): ~2 mg/kg
- With adrenaline: ~3 mg/kg
- Spinal anaesthesia: 10–20 mg (0.5% heavy)
- Dose varies with technique and patient factors

MATERIALS AND METHODS

The present study, entitled "To study the comparison of dexmedetomidine as an adjuvant to intrathecal bupivacaine versus bupivacaine alone in lower abdominal & lower limb surgeries", was conducted at Classic Hospital, Srinagar, Jammu and Kashmir, from February 2025 to August 2025.

Sixty patients aged 30-60 years, weight 50-70kg, of either gender, with ASA 1 and II, for lower abdomen or lower limb surgeries under spinal anaesthesia were studied. The patients were divided into two groups of 30 each: group I and group II.

Group I (n=30) received an injection. Bupivacaine (0.5%) hyperbaric 3 ml (15 mg). Total volume of the drug=3 ml.

Group II (n=30) received an injection. Bupivacaine (0.5%) hyperbaric 2 ml (10 mg) + inj. Dexmedetomidine 5ug (1ml) (30 mcg). Total volume of the drug = 3 ml. Written consent was taken from all patients.

INCLUSION CRITERIA
- Patients aged 20–60 years
- Patients of either gender
- Patients belonging to ASA Physical Status I & II
- Patients scheduled for lower abdominal and lower limb surgeries
- Patients undergoing surgery under spinal anaesthesia
- Patients who are willing to participate and provide informed consent

EXCLUSION CRITERIA.
- Patient with a history of previous back surgery and infection at the injection site.
- Patient with hypersensitivity to amide-level local anaesthetics or fentanyl.
- Uncooperative patient.
- Patient with Musculoskeletal deformity.
- Patient with severe compromised medical conditions like cardiac and respiratory diseases.
- Patient with ASA III or IV.

PRE ANESTHETIC CHECKUP

Details pertaining to the patient's medical history, general physical and systematic examination, and basic routine investigations like Hb, blood sugar, blood urea, serum creatinine (BT, bleeding time, Clotting time (CT), ECG, Chest X-Ray were done.

Tab. Alprazolam 0.25mg was given as an anxiolytic if needed. No premedication was given to the patient in the morning.

ANESTHETIC CHECKUP

In the operating room, routine monitoring (e.g., non-invasive blood pressure, heart rate, pulse oximeter, ECG) was used, an IV line was started, and all the patients were preloaded with 0.9% NaCl (10ml per kg of body weight) over a period of 15 to 20 minutes before the injection of local anaesthetic.

The technique, following the proper protocol of preparation, position, projection and puncture, was followed. The patient was placed in the right or left lateral position or in sitting position, and under all aseptic conditions. Subarachnoid block was given in the L3-L4 interspace with a 25G Quincke spinal needle via midline approach. After the free flow of CSF, the study drug was given intrathecally according to the group allotted. The patient was placed in the supine position until the induced blockade reached the highest level.

The following parameters Were assessed and recorded:

1. Every 2 minutes from the time of intrathecal injection, the sensory level was checked until the level stabilised for 4 consecutive tests. After that, sensory level testing was continued every 10 minutes until two-segment regression. Further testing was performed at 20 min intervals in the recovery room for two hours. All the times were recorded from the time of intrathecal injection.
2. Motor block was assessed by the Bromage Scale.

Score 0- No motor block
Score 1- Hip blocked
Score II - Hip and Knee blocked
Score III- Hip, knee and foot blocked

Pain was assessed by using a 10cm Visual Analogue Scale. In the event of a patient complaining of pain during surgery with a pain score > 5 inj. Fentanyl 1ml (20 mg) was given intravenously.

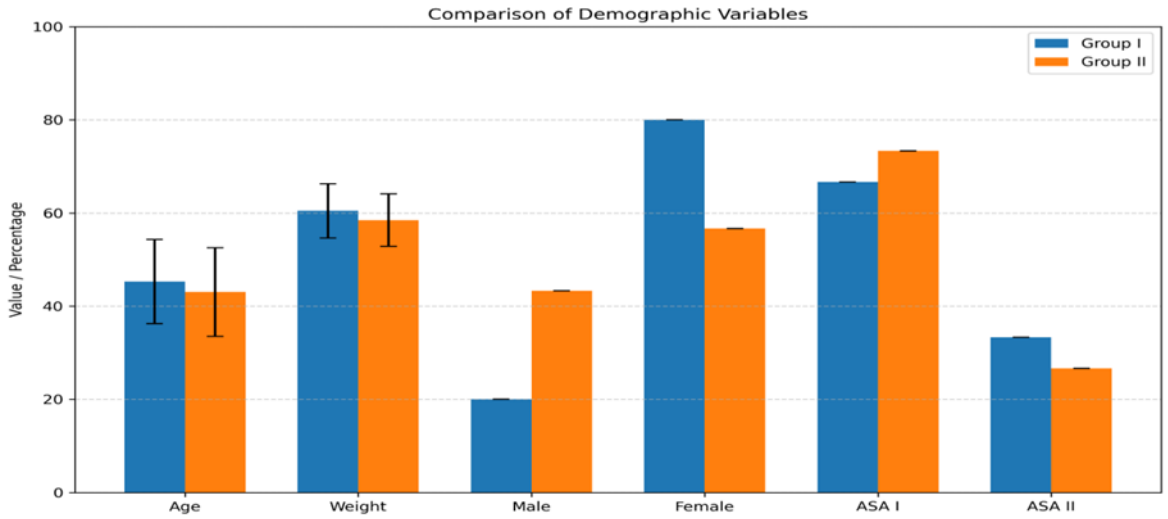
1. After Spinal Anaesthesia, systolic blood pressure, diastolic blood pressure and heart rate were recorded every 3 minutes in the first 15 minutes until the end of surgery. Intraoperative complications like hypotension and bradycardia were recorded. Hypotension was taken as 30% decrease in systolic blood pressure compared with preoperative control levels or blood pressure less than 90mm Hg. Bradycardia was taken as less than 60 per minute or 20% decrease from the baseline, whichever was less. Hypotension and bradycardia were treated with intravenous injection of Mephentine 3mg and Atropine 0.3mg, respectively, in incremental doses.
2. Adverse effects such as nausea, vomiting, shivering, pruritus, respiratory depression, and transient neurological symptoms were recorded.

Further testing of sensory level, motor block, blood pressure, pulse rate and SPO2 was performed at 20-minute intervals in the recovery room for two hours

RESULTS AND ANALYSIS.

Comparison of Baseline Demographic Characteristics in both the Groups

Variable	Group I	Group II	p-value
Age (years)	45.30 ± 9.03	43.03 ± 9.54	0.74
Height (cm)	162.10 ± 6.63	161.93 ± 5.59	0.91
Weight (kg)	60.47 ± 5.81	58.47 ± 5.62	0.18
Gender	M=6 (20.0%)	12 (43.3%)	0.96
	F=24 (80.0%)	17 (56.7%)	0.96
ASA Physical Status			
• Grade I	20 (66.7%)	22 (73.3%)	0.78
• Grade II	10 (33.3%)	9 (26.7%)	0.78



Comparison of the Demographic Variables in both group

The data was mean ± SD for both the groups.

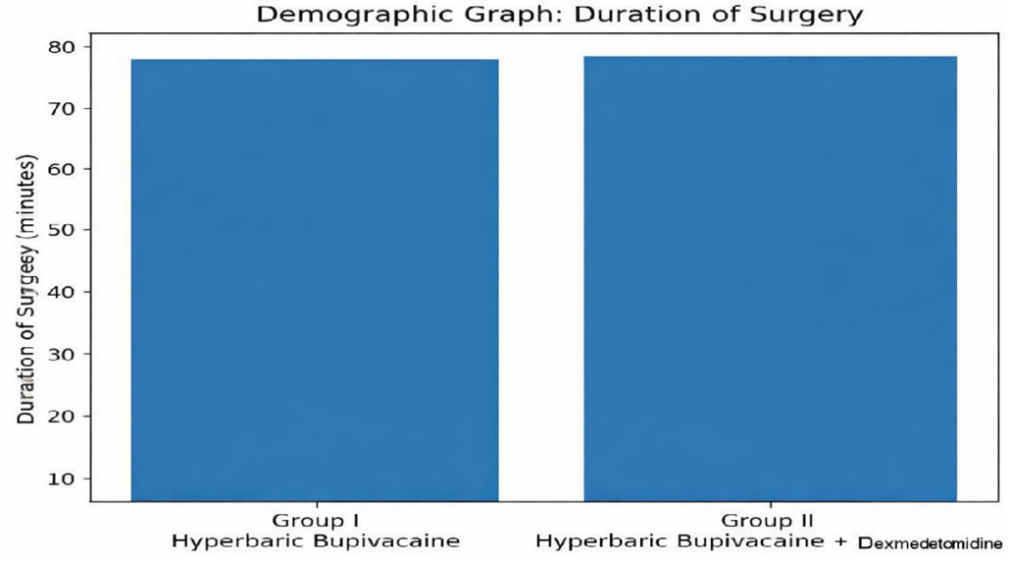
- Age: In Group I, the mean age of the patients was 45.30 ± 9.03 years, and in Group II, the mean age was 43.03 ± 9.54 years. When compared statistically using the unpaired t- test, the p-value was > 0.05 (0.348), which was statistically not significant.
- Weight: In Group I, the mean weight was 60.47 ± 5.81 kg, and in Group II, it was 58.47± 5.62 kg. The difference was statistically not significant (p=0.181).
- Gender: In Group I, there were 20.0% males (n=6) and 80.0% females (n=24). In Group II, there were 43.3% males (n=13) and 56.7% females (n=17). The comparison using the chi-square test showed a p-value of 0.096, indicating no significant difference in

gender distribution between the groups.

- ASA Grade: For ASA physical status, Group I had 20 patients (66.7%) in Grade I and 10 patients (33.3%) in Grade II. Group II had 22 patients (73.3%) in Grade I and 8 patients (26.7%) in Grade II. The chi-square test computed a p-value of 0.778, showing that the groups were comparable in terms of physical status.

Comparison of Duration of surgery in both the group

Parameter	Group I	Group II	P-value
Duration of surgery (min)	120.30±25	110.40±30	0.75

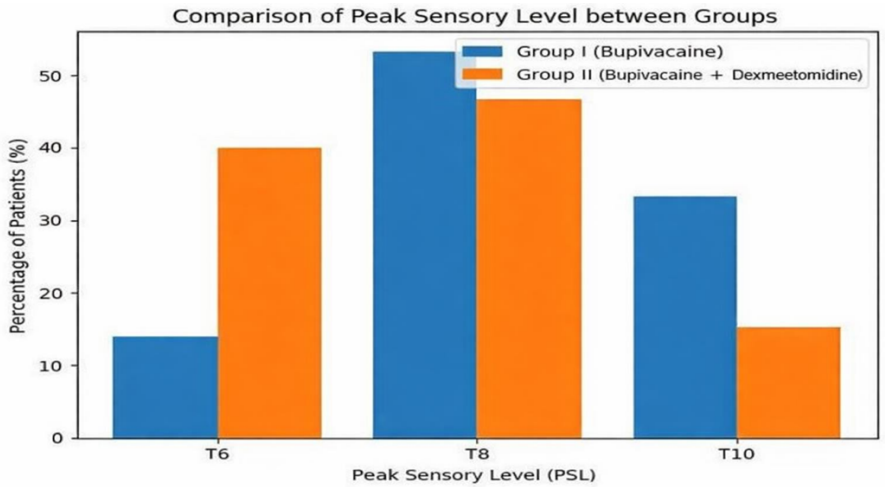


Comparison of Duration of Surgery in both groups

The data was mean ± SD for both the groups. The mean duration in Group I was 120.30±25minutes, while in Group II was 110.40±30minutes. The difference between the groups was statistically significant (p= 0.75), indicating that the duration of surgery was comparable in both groups.

Comparison of Peak Sensory Level in both groups

PSL	Group I	Group II	P-value
T10	4 (13.3%)	12 (40.0%)	0.63

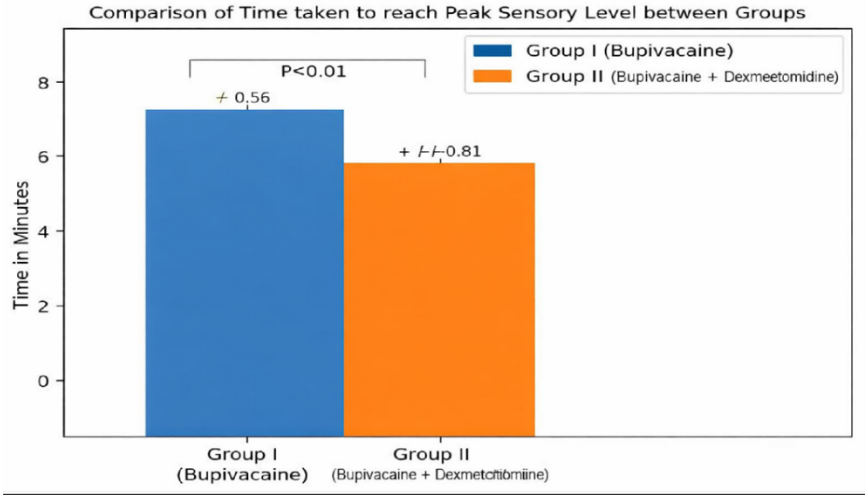


FComparison of Peak Sensory Level in both the Groups.

The peak sensory level was recorded in all patients. In Group I (Bupivacaine), most patients reached T8 (53.3%), followed by T10 (33.3%) and T6 (13.3%). In Group II (Dexmedetomidine + Bupivacaine), a higher proportion of patients achieved T6 (40%) than in Group I. The difference was statistically significant (p = 0.035), indicating that adding Dexmedetomidine enhances the cephalad spread of sensory block compared to bupivacaine alone.

Time taken to reach Peak Sensory Level in both groups

Time taken to reach Peak Sensory Levels	Group I	Group II	P-value
Time in Minutes	6.82±0.56	4.44±0.81	0.01

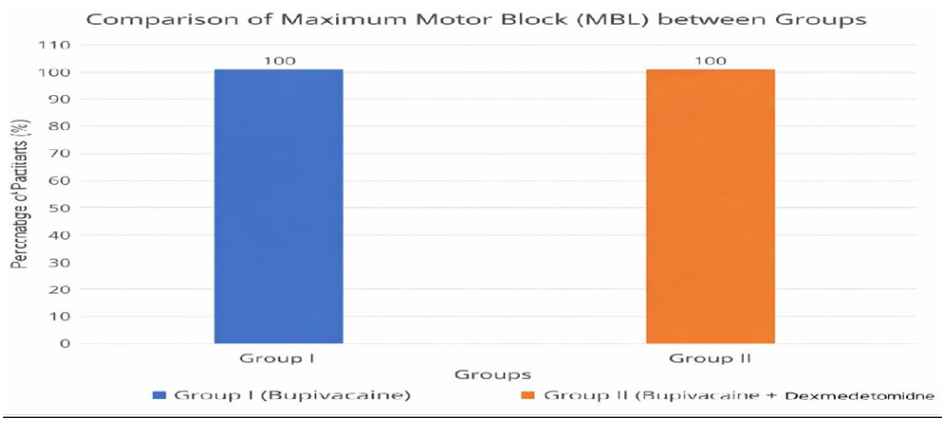


Comparison of the time taken to reach peak sensory level in both groups

The graph compared the time taken to reach peak sensory level between two groups. Group I (Bupivacaine) required 6.82 ± 0.56 minutes, whereas Group II (Bupivacaine + Dexmedetomidine) reached the peak faster at 4.44 ± 0.81 minutes. The difference between the groups is statistically significant (p = 0.01), indicating that the addition of dexmedetomidine significantly reduces the time to achieve peak sensory block.

Comparison of Maximum Motor Block (MBL) in both the Groups.

Bromage Score	Group I	Group II	P-value
Grade 3 (Complete)	30 (100%)	30 (100%)	
Grade 2 (Partial)	0 (0%)	0 (0%	
Grade 1 (Weakness)	0 (0%)	0 (0%)	0.62



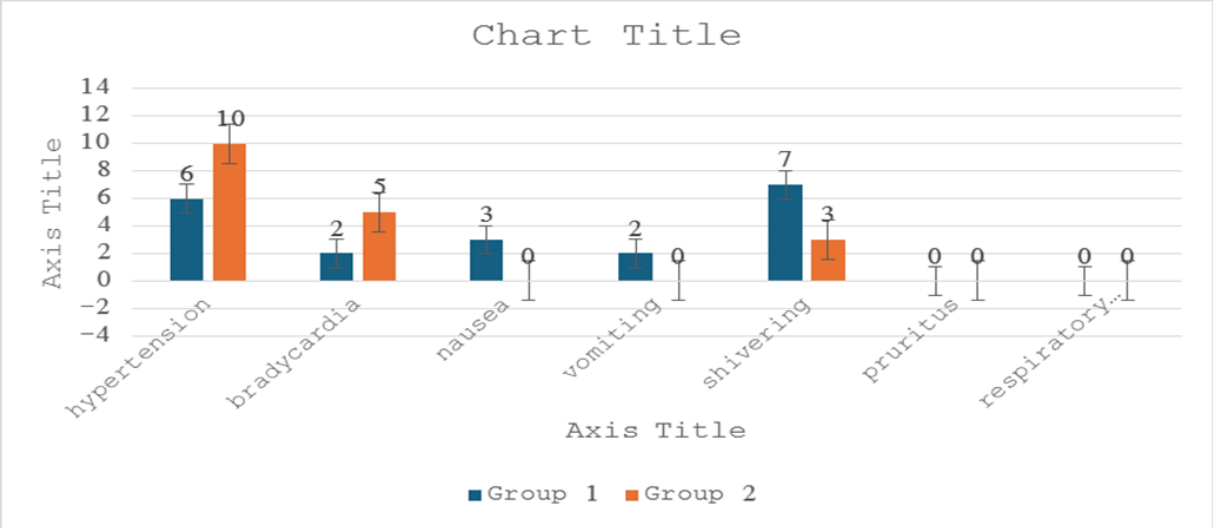
Comparison of Maximum Motor Block (MBL) in both the Groups

The quality of motor blockade was assessed using the Modified Bromage Scale. In this study, 100% of patients in both Group I and Group II achieved a Modified Bromage Score of 3 (complete paralysis of the lower limbs).

Statistical analysis using Fisher's Exact Test yielded a p-value of 1.000, indicating no significant difference between the two groups. This confirms that both anaesthetic regimens were equally effective in providing the dense motor block required for lower limb surgeries.

Comparison of Side Effects in both groups

Side Effect	Group I	Group II	P Value
Hypotension	6 (20%)	10 (33.33%)	0.382
Bradycardia	2 (6.67%)	5 (16.67%)	0.424
Nausea	3 (10%)	0 (0%)	
Vomiting	2 (6.67%)	0 (0%)	
Shivering	7 (23.33%)	3 (10%)	0.299
Pruritus	0 (0%)	0 (0%	
Respiratory depression	0 (0%)	0 (0%)	

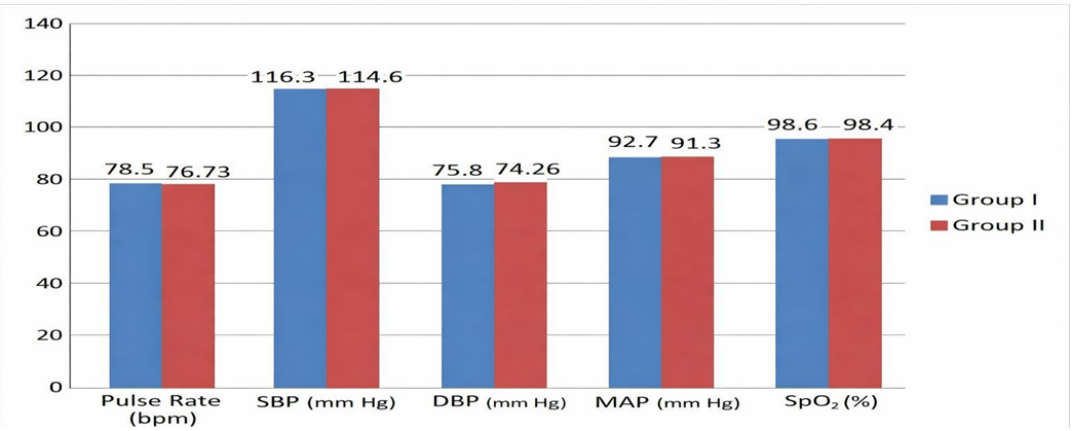


Comparison of Side Effects in both the Groups

The comparison of side effects between Group I and Group II showed that hypotension occurred in 20% of patients in Group I and 33.33% in Group II (p = 0.382). Bradycardia was observed in 6.67% of Group I and 16.67% of Group II patients (p = 0.424). Nausea (10%) and vomiting (6.67%) were reported only in Group I, while none were noted in Group II. Shivering was seen in 23.33% of Group I and 10% of Group II patients (p = 0.299). No cases of pruritus or respiratory depression were observed in either group. Overall, the differences were not statistically significant.

Shows the comparison of baseline hemodynamic variables in both groups

Parameter	Group I	Group II	p-value
Pulse Rate (bpm)	78.5±4.2	76.73±4.6	0.218
SBP (mm Hg)	116.3 ± 6.5	114.6 ±8.01	0.368
DBP (mm Hg)	75.8 ± 3.9	74.26 ±7.66	0.276
MAP (mm Hg)	92.7 ± 5.1	91.3 ± 4.7	0.159
SpO2 (%)	98.6 ± 0.9	98.4 ± 1.2	0.453



Comparison of baseline hemodynamic variables in both groups

The data is mean ± SD for the comparison of the baseline hemodynamic variables in both the groups

P > 0.05 – insignificant (NS)

Table 7 shows that, the mean pulse rate of patients in Group I was 78.5 ± 4.2 bpm and 76.73 ± 4.6 bpm in Group II and when compared statistically using Student's t-test, the difference in the pulse rate of the patients in both the groups was insignificant (P > 0.05).

The mean systolic blood pressure of patients in Group I was 116.3 ± 6.5 mm hg and 114.6 ± 8.01 mm hg in Group II. The difference in both the groups was statistically insignificant (P > 0.05).

The mean diastolic blood pressure of patients in Group I was 75.8 ± 3.9 mm hg and 74.26 ± 7.66mm hg in Group II. The difference in both the groups was statistically insignificant (P > 0.05) .

The mean arterial blood pressure of patients in Group I was 92.7 ± 5.1 and 91.3 ± 4.7 mm hg mm hg in Group II. The difference in both the groups was statistically insignificant (P > 0.05) .

The mean oxygen saturation of the patients in group I was 98.6 ± 0.9 and 98.4 ± 1.2 in group II. The difference in both the groups was statistically insignificant (P> 0.05)

Shows the comparison of post induction hemodynamic variables in both groups

Parameter	Group I	Group II	p-value
Pulse Rate (bpm)	78.5±4.2	76.73±4.6	0.218
SBP (mm Hg)	110.3 ± 6.5	105.6 ±8.01	0.368
DBP (mm Hg)	72.8 ± 3.9	70.26 ±7.66	0.276
MAP (mm Hg)	92.7 ± 5.1	91.3 ± 4.7	0.159
SpO2 (%)	98.6 ± 0.9	98.4 ± 1.2	0.453

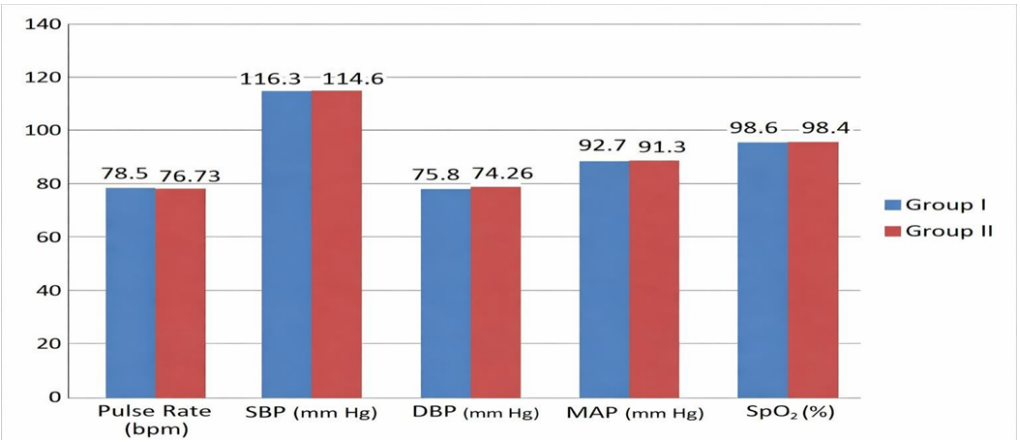


Figure 8: Comparison of Post induction hemodynamic variables in both groups

The data is mean ± SD for the comparison of the baseline hemodynamic variables in both the groups P > 0.05 – insignificant (NS)

Table 8 shows that the mean pulse rate of patients in Group I was 78.5 ± 4.2 bpm and 76.73 ± 4.6 bpm in Group II, and when compared statistically using Student's t-test, the difference in the pulse rate of the patients in both groups was insignificant (P > 0.05) (Table 8, Fig. 8)

The mean systolic blood pressure of patients in Group I was

116.3 ± 6.5 mm hg and 114.6 ± 8.01 mm hg in Group II. The difference between the two groups was statistically insignificant (P > 0.05) (Table 8, Fig.

The mean diastolic blood pressure of patients in Group I was 75.8 ± 3.9 mm hg and 74.26 ± 7.66mm hg in Group II. The difference between the two groups was statistically insignificant (P > 0.05)

The mean arterial blood pressure of patients in Group I was 92.7 ± 5.1 and 91.3 ± 4.7 mm hg mm hg in Group II. The difference between the two groups was statistically insignificant (P > 0.05) (Table 8, Fig. 8

The mean oxygen saturation of the patients in group I was 98.6 ± 0.9 and 98.4 ± 1.2 in group II. The difference between the two groups was statistically insignificant (P> 0.05) (Table 8, Fig.8)

DISCUSSION

Spinal anaesthesia is widely used for various surgical procedures, including caesarean section and lower limb surgeries, because of its simplicity, rapid onset, and reliable block. However, the relatively short duration of action of local anaesthetics such as bupivacaine often limits the duration of postoperative analgesia. To overcome this limitation, various adjuvants have been added to intrathecal bupivacaine to prolong the duration of sensory and motor blockade and improve postoperative analgesia.

In the present study, 60 patients scheduled for elective surgeries under spinal anaesthesia were included and divided into two groups of 30 each. Group B received intrathecal bupivacaine alone, whereas Group BD received intrathecal bupivacaine with dexmedetomidine.

The demographic characteristics of the study subjects which include age, gender and weight, were almost similar in both groups.

The mean duration of surgery in Group I was 65±10 mins, and in Group II was 68±12 mins. On comparing statistically, the p-value was >0.05, which was statistically not significant

The onset of sensory block was observed to be slightly faster in the dexmedetomidine group compared to the bupivacaine group. The duration of sensory block was significantly prolonged in patients receiving dexmedetomidine as an adjuvant. Similarly, the duration of motor block was also longer in the dexmedetomidine group. These findings suggest that the addition of dexmedetomidine enhances the quality and duration of spinal anaesthesia.

There were no statistically significant differences in baseline hemodynamic variables between the two groups (p > 0.05), indicating that both groups were comparable before intervention.

The incidence of adverse effects such as hypotension, bradycardia, nausea, vomiting, and shivering was comparable between the two groups. No serious complications such as respiratory depression were observed in either group.

Group I (Bupivacaine) required 6.82 ± 0.56 minutes, whereas Group II (Bupivacaine + Dexmedetomidine) reached the peak faster at 4.44 ± 0.81 minutes. The difference between the groups is statistically significant (p = 0.01), indicating that the addition of dexmedetomidine significantly reduces the time to achieve peak sensory block.

Riaz MA et al (2012): This quasi-experimental study on 60 patients (ASA I–II) compared intrathecal bupivacaine alone (Group B) with bupivacaine plus dexmedetomidine (Group BD). Group BD showed significantly faster onset of sensory and motor block and prolonged duration of motor block and analgesia (p < 0.001).

Chandra D et al (2015): This randomized, double-blind study in 100 patients compared bupivacaine alone (Group X) with bupivacaine plus dexmedetomidine (Group Y). Group Y had a faster onset of sensory and motor block and significantly prolonged block duration and recovery times (p < 0.0001).

Liu S et al (2011): This meta-analysis of 25 studies (1478 patients) showed that intrathecal dexmedetomidine significantly prolonged sensory and motor block duration, hastened onset, and delayed analgesic request (p < 0.001). It also reduced shivering but slightly increased bradycardia and hypotension.

Azemati S et al (2009): This randomized trial in 90 patients compared bupivacaine alone, with dexmedetomidine, and with meperidine. Dexmedetomidine prolonged block duration and analgesia, increased sedation, and reduced shivering without increasing overall adverse effect.

CONCLUSION

A study aimed to compare dexmedetomidine as an adjuvant to intrathecal bupivacaine versus bupivacaine alone in lower abdominal & lower limb surgeries. The present study was conducted on a total of sixty (60) surgical patients, aged 20–65 years, weighing 55–70 kg, belonging to ASA physical status I and II, and scheduled for elective surgeries under Spinal anaesthesia. The patients were randomly divided into two equal groups of 30 each. Group I received Bupivacaine, while Group II received Dexmedetomidine as an Adjuvant to Bupivacaine.

The key finding of this study is that dexmedetomidine, when used as an adjuvant to intrathecal bupivacaine, results in a faster onset of both sensory and motor blockade, along with a lower incidence of side effects

Future studies should primarily focus on further validating the early onset of sensory and motor block and the low incidence of side effects observed with dexmedetomidine as an adjuvant to intrathecal bupivacaine. Larger, well-designed multicentric trials are needed to confirm these findings across different patient populations and surgical settings. Research should also aim to determine the optimal minimal effective dose that provides rapid onset and prolonged analgesia while maintaining hemodynamic stability and minimizing adverse effects.

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