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Efficacy Of 0.5% Hyperbaric Levobupivacaine With Clonidine And 0.5% Hyperbaric Levobupivacaine With Buprenorphine As Adjuvants For Total Abdominal Hysterectomy Under Subarachnoid Block - A Comparative Study

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Abstract
Introduction: *Total abdominal hysterectomy (TAH) is a common gynaecological surgery where subarachnoid block (SAB) with hyperbaric bupivacaine provides effective anesthesia but limited duration. Levobupivacaine, the S (-) isomer, offers similar efficacy with less cardio- and neurotoxicity and faster motor recovery. Adjuvants such as clonidine (α2-agonist) and buprenorphine (partial μ-agonist) are used to enhance and prolong block and analgesia.*
Materials and Methods: *Sixty ASA I–II patients aged 40–75 years undergoing TAH at Adichunchanagiri Hospital were randomised into two groups: LC (levobupivacaine + clonidine) and LB (levobupivacaine + buprenorphine). Onset, duration of sensory and motor block, analgesia, hemodynamics, and adverse effects were recorded. Data were analysed using SPSS v19; $p < 0.05$ was significant.*
Results: *Demographics (age, height, weight, BMI, ASA) were comparable between groups. LC showed faster onset of sensory (2.37 vs 2.87 min) and motor block (5.66 vs 6.40 min), longer sensory regression (150.4 vs 120.5 min), motor block (186.7 vs 145.3 min), analgesia (219.2 vs 171.7 min), and delayed rescue analgesic need (192.7 vs 159.7 min), all $p < 0.001$. Hemodynamic changes were minor and largely insignificant, though LC showed lower SBP and HR at some points. SpO_2 remained stable in both groups. Adverse effects were more frequent in LB, especially nausea (40% vs 6.7%).*
Conclusion: *Hyperbaric levobupivacaine 0.5% with clonidine provides faster onset, longer block, prolonged analgesia, and reduced rescue analgesic use compared to buprenorphine, with stable hemodynamics and fewer side effects.*
Keywords: *Subarachnoid block, spinal anesthesia, TAH, hyperbaric levobupivacaine, clonidine, buprenorphine, analgesia.*

INTRODUCTION:

Total abdominal hysterectomy (TAH) is one of the most common gynaecological surgeries, often required for benign or malignant uterine conditions unresponsive to medical therapy. Despite laparoscopic and vaginal alternatives, TAH remains preferred in cases of large uterine pathology, malignancy, or when extensive pelvic exploration is needed. Subarachnoid blockade (SAB) is the most used neuraxial technique for lower abdominal surgeries, providing reliable sensory and motor block, good surgical conditions, and effective postoperative pain relief. [1][2]

Hyperbaric bupivacaine 0.5% is the standard local anaesthetic in SAB due to its predictable spread, long duration, and safety. It blocks sodium channels, stabilizing neuronal membranes and preventing impulse propagation. Recently, hyperbaric levobupivacaine, the S (-) enantiomer, has gained interest because of similar potency with reduced neuro- and cardiotoxicity, faster motor recovery, and preferential sensory block—making it a desirable option in high-risk patients. [3]

To overcome the limited duration of SAB,[4] adjuvants are added. Clonidine, an α2-agonist, enhances sensory and motor block, increases acetylcholine levels in CSF, and provides visceral pain relief without opioid side effects. [5,6] Buprenorphine, a partial μ-agonist, prolongs spinal anesthesia through both opioid activity and sodium channel blockade. Its high lipid solubility reduces rostral spread and respiratory depression. [7,8]

Several studies comparing bupivacaine and levobupivacaine with adjuvants in SAB for TAH show differences in onset, block duration, hemodynamic stability, and side-effect profile, influencing both intraoperative conditions and recovery.

AIMS AND OBJECTIVES

Aim: To compare efficacy of 0.5% hyperbaric levobupivacaine with clonidine and 0.5% hyperbaric levobupivacaine with buprenorphine as adjuvants for total abdominal hysterectomy under subarachnoid block in the age group 45-75 yrs of ASA-1 & 2.

Primary Objective: To compare onset, maximum level, and duration of sensory and motor block with 0.5% hyperbaric levobupivacaine plus clonidine versus buprenorphine in total abdominal hysterectomy.

Secondary Objective: To assess perioperative hemodynamic stability, postoperative analgesia duration, time to rescue analgesia, and adverse effects between the two groups.

MATERIALS AND METHODS

A Randomised controlled study was done on 60 patients of age group 40-75 years of ASA I and II posted for elective Total abdominal hysterectomy surgery were included after getting approval from institutional ethical committee & obtaining informed and written consent in

Adichunchanagiri Hospital and Research Centre, B.G. Nagara, Mandya dist., Karnataka.

Patients were divided into two groups levobupivacine with clonidine (LC) and levobupivacaine with buprenorphine (LB) of 30 each on the basis of simple randomized technique.

RANDOMIZATION TECHNIQUE-

Patients were randomly allocated into one of the two groups by computer generated randomized list and delivered in opaque sealed numbered envelopes.

Group LC - Received hyperbaric levoBupivacaine 0.5% 3cc and clonidine 0.15cc(22.5mcg) premixed in a single syringe.

Group LB - Received hyperbaric levobupivacine 0.5% 3cc and buprenorphine 0.15cc(45mcg) premixed in a single syringe.

INCLUSION CRITERIA:

- American Society of Anesthesiologists physical status 1 & 2.
- Females of Age group 40-75 years
- Undergoing Total abdominal hysterectomy under spinal anesthesia.
- Patients' willingness for study and written consent

EXCLUSION CRITERIA:

- Patient refusal
- History of neurological, cardiac, and renal disease.
- Coagulation abnormalities, Platelet count less than one lakh.
- Patients with skin infections and anatomical malformation of spine.
- Emergency surgeries.
- Hypersensitivity to local amide injections

METHODOLOGY

A detailed preanesthetic evaluation was carried out for each patient with relevant laboratory investigations. Patient was kept nil per oral 8 hrs prior to surgery. They were pre medicated with tab. Ranitidine 150mg and tab. Alprazolam 0.5 mg on the night before the surgery. On the day of surgery patient was explained in detail about the anesthetic procedure and informed written consent was obtained.

On shifting the patient to the OT, an intravenous line was secured with 18G IV cannula. Patient were preloaded with Ringer's Lactate at 10-15 ml/kg bolus. GE multi-parameter monitor indicating Heart rate, ECG, Noninvasive Blood pressure and pulse oximeter was connected to the patient and baseline ECG with heart rate, Systolic Blood Pressure, Diastolic Blood Pressure, Mean Arterial Pressure, oxygen saturation reading was prior to the procedure.

Under aseptic precautions, with patient in sitting position 25gauge Quincke spinal needle was introduced in L3-L4 space. On confirming clear flow of CSF, test drug was intrathecally at the rate of 0.2ml/sec without barbotage. Patient were placed in supine position immediately after complete injection of the study drugs. A fellow anesthesiology resident, who was not aware of the group to which the patient belongs, recorded the following parameters.

a) Onset of sensory block – time from drug deposition to loss of pin-prick sensation at T10.
b) Maximum sensory level – time to highest block (T6/T4).
c) Onset of motor block – assessed by Bromage scale.
d) Complete motor block – time to Bromage Grade 3.
e) Maximum blockade – time to 2-segment regression at mid-clavicular level.
f) Duration of sensory block – noted till regression.
g) Recovery of motor block – time recorded.
h) First rescue analgesia – time to first request.
i) Motor block regression – time to Bromage Grade 0 at end of surgery.
j) Hemodynamics – HR, SBP, DBP, MAP, SpO_2 measured every 2 min (first 20 min), every 5 min (first 60 min), then every 10 min till end.
k) Rescue analgesia – VAS explained (0–3 mild, 4–7 moderate, 8–10 severe). Time and frequency of rescue analgesia in 24h noted. Post-operative analgesia duration measured from first dose.
l) Sedation – Ramsay scale, sedated if score ≥4.
m) Adverse effects – nausea, vomiting, hypotension, bradycardia, pruritus, etc.

Hypotension (SBP<90 mmHg or >25% fall in baseline blood pressure) will be treated with Intravenous fluids, Inj. Ephedrine 3-6mg IV bolus dose.
Bradycardia will be treated with Inj. Atropine 0.6 mg IV bolus.

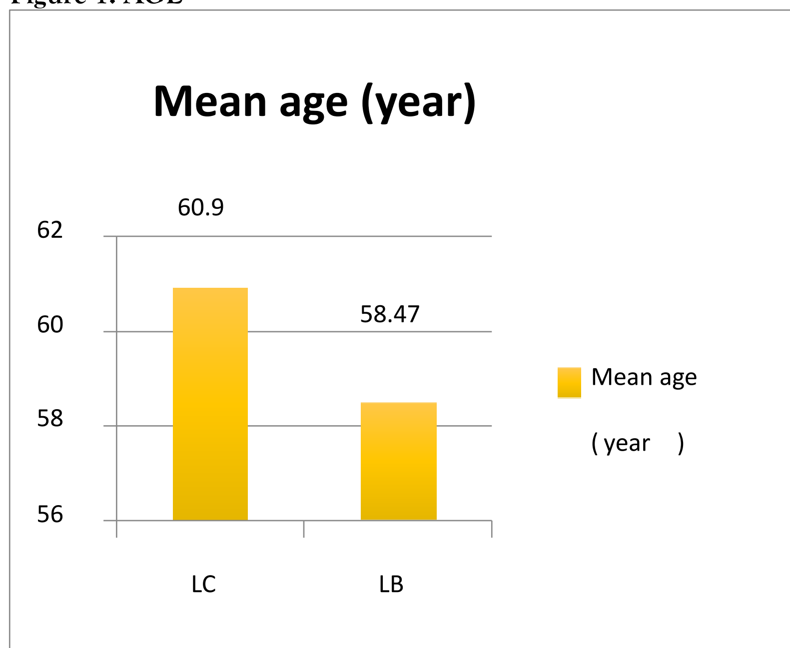
STATISTICAL ANALYSIS

At the end of the study, data was entered and tabulated using MS Excel and data analysis was done with the help of applications like G Power, SPSS version 19 and compared by using independent sample T test. Using these softwares, measures of central tendency, measures of dispersion and p values were calculated. Sensory and motor block onset and duration; hemodynamic variables were represented by mean +/- SD. A p value less than 0.05 was considered significant.

RESULTS

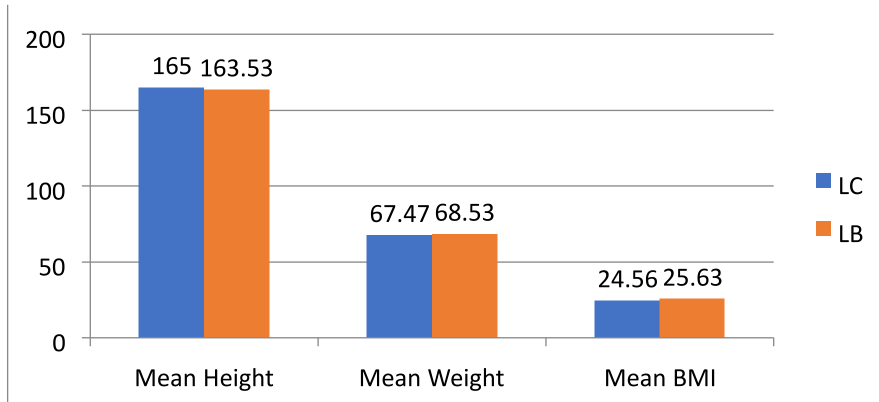
Total of 60 patients undergoing elective total abdominal hysterectomy surgeries were selected. Patients were divided into two groups levobupivacine with clonidine (LC) and levobupivacaine with buprenorphine (LB) of 30 each and following results were obtained.

Figure 1: AGE



The mean age was 60.9 years in LC and 58.5 years in LB, with no significant difference (p = 0.241).

Figure 2: Comparison of Height, Weight, and BMI Between Anesthesia Groups



Height, weight, and BMI were comparable between the two groups, with no statistically significant differences ($p > 0.05$)

FIGURE 3: GENDER DISTRIBUTION AMONG THE STUDY PARTICIPANTS

All the patients in both the intervention groups were females

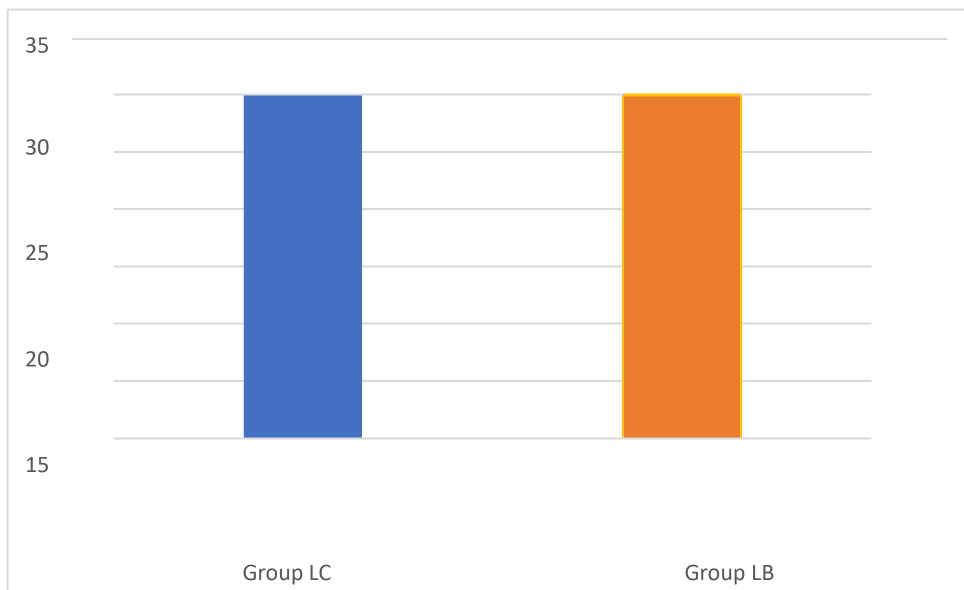
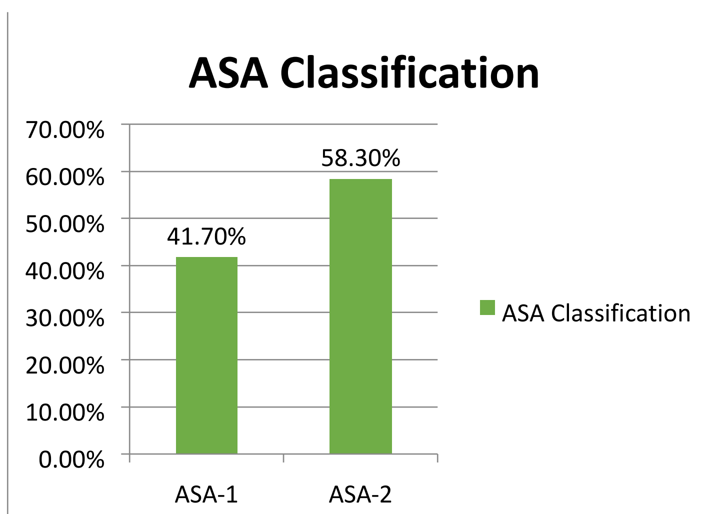
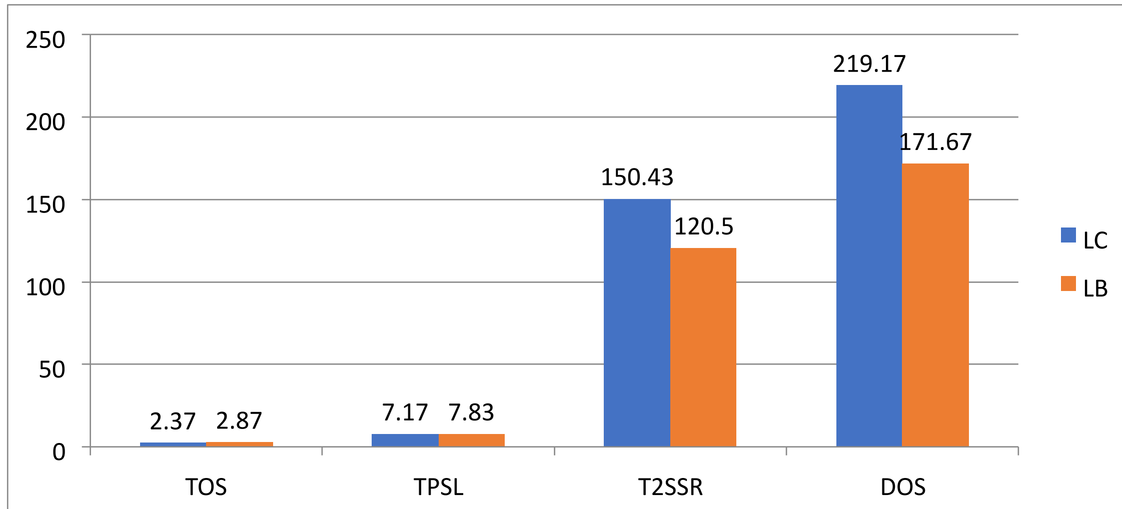


Figure 4: ASA classification of the study participants



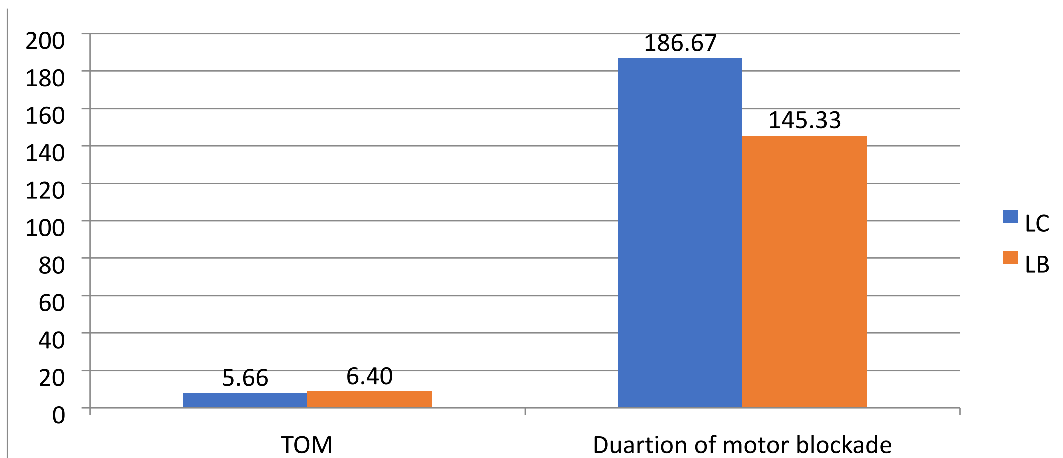
Most patients were ASA II (58.3%), while 41.7% were ASA I, indicating a predominance of mild systemic disease.

Figure 5: Comparison of Sensory Block Characteristics Between Anesthesia Groups



The LC group showed faster sensory onset (2.37 vs 2.87 min), quicker attainment of maximum level (7.17 vs 8.37 min), longer two-segment regression (150.4 vs 120.5 min), and prolonged analgesia (219.2 vs 171.7 min) compared to LB, all statistically significant (p <0.001).

Figure 6: Comparison of Motor Block Characteristics Between Anesthesia Groups



The LC group had faster motor onset (5.66 vs 6.40 min) and longer duration (186.7 vs 145.3 min) than LB, both highly significant (p <0.001).

Figure 7: Comparison of adverse effects between the groups

Adverse effects were similar between groups. Hypotension was slightly higher in LC (6.7% vs 3.3%), while nausea was more common in LB (23.3% vs 6.7%). Most LC patients (83.3%) had no side effects versus 70% in LB (p = 0.326).

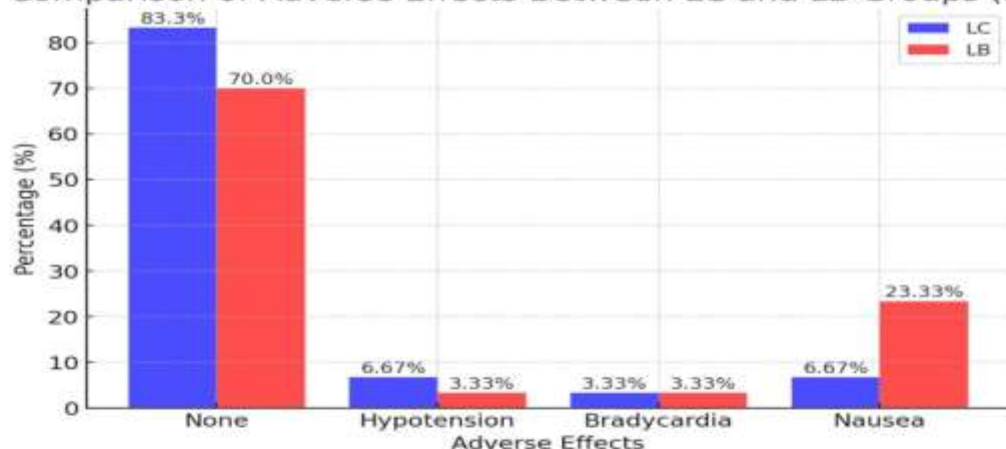
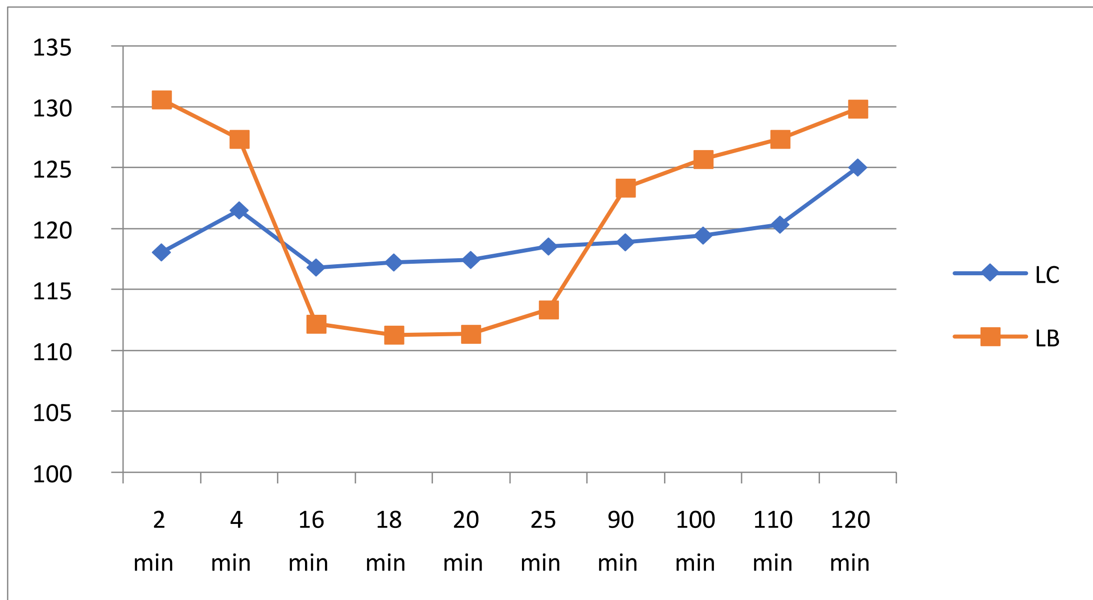
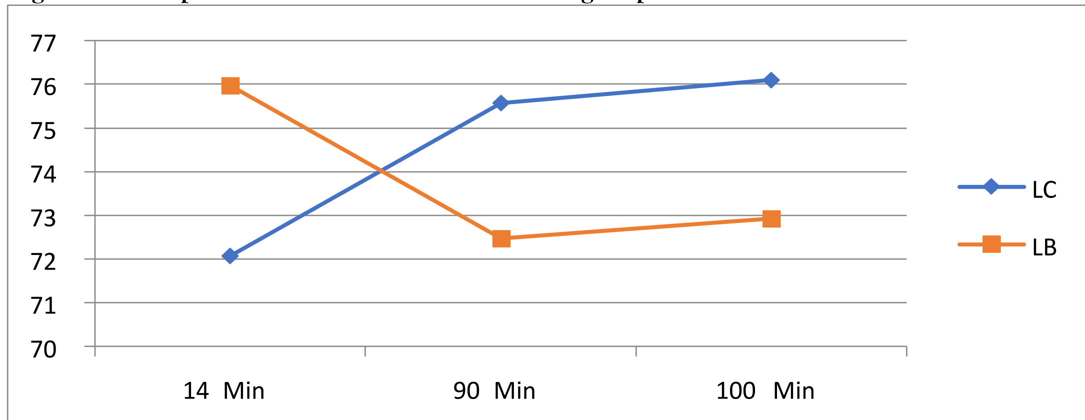


Figure 8: Comparison of SBP Between the two groups measured at different time intervals



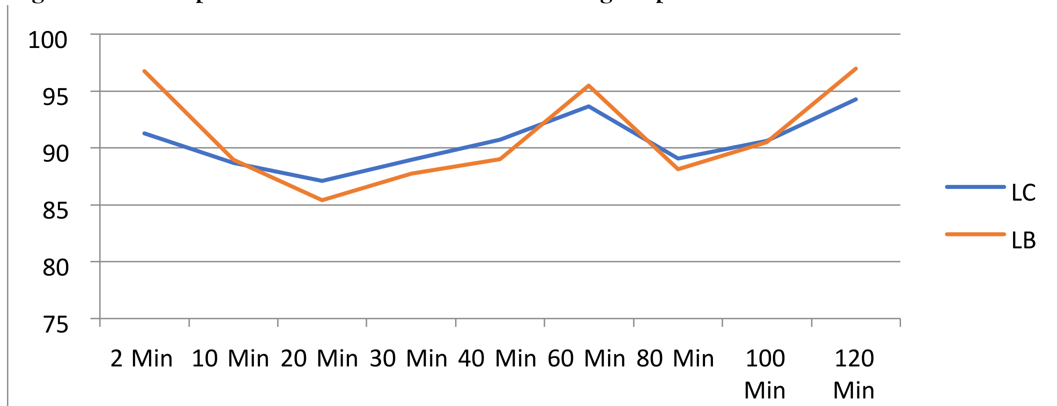
Systolic blood pressure (SBP) initially showed no difference between groups, but LC had significantly lower SBP than LB at several time points (2, 4, 16, 18, 20, 25, 90, 100, 110, 120 min). At other intervals, SBP differences were not significant, indicating stabilization over time.

Figure 9: Comparison of DBP Between the two groups measured at different time intervals



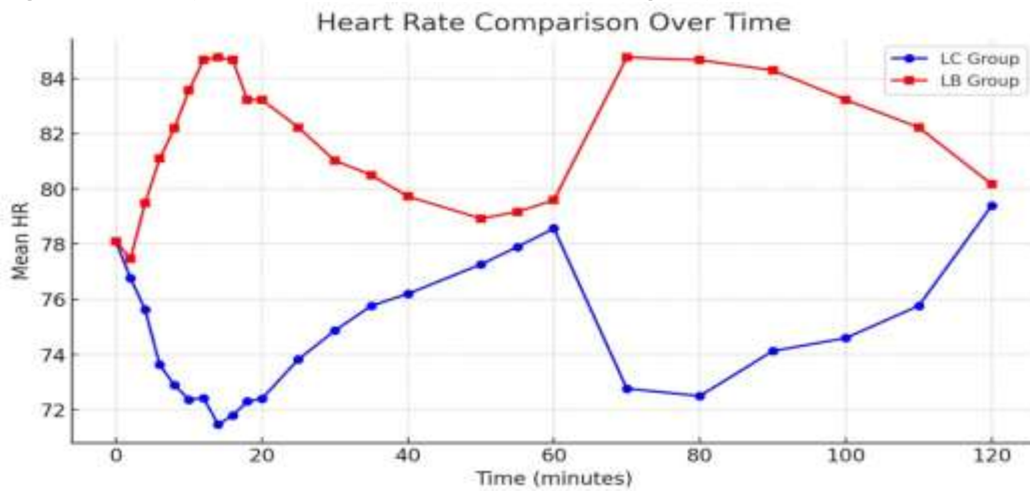
Diastolic blood pressure remained generally stable in both groups, with minor significant differences at 14, 90, and 100 minutes, indicating only temporary fluctuation.

Figure 10: Comparison of MAP Between the two groups measured at different time intervals.



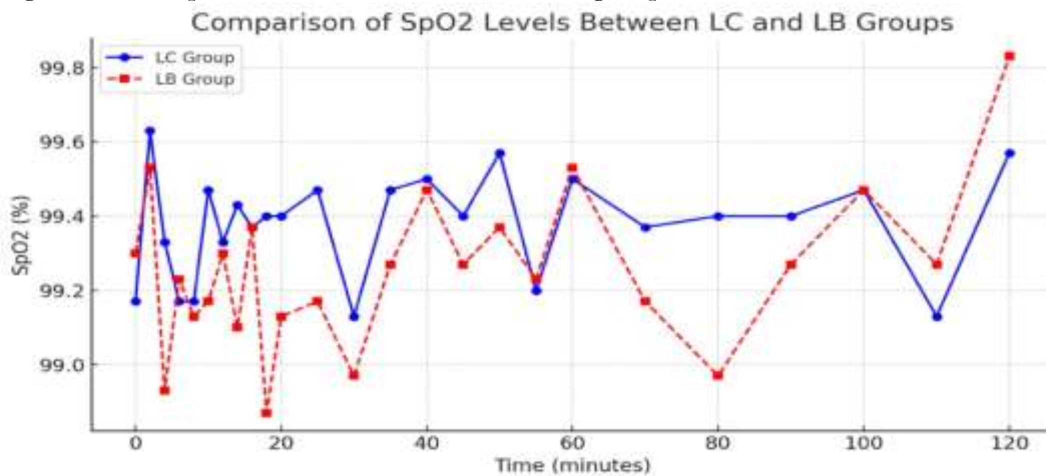
Mean arterial pressure was generally stable in both groups, with minor significant differences at 2 and 120 minutes, indicating overall comparable MAP throughout the observation period.

Figure 11: Comparison of Heart rate between the two groups measured at different time intervals



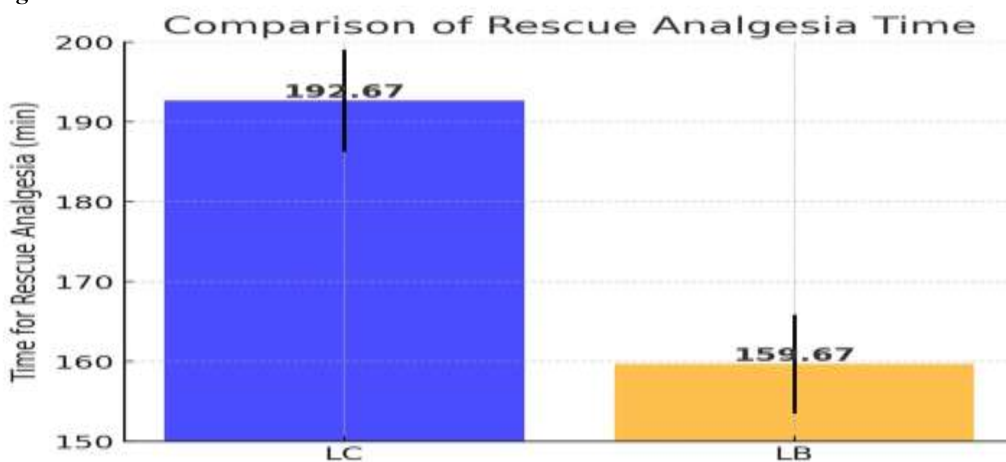
The LC group maintained a lower heart rate than the LB group at most time points, with significant differences from 16–35 and 70–110 minutes, while HR stabilised at 50–60 and 120 minutes.

Figure 12: Comparison of SPO2 between the two groups measured at different time intervals



SpO_2 remained stable in both groups, with minor fluctuations. Significant differences occurred at 4, 18, 25, 80, and 120 minutes, showing slightly lower values in the LB group, but overall oxygenation was well-preserved.

Figure 13: TIME FOR RESCUE ANALGESIA



The need for rescue analgesia comes significantly later in group LC (192.67 ± 6.397) compared to group LB (159.67 ± 6.2) Suggesting prolonged analgesic effects in LC ($p<0.001$)

DISCUSSION

In the present study, the mean age for Group LC was 60.9 ± 6.707 years and for Group LB was 58.47 ± 9.024 years, with a p-value of 0.241 indicating no statistically significant difference between the groups.These age groups were similar to the study done by *Malik I et al.* [9]Group LC individuals have a mean height of 165.00 ± 6.923 cm, while Group LB has a mean height of 163.97
± 6.505 cm and the difference was insignificant. The average weight for Group LC is 67.47 ± 8.114 kg compared to GroupLB, which averages
68.53 ± 6.637 kg. Again, the difference is not significant. The mean BMI for Group LC is 24.56 ± 2.38 kg/m², and for Group LB, it is 25.63 ± 2.27 kg/m² but not statistically significant (p=0.081). In the study by *Misirlioglu K et al*
[10] the mean difference in weight between the two groups found to be statistically insignificant. No significant differences in height and weight detected between the two groups in the prospective double-blinded randomized study by *Subasi D et al* [11], *Chaudhari B et* al [12] and Malik I et al. [9]
The highest level of sensory block is faster in Group LC (7.17± 0.372 minutes) compared to Group LB (7.83 ± 0.747 minutes), and this difference found to be statistically significant (p<0.001). The maximum level of sensory block at T4 and T6 across both the groups found to be insignificant. The mean time to onset of sensory block in Group LC (2.37±0.490) minutes was significantly faster than in Group LB (2.87±0.507) as reported by Nagi AS et al,[13]
In the present study, the onset of motor block was slower in Group LB (103.07 ± 17.394 seconds) compared to Group LC (86.20 ± 3.167 seconds), showing a significant difference (p<0.001). The regression of sensory block takes longer in Group LC (150.43 ± 10.86 minutes) compared to Group LB (120.50 ± 6.61 minutes), showing a significant delay (p<0.001) in the current study. The total duration of sensory block was significantly greater in Group LC, while the total duration of motor block was more in LC group compared to LB. Similar findings were reported in the study by Nagi
AS et al, [13] where he showed 0.5% hyperbaric bupivacaine with clonidine (Group C) has faster motor onset than 0.5% hyperbaric bupivacaine with buprenorphine.
The regression of sensory block takes longer in Group LC (150.43 ± 10.86 minutes) compared to Group LB (120.50 ± 6.61 minutes), showing a significant delay (p<0.001) in the current study. The findings of present study were supported by the findings of *Bafna U et al* [14]
The need for rescue analgesia comes significantly later in Group LC (192.67 ± 6.397 minutes) compared to Group LB (159.67 ± 6.200 minutes), suggesting prolonged analgesic effect in Group LC (p<0.001) in the current study,which is Statistically significant .In the study by *Negi AS et al*, [13] *Bafna U et al* ,where group C showed (354.50 38.48) with p value < 0.001compared to Group B (277.10 25.47) and Group A(131.50 20.15) .[14]
In the present study, around 23-25 % of the patients reported nausea as an adverse effect in LB group compared to 6-7% in LC group. Hypotension was noted around 6-7% Group LC compared to 3-4% in group LB. Bradycardia was similar in both groups (3-4%). Around 70-84% reported no adverse events. Comparison of adverse effects between the groups were not statistically significant. In the study by *Negi AS et al*, [13] *around* 2% in C group and around 4% in B reported pruritis. 10% hypotension in group C of patients and 5% in group B.
However, in studies conducted by *Mallappa et al*, [15] the time of onset of duration of post operative analgesia as well as sensory and motor block was significantly higher in buprenorphine group as compared to clonidine group showing opposite results of the present study showing buprenorphine is better than clonidine.

CONCLUSION
Our study concluded that 0.5% hyperbaric levobupivacaine combined with clonidine is more effective than when combined with buprenorphine.
LIMITATIONS
The study had a limited sample size and a homogeneous population, which may affect generalisability. Additionally, only short-term outcomes were assessed, leaving long-term effects and complications unexamined. Despite these limitations, the study provides a foundation for further research on the comparative efficacy of these anaesthetic agents.

REFERENCES

1. Sharma K, Gupta A. To study the hemodynamic stability between 0.5% hyperbaric levobupivacaine and 0.5% hyperbaric bupivacaine for spinal anesthesia in cesarean section. *Int J Sci Res* [Internet]. 2019;8(10):1–5. Available from: http://dx.doi.org/10.36106/ijsr.2019.v8.i10.001
2. Shukla C, Sharma N, Meena H, Goyal G. A comparative clinical study of effect of hyperbaric levobupivacaine and bupivacaine for spinal anesthesia on patients undergoing elective lower abdominal and limb surgeries. *IOSR J Dent Med Sci* [Internet]. 2019;18(8).
3. Bardsley H, Gristwood R, Baker H, Watson N, Nimmo W. A comparison of the cardiovascular effects of levobupivacaine and rac-bupivacaine following intravenous administration to healthy volunteers. *Br J Clin Pharmacol.* 1998;46(3):245-9. doi:10.1046/j.1365-2125.1998.00775.x
4. Gupta R, Verma R, Bogra J, Kohli M, Raman R, Kushwaha JK. A comparative study of intrathecal dexmedetomidine and fentanyl as adjuvants to bupivacaine. *J Anaesthesiol Clin Pharmacol* [Internet]. 2011;27(3):339–43.
5. Singh RB, Chopra N, Choubey S, Tripathi RK, Prabhakar, Mishra A. Role of clonidine as adjuvant to intrathecal bupivacaine in patients undergoing lower abdominal surgery: a randomized control study. *Anesth Essays Res* [Internet]. 2014;8(3):307–.
6. Eisenach JC, De Kock M, Klimscha W. α2-adrenergic agonists for regional anesthesia. *Anesthesiology* [Internet]. 1996;85(3):655-674.
7. Leffler A, Frank G, Kishner K, Niedermirtl F, Koppert W, Reeh PW, et al. Local anesthetic-like inhibition of voltage-gated Na(+) channels by the partial μ-opioid receptor agonist buprenorphine. *Anesthesiology.* 2012;116:1335–46.
8. Shailaja S. Comparison of intrathecal dexmedetomidine with buprenorphine as adjuvant to bupivacaine in spinal anesthesia. *J Clin Diagn Res* [Internet]. 2014.
9. Malik I, Kamboj S, Kamal H, Singhal SK, Kumar V, Seelwal D. Comparison of intrathecal bupivacaine with levobupivacaine using fentanyl as an adjuvant for transurethral resection of prostate – a randomised controlled trial. *J Clin Diagn Res.* 2023 Feb;17(2):UC16–22.
10. Honca M, Dereli N, Kose EA, Honca T, Kutuk S, Unal SS, Horasanli E. Low-dose levobupivacaine plus fentanyl combination for spinal anesthesia in anorectal surgery. *Rev Bras Anestesiol.* 2015;65(6):461-5.
11. Subaşı D, Ekİncİ O, Arı A, Avcı C. Comparison of intrathecal hyperbaric bupivacaine and levobupivacaine with fentanyl for caesarean section. *Göztepe Tıp Dergisi.* 2012;27:22–9.
12. Chaudhari NS, Bhumika. Comparison of the effectiveness of hyperbaric levobupivacaine (0.5%) and hyperbaric bupivacaine (0.5%) combined with fentanyl in patients undergoing caesarean section. *Int J Sci Res (IJSR).* 2023;12(6):1608-12.
13. Negi AS, Gupta M, Singh A. Comparison of effect of intrathecal buprenorphine vs clonidine as an adjuvant to hyperbaric bupivacaine on subarachnoid block characteristics. *J Recent Adv Pain.* 2015;1(2):67-72.
14. Bafna U, Yadav H, Sharma N. Comparison of intrathecal buprenorphine versus clonidine as an adjuvant to 0.5% hyperbaric bupivacaine in lower abdominal surgeries. *Int J Med Biomed Stud.* 2020;4(4):04-8.
15. Mallappa K, Manjunath BN, Narendra PL, Kavi C. A comparative study of intrathecal clonidine and buprenorphine as adjuvant for abdominal and lower limb surgeries. *Asian J Med Sci.* 2023;14(7):29-33.