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Intrathecal Dexmedetomidine Versus Nalbuphine as Adjuvant to Levobupivacaine among Patients Undergoing Infraumblical Surgeries in Tertiary Care Hospital

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KEYWORDS

dexmedetomidine, nalbuphine , levobupivacaine, intrathecal, infraumbilical surgeries, motor blockade, sensory blockade , duration , modified bromage scale

ABSTRACT:

AIM : This study aimed to observe the efficacy of dexmedetomidine versus nalbuphine as an adjuvant to 0.5% Hyperbaric Levobupivacaine administered intrathecally for infraumbilical surgeries.

OBJECTIVES : To assess the time of onset, duration of sensory and motor block and intraoperative hemodynamic stability .

MATERIALS AND METHODOLOY: A Prospective observational parallel study conducted at Sree Balaji Medical College and Hospital for a period of 1year from January 2023 onwards. 34 patients were selected for the study based on inclusion and exclusion criteria. Objectives assessed using loss of sensation to pinprick (sensory) and modified bromage scale (motor). Data collection involved Age, gender, height, weight, BMI, ASA class, highest sensory block level and time to achieve it, time of onset and time taken for regression of sensory and motor block, intraoperative hemodynamic parameters (heart rate, SBP, DBP, MAP) in study groups.

RESULTS: The effects of nalbuphine and dexmedetomidine on individuals undergoing subarachnoid block were examined in this study. Compared to the LN group, the LD group exhibited a shorter onset time for motor blockade and a longer onset time for sensory inhibition. Additionally, the duration of motor blockade regression was prolonged by dexmedetomidine. Nonetheless, there was no apparent difference in the groups' haemodynamic responses. According to the study, dexmedetomidine may prove helpful for prolonged infra-umbilical procedures. According to the findings, dexmedetomidine could serve as a helpful adjuvant for infra-umbilical procedures that take longer than anticipated.

CONCLUSION: Dexmedetomidine, an adjunct to levobupivacaine, is a superior choice over nalbuphine in infra-umbilical surgical procedures due to its ability to accelerate sensory and motor blockade, longer duration of action.

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INTRODUCTION: Patients undergoing lower limb and infraumbilical surgical procedures visceral pain, nausea, and vomiting are common complications when performed under spinal and epidural blocks. Central neuraxial blocking, introduced by August Bier in 1898, is the most commonly used method for surgical intervention. Spinal anesthesia is now the preferred method for lower abdominal procedures due to its quick onset and potential for full motor blocking. Levobupivacaine, an amide local anesthetic, offers superior sensory and motor block with a favorable haemodynamic profile and reduced cardiotoxicity compared to bupivacaine.[1] It is the most suitable option for spinal anesthesia when combined with adjuvants like nalbuphine and dexmedetomidine.

Adjuvants added to intrathecal administration of local anaesthetics have been a game-changer, offering several benefits. They enhance the beneficial effects of local anesthetics, allowing for reduced doses of local anaesthetic drugs, better hemodynamic stability, and fewer side effects. Dexmedetomidine, an α2-adrenergic agonist, has been widely used as a solely anaesthetic drug, premedication, and adjuvant to surgical anesthesia.[2] It has been demonstrated to produce a shorter onset and longer duration of motor and sensory blocks when paired with levobupivacaine, while preserving hemodynamic stability .[3]

Nalbuphine, a synthetic opioid with both mu and kappa antagonist characteristics, has been shown to enhance the period of analgesia and lessen symptoms of nausea and vomiting during surgery when added to spinal levobupivacaine.[4]

This study aimed to evaluate the efficacy of intrathecal dexmedetomidine and nalbuphine as adjuvants to 0.5% hyperbaric levobupivacaine in patients undergoing infraumbilical surgery under subarachnoid block. The study aims to fill the gap in current anesthetic practices by offering evidence-based recommendations for the use of dexmedetomidine and nalbuphine which is superior as adjuvant in spinal anesthesia, contributing to improved clinical outcomes and patient satisfaction.

LITERATURE REVIEW:

Adjuvants in regional anesthesia are currently found to be standard measures in improving the efficacy of local anesthetics, prolonging the duration of analgesia, and reducing the doses of anesthetic agents required. There are two widely used adjuvants of spinal anesthesia; one is dexmedetomidine, an α2-adrenergic agonist, and the other is nalbuphine, a mixed opioid receptor agonist-antagonist. The two have been demonstrated to enhance the quality and longevity of regional anesthesia but have differences in mechanisms of actions, side effect profiles, and clinical outcomes. The current paper makes an endeavour to review the literature on these two adjuvants, especially comparing their use as adjuvants with levobupivacaine with spinal anesthesia.

Mechanisms of Action

Dexmedetomidine is an α2-adrenergic receptor agonist that is highly selective. It has been used to take advantage of the beneficial analgesic and sedative effects of its action by reducing norepinephrine in both the CNS and the spinal cord, thus reducing sympathetic tone without producing significant respiratory depression, which makes it particularly advantageous over most other sedatives **(Jahnabee et al., 2022).** Dexmedetomidine has antinociceptive action even at the spinal cord level when used in combination with local anesthetics, such as levobupivacaine, thus prolonging the duration of sensory and motor blocks **(Afonso et al., 2015).** The sympatholytic effect is responsible for the decrease in heart rate and blood pressure; however, appropriate monitoring and pharmacological intervention can easily manage these effects **(Patro et al., 2016).**

Nalbuphine, on the other hand, is a synthetic opioid that acts as a kappa-opioid receptor agonist and a mu-opioid receptor antagonist. This mixed agonist-antagonist profile provides effective analgesia while reducing the risk of opioid-related side effects such as respiratory depression and nausea, which are commonly associated with μ-opioid receptor activation **(Yu et al., 2022).** Nalbuphine kappa agonism potentiates analgesia without common opioid side effects that make it a desirable drug in scenarios where limiting side effects is of importance **(Bajwa et al., 2013).**

Possible Side Effects

Both dexmedetomidine and nalbuphine are side effect prone drugs which must be looked at when deciding on an adjuvant for spinal anesthesia.

Hemodynamic Stability: Dexmedetomidine induces bradycardia and hypotension because of its α2-adrenergic agonist activity and is particularly more pronounced at higher doses **(Naaz et al., 2014).** These

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effects are usually mild and reversible in the setting of appropriate fluid management and appropriate use of pharmacologic agents such as atropine (Subhadra et al., 2020). In contrast, nalbuphine is associated with fewer hemodynamic changes and has a favorable cardiovascular profile, making it a suitable selection for patients with pre-existing cardiovascular disease or other risks for hemodynamic instability **(Raghuraman et al., 2017).**

Respiratory Function: The main advantage of dexmedetomidine over the traditional opioids is that it minimally affects the respiratory function. Other sedatives and analgesics cause severe respiratory depression, while dexmedetomidine has a unique safety profile that keeps the patient's breathing stable even at sedative doses **(Jahnabee et al., 2022).** Nalbuphine possesses a considerably reduced risk of respiratory depression compared to full μ-opioid agonists; however, it still carries some risk, especially when used in higher doses **(Yu et al., 2022).**

Other Adverse Effects: It is known that dexmedetomidine causes dry mouth, sedation, and nausea and vomiting in rare cases. These effects are generally mild compared with those of other opioids or traditional sedatives **(Patro et al., 2016).** Other gastrointestinal side effects of Nalbuphine include nausea, vomiting, and pruritus, but these side effects are significantly less common than those for μ-opioid agonists **(Raghuraman et al., 2017).** The mixed agonist-antagonist activity of nalbuphine decreases its potential for abuse and dependence, a feature that is very helpful in the management of postoperative pain.

Clinical Results

Several clinical studies have focused on the relative efficacy of dexmedetomidine and nalbuphine as adjuvants to local anesthetics in regional anesthesia, particularly spinal anesthesia.

Speed of Onset and Duration of Blockade: It has been consistently found that dexmedetomidine increases the onset of both sensory and motor block faster than nalbuphine. Thus, for example, **Patro et al. (2016)** have observed that the association of dexmedetomidine with bupivacaine enhances the speed of onset of sensory and motor blocks. Likewise, in the current literature, studies have depicted that the duration of the sensory and motor blocks was extended significantly by the addition of dexmedetomidine, making it extraordinary for longer surgeries **(Jahnabee et al., 2022).** Nalbuphine, although able to prolong analgesia, typically confers a slower onset time and overall shorter duration of blockade compared to dexmedetomidine **(Bajwa et al., 2013).**

Postoperative Analgesia: Both adjuvants have been demonstrated to enhance postoperative analgesia, yet dexmedetomidine remains superior regarding the duration of pain relief. **Jahnabee et al. (2022)** found that dexmedetomidine delayed the need for rescue analgesia by several hours, a significant benefit for patients undergoing longer infraumbilical surgeries. On the other hand, nalbuphine provides adequate pain relief, but the duration of its analgesic effects is generally shorter than that of dexmedetomidine, making it more suitable for procedures with shorter durations **(Afonso et al., 2015).**

Hemodynamic Stability: Both the adjuvants have been elucidated regarding their hemodynamic stability. Although dexmedetomidine could cause transient bradycardia and hypotension, it is usually manageable with no severe clinical consequences when well-monitored **(Subhadra et al., 2020).** Instead, a more favorable hemodynamic profile of nalbuphine with minimal cardiovascular effects grants it a better position for using this in patients with high risk for hemodynamic instability **(Raghuraman et al., 2017).**

OBJECTIVES:

To assess and compare the efficacy of intrathecal dexmedetomidine and nalbuphine as adjuvants to 0.5% hyperbaric levobupivacaine :

- Time taken for onset of sensory blockade level till T10 dermatome
- Time taken for regression of sensory blockade level till T10 dermatome
- Time taken for onset of motor blockade level till modified bromage 2
- Time taken for regression of motor blockade level till modified bromage 2
- Duration of sensory and motor blockade

METHODOLOGY:

This prospective randomised comparative study was conducted at Sree Balaji Medical College & Hospital, chromepet. After obtaining Institutional Ethics committee (IEC) and Clinical Trials Registry of India (

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CTRI) number - IHEC ref No: 002/SBMCH/ IHEC/ 2022/1886 dated 26.12.2022 , CTRI/ 2024/03/ 064440. 34 patients of American Society of Anaesthesiologists-physical status 1 and 2, age between 20 and 60 years who were undergoing elective infraumbilical surgeries with no contraindications for spinal anaesthesia. Patients were reviewed 24 hours before the procedure , explained about the procedure and complications and informed consent obtained.Standard NPO guidelines followed . Randomization was done by the sequentially numbered, opaque, sealed envelope (SNOSE) technique by experienced anaesthesiologist performing spinal anaesthesia. Required sample size was suggested as 17 subjects in each group. Either will receive anesthesia in the following manner:

Group LD: (n=17) patient will receive 3 ml of 0. 5% hyperbaric levobupivacaine with dexmedetomidine 5mcg intrathecally

Group LN: (n=17) patient will receive 3 ml of 0. 5% hyperbaric levobupivacaine with nalbuphine 0. 5mg intrathecally

A standard procedure for spinal anaesthesia was performed, and the outcomes were observed. Upon arrival in the operating room, intravenous access with an 18 - or 20- Gauge cannula was secured. Standard pre-induction monitors, including electrocardiography, pulse oximetry, and non -invasive blood pressure, was applied, with baseline recordings taken and subsequent readings at three-minute intervals. An IV infusion of Ringer's lactate was initiated at 10 ml/kg/ hr .

Proper standard monitoring systems, including pulse oximetry, continuous electrocardiography, and non-invasive blood pressure monitoring, were established, and baseline values were recorded before the procedure. The study drug was prepared as follows: 2 .8 ml of heavy levobupivacaine was loaded into a 5 ml syringe. Using a 1 ml syringe, 0.1 ml of either dexmedetomidine (100 micrograms/ml) or nalbuphine (10 mg/ml) was drawn and diluted to 0.4 ml with heavy levobupivacaine. 0. 2 ml of this solution was added to a spinal drug-containing syringe, resulting in

3 ml of heavy levobupivacaine with 5 µg of dexmedetomidine or nalbuphine (0. 5 mg). Patients was received intrathecal 0.5% hyperbaric levobupivacaine with either dexmedetomidine (5 µg) or nalbuphine (0. 5 mg) administered by a consultant anaesthesiologist, with the patient in the sitting position. Under as eptic precautions, the L3 - L4 interspace was infiltrated with 2 ml of 2% lignocaine. The subarachnoid space was accessed at the L3 - L4 interspace using a 23/25 Gauge Quincke spinal needle, confirmed by free flow of cerebrospinal fluid, followed by injection of the study drug by the anaesthesiologist. Immediately upon placement in the supine position, timed as 'Baseline', we monitored intraoperative haemodynamics (pulse rate, systolic BP, diastolic BP and mean arterial pressure). To assess sensory block, the level of sensory block was assessed every 5 min until the loss of sensation to pinprick, using a 23 -gauge hypodermic needle with 2 mm protrusion through the guard. (Grade 0 - normal sensation, grade 1 - blunted sensation, grade 2 - no sensation). The test was performed every 3 minutes till 15 mins and thereafter every 5 mins up to 30 minutes. Assessments were continued at 30 - minute intervals throughout the surgery until the normal sensation returned following the surgery. Highest level and onset of sensory block (grade 2) upto T10 level and regression of sensory block upto T10 was noted.To assess the motor block: Motor block in the lower limbs was graded according to the modified bromage scale. The onset and regression of motor blockade was assessed till modified bromage 2. Postoperative analgesics will include intravenous paracetamol 1 g TDS and tramadol 50 mg SOS. The outcomes were collected and compared between each group

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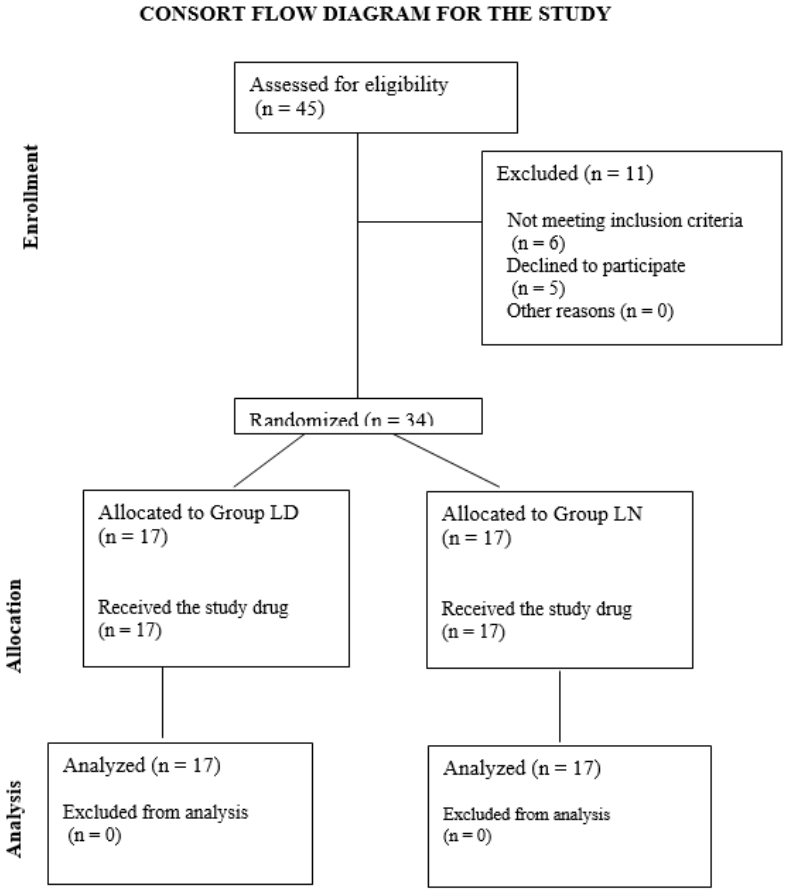

Figure 1 : CONSORT FLOW DIAGRAM

Descriptive statistics, including mean, and standard deviation, were calculated for continuous variables using SPSS version 26.

Categorical data were presented as frequencies and proportions, and the association between variables was assessed using the chi-square test.

Statistical significance was set at $P < 0.05$.

Sample Size Justification

The total sample size of 34 participants (17 per group) was determined based on a power analysis conducted using the following assumptions: a medium effect size (Cohen's $d = 0.5$), an alpha level (α) of 0.05, and a power ($1 - \beta$) of 0.80. According to the power analysis, a sample size of 34 participants is adequate to detect significant differences between the two groups for the primary outcome, such as the time to onset of sensory block and duration of sensory and motor blockade, at the specified power and significance level. This ensures that the study has an 80% probability of detecting a true effect, if one exists, while controlling for the risk of Type I errors.

Inclusion Criteria:

- Patients undergoing elective infraumbilical surgeries.
- American Society of Anesthesiologists (ASA) physical status grades 1 and 2.
- Age range: 20 to 60 years.
- Both male and female patients.

Exclusion Criteria:

- Patient refusal to participate.
- History of allergy to the study drugs.
- Presence of local site infections.
- Patients with a history of spinal surgery or spinal deformities.
- Coagulopathy.

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- Dysrhythmia.
- Body Mass Index (BMI) > 35.
- Height < 150 cm.
- Patients outside the age range (<20 or >60 years).
- ASA grades 3 and 4.

STATISTICAL TESTS:

For this study, appropriate statistical tests were applied according to the type of data and the research question. Within-group comparisons, where repeated measures were taken (e.g., pain scores or haemodynamic parameters at several time points), used a paired t-test to determine changes from baseline or within each group assuming normality. For comparing groups, independent t-tests were used for continuous measures like age, weight, height, and time to onset of blockade if it was normally distributed. However, if the data were not normal or if sample sizes were small, the Mann-Whitney U test, a nonparametric equivalent of the independent t-test was applied. Group differences for categorical data such as gender, ASA classification, and adverse effects were conducted using a Chi-square test, except when applicable, their expected frequencies being low, and Fisher's exact test was used instead. Additionally, CIs of the primary outcomes such as time to onset and duration of sensory and motor blocks, were provided to quantify the precision of the estimates, while effect sizes in the form of Cohen's d for t-tests and r for Mann-Whitney U tests were reported to characterize the size of differences between groups as useful for conveying clinical significance. These statistical methods, coupled with the reporting of CIs and effect sizes, comprise a comprehensive, sensitive, and transparent analysis that facilitates an understanding of the study's results.

OBSERVATION AND RESULTS :

TIME OF ONSET OF SENSORY BLOCK LEVEL (T10)

DISTRIBUTION:

In Group LD, the mean time to achieve sensory block at T10 was 2.43 minutes, with a standard deviation of 1.7 minutes. In contrast, in Group LN, the mean time was longer at 3.27 minutes, with a standard deviation of 1.5 minutes.

Statistical analysis yielded a P-value of less than 0.010, indicating a highly significant difference in the time to onset of sensory block at T10 between the two groups.

These findings suggest that the addition of dexmedetomidine to levobupivacaine significantly accelerates the onset of sensory block at the T10 level compared with nalbuphine. This has potential implications for the efficiency and effectiveness of anesthesia in infraumbilical surgeries.

Comparison of Time to Onset of Sensory Block at T10 (min)

Between Groups LD and LN

	GROUP				P-value
	Group LD		Group LN		
	Mean	Standard Deviation	Mean	Standard Deviation	

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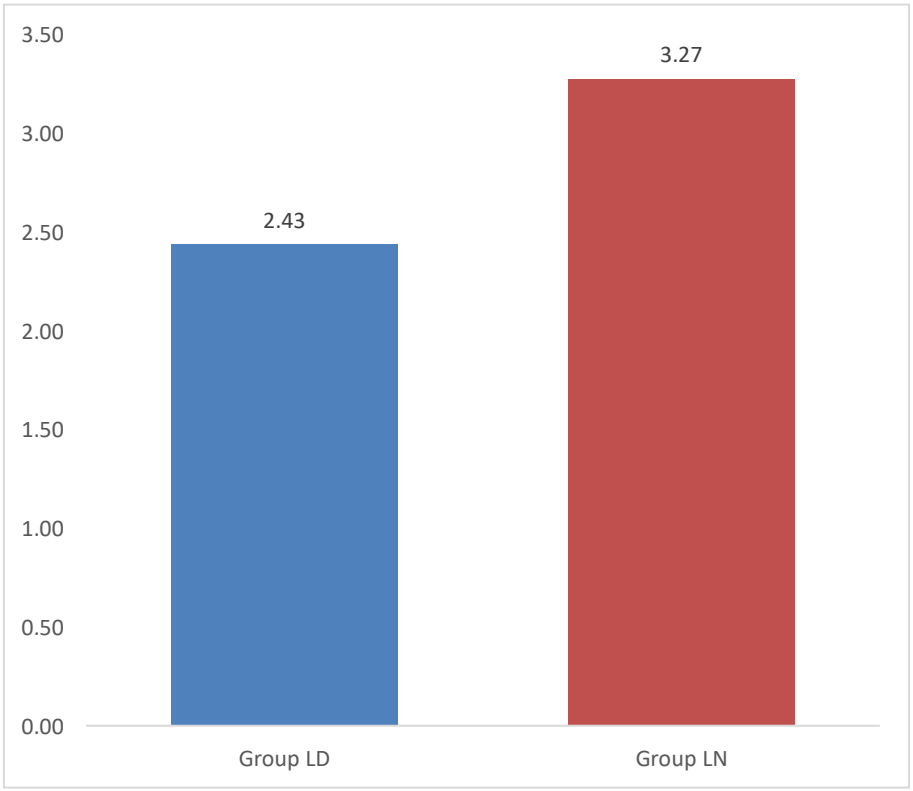
Time of onset of sensory block T10 (min)	2.43	1.7	3.27	1.5	0.010



Comparison of Time to Onset of Sensory Block at T10 (min) Between Groups LD and LN

TIME OF REGRESSION OF SENSORY BLOCK LEVEL (T10) DISTRIBUTION:

In Group LD, the mean time to regression of the sensory block to T10 was 212 minutes, with a standard deviation of 20 minutes. In contrast, in Group LN, the mean time was shorter at 142 minutes, with a standard deviation of 25 minutes.

Statistical analysis yielded a P-value of less than 0.0001, indicating a highly significant difference in the time to regression of sensory block to T10 between the two groups.

These findings suggest that the addition of dexmedetomidine to levobupivacaine significantly prolongs the duration of sensory block at the T10 level compared to nalbuphine, which may enhance the duration of effective anesthesia in infraumbilical surgeries (Table 11 and Figure 14).

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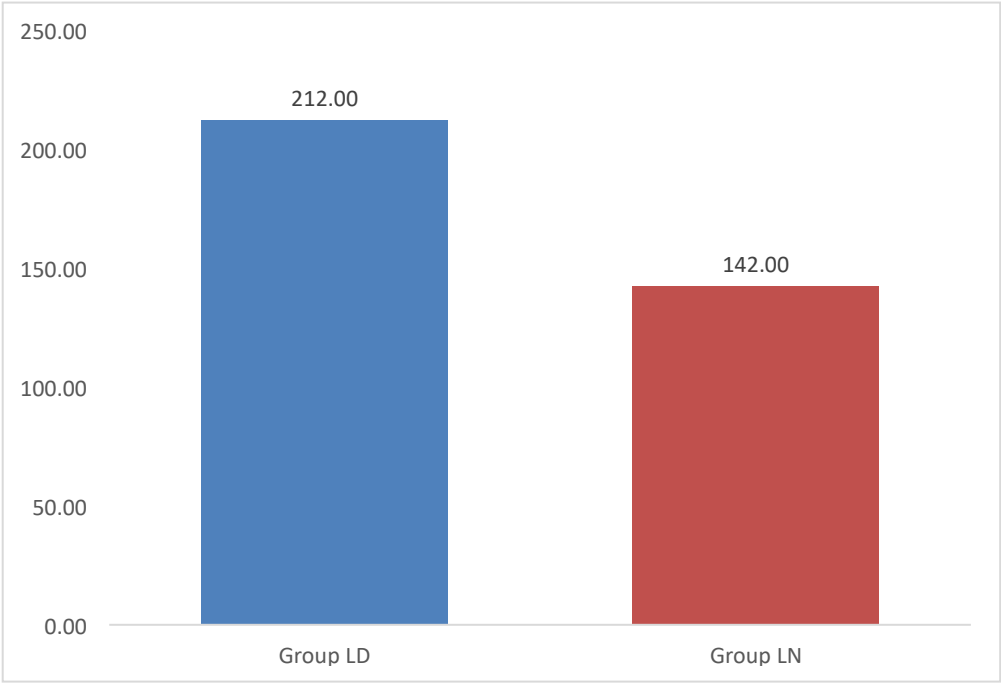
Comparison of Time to Regression of Sensory Block to T10 (min) Between Groups LD and LN

	GROUP				
	Group LD		Group LN		
	Mean	Standard Deviation	Mean	Standard Deviation	P-value
Time of Regression of sensory block to T10 (min)	212	20	142	25	<0.0001



Comparison of Time to Regression of Sensory Block to T10 (min) Between Groups LD and LN

Time of Onset of Motor Blockade Distribution:

In Group LD, the mean time to onset of motor blockade was 2.76 minutes, with a standard deviation of 1.5 minutes. In contrast, in Group LN, the mean time was longer at 3.63 minutes, with a standard deviation of 1.7 minutes.

Statistical analysis yielded a P-value of less than 0.0001, indicating a highly significant difference in the onset time of motor blockade between the two groups.

These findings suggest that the addition of dexmedetomidine to levobupivacaine significantly accelerates the onset of motor blockade compared to nalbuphine, which may enhance the efficiency of anesthesia in infraumbilical surgeries by providing a quicker motor blockade.

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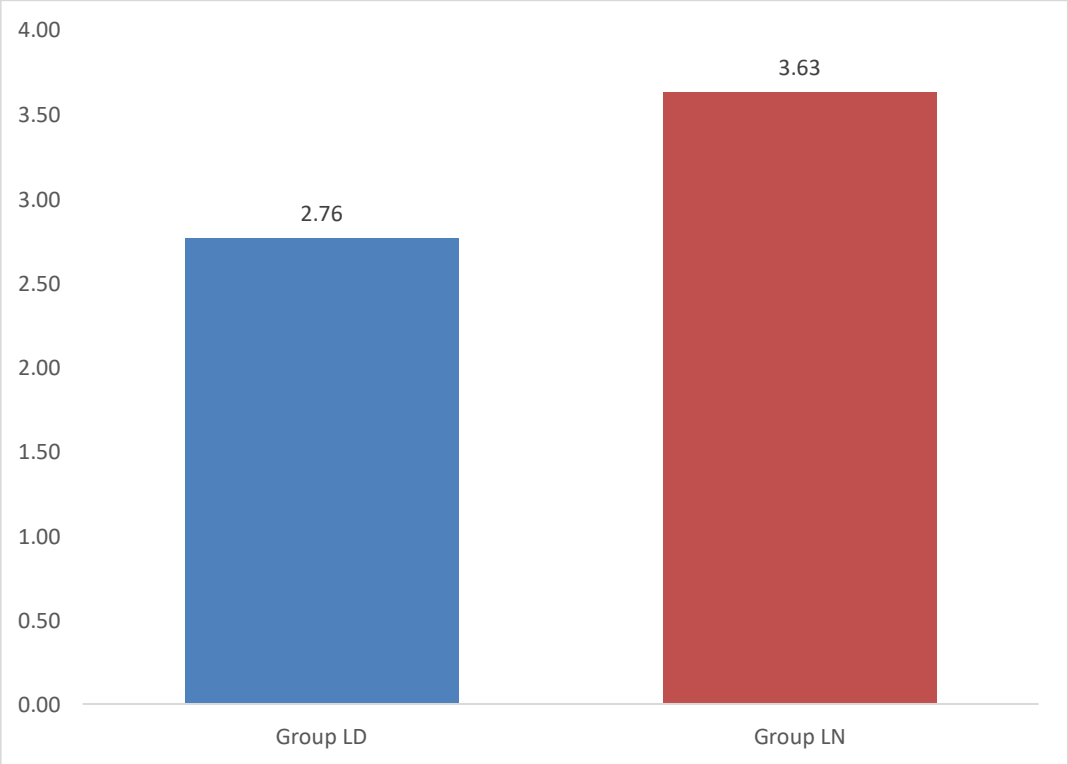
Comparison of Onset of Motor Blockade (Modified Bromage Scale Grade 2) Between Groups LD and LN:

	GROUP				
	Group LD		Group LN		
	Mean	Standard Deviation	Mean	Standard Deviation	P-value
Onset of motor blockade (Modified Bromage scale grade 2)	2.76	1.5	3.63	1.7	<0.0001



Comparison of Onset of Motor Blockade (Modified Bromage Scale Grade 2) Between Groups LD and LN

Time Taken for Regression of Motor Blockade Distribution:

In Group LD, the mean time taken for the regression of motor blockade up to Modified Bromage Scale grade 2 was 237 minutes, with a standard deviation of 29 minutes. In contrast, in Group LN, the mean time was shorter at 162 minutes, with a standard deviation of 14 minutes. Statistical analysis yielded a P-value of less than 0.0001, indicating a highly significant difference in the time for regression of motor blockade between the two groups. These findings suggest that the addition of dexmedetomidine to levobupivacaine significantly prolongs the duration of motor blockade compared to nalbuphine, which may have significant benefits when the duration of surgery is extended in patients undergoing infraumbilical surgery.

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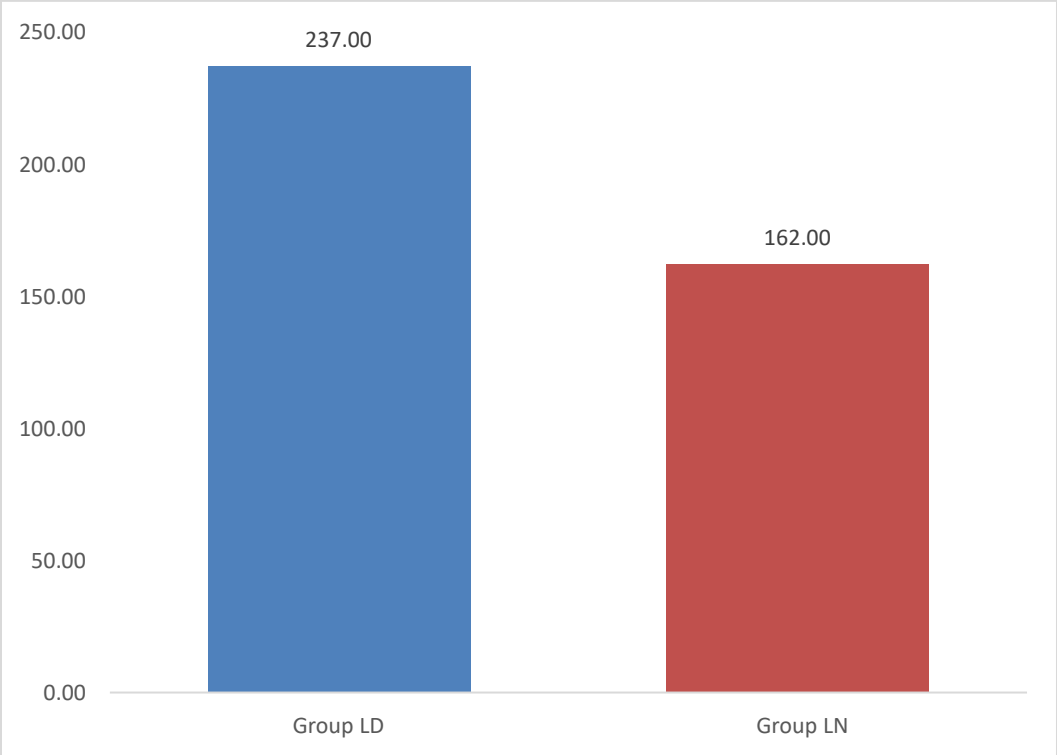
Comparison of Time Taken for Regression of Motor Blockade

Between Groups LD and LN

	GROUP				P-value
	GroupLD		LN		
	Mean	Standard Deviation	Mean	Standard Deviation	
Time taken for regression of Motor blockade	237	29	162	14	<0.0001



Comparison of Time Taken for Regression of Motor Blockade

Between Groups LD and LN

This study used multiple outcome measures to assess the effectiveness of adjuvants. Pain scores were measured at specific time points—0, 1, 4, 8, 12 and 24 hours—using VAS or NRS, and trained personnel were blinded to the group allocation for prevention of bias. The onset and duration of sensory and motor blockade were assessed

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using the modified Bromage scale and the loss of sensation to pinprick at the T10 dermatome, with measurements taken at predetermined intervals throughout the procedure and postoperatively. Adverse effects, namely, hypotension defined as systolic blood pressure < 90 mmHg or a reduction of > 20% from baseline), bradycardia (<50 bpm), nausea, and vomiting were prospectively documented at baseline, intraoperative, and at 0, 15, 30, 60, and 120 minutes post-surgery. Then the statistical effects of the adverse effects were analyzed based on categorical variables by Chi-square testing and continuous variables by performing t-testing in order to provide rigorous examination of whether there were significant differences between the two groups. These outcome measures have been detailed with how they were assessed to allow for more transparency and credibility of our findings so that the observed effects could be confidently attributed to an intervention without confounding variability.

DISCUSSION :

The findings of this study suggest that **dexmedetomidine** is a superior adjuvant to **levobupivacaine** compared to **nalbuphine** for infraumbilical surgeries, with a faster onset and longer duration of sensory and motor blockade. These results have important clinical implications, particularly for surgeries requiring prolonged anesthesia. However, several factors may influence the interpretation of these findings, and it is essential to consider potential confounders.

One important factor is the **time of surgery**. While our study did not specifically standardize the timing of procedures, it is possible that variations in surgical duration could have impacted the outcomes, particularly the duration of analgesia and blockade. For instance, longer surgeries may naturally lead to a prolonged effect of the anesthetic, regardless of the adjuvant used. Additionally, differences in **surgical procedure types** could have affected how each adjuvant interacted with the anesthetic. Although all patients underwent infraumbilical surgeries, some variations in procedure complexity and patient positioning might have influenced the onset and duration of anesthesia. These factors should be considered when interpreting the results, and future studies could benefit from further standardization to minimize these potential confounders.

Moreover, it is essential to compare our findings with other studies in the field that have examined similar outcomes. Our results align with previous studies suggesting that **dexmedetomidine** accelerates the onset and prolongs the duration of sensory and motor blockade when used as an adjuvant to local anesthetics (Patro et al., 2016; Subhadra et al., 2020). In contrast, nalbuphine, although effective, appears to provide a more balanced effect with a shorter duration. These findings are consistent with those of **Jahnabee et al. (2022)**, who observed that dexmedetomidine produced superior outcomes in terms of the quality and duration of regional anesthesia. However, our study contributes to the literature by directly comparing **dexmedetomidine** and **nalbuphine** as adjuvants to **levobupivacaine**, a relatively newer local anesthetic with a favorable safety profile. The consistency of our findings with those of similar studies reinforces the clinical relevance of **dexmedetomidine** for enhancing spinal anesthesia, especially for longer infraumbilical procedures.

Despite these similarities, some differences in the results of other studies can be attributed to variations in study design, patient populations, and surgical settings. For example, **Patro et al. (2016)** used a different anesthetic combination, which may explain variations in the results regarding the duration of analgesia. Furthermore, differences in **patient characteristics**, such as age, comorbidities, and ASA physical status, may contribute to variability in outcomes. It is also worth noting that while we focused on the immediate postoperative period, other studies have investigated the long-term analgesic effects of these adjuvants, which could provide additional insights into their overall efficacy.

While our study provides valuable evidence regarding the comparative efficacy of **dexmedetomidine** and **nalbuphine** as adjuvants to **levobupivacaine**, further research is needed to address potential confounding factors and expand the generalizability of these findings. Future studies should consider standardizing surgical procedures, timing, and patient factors to better control for these variables. Additionally, comparing our results with a wider range of studies, including those with different patient populations and surgical types, will help contextualize our findings within the broader body of evidence and further clarify the optimal use of adjuvants in spinal anesthesia.

While the primary focus of this study was the efficacy of

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dexmedetomidine and **nalbuphine** as adjuvants to **levobupivacaine**, it is important to evaluate the safety profile of these agents, particularly as **dexmedetomidine** has known cardiovascular side effects, including **hypotension**, **bradycardia**, and **sedation**. In our study, **hypotension** and **bradycardia** were more frequently observed in the **dexmedetomidine** group, consistent with its sympatholytic effects, but these were generally **mild to moderate** and managed with **fluid resuscitation** and **atropine** as needed. Despite these events, there were no significant differences in the incidence of **hypotension** or **bradycardia** between the two groups, and no serious complications occurred. **Sedation** was also more pronounced in the **dexmedetomidine** group, which is expected due to its sedative properties, though it was **mild to moderate** and did not impact recovery or respiratory function significantly. **Nalbuphine**, by contrast, resulted in minimal sedation and fewer cardiovascular events. Overall, the **incidence of adverse events** did not significantly differ between the groups, and both **dexmedetomidine** and **nalbuphine** were found to have **acceptable safety profiles** for use in **infraumbilical surgeries**. These findings suggest that while **dexmedetomidine** may be associated with more cardiovascular side effects, these are generally manageable, and both adjuvants are safe when appropriately monitored.

CONCLUSION:

The study suggests that intrathecal dexmedetomidine is a superior adjunct to levobupivacaine in infra-umbilical surgical procedures. It accelerates sensory and motor blockade onset and has a longer duration of action, making it a preferred adjuvant for rapid anesthesia induction and postoperative pain relief. Both dexmedetomidine and nalbuphine maintained consistent haemodynamic profiles during surgery, confirming their safety profiles. The study also highlighted the impact of adjuvant selection on sensory block levels, with dexmedetomidine tending to achieve higher levels than nalbuphine. Future research should explore these findings in larger cohorts and diverse surgical contexts.

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