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Research Article

A COMPARATIVE DOSE-RESPONSE STUDY BETWEEN INTRATHECAL NALBUPHINE (0.8 MG, 1.4 MG) WITH BUPIVACAINE HEAVY 0.5% 3.5 CC IN LOWER ABDOMINAL SURGERIES

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ABSTRACT

Objective: To study the efficacy of various doses of nalbuphine as an additive in sub-arachnoid block for lower abdominal surgeries.

Methods: This comparative study was conducted by the addition of two different doses of nalbuphine as an adjuvant: 0.8 mg nalbuphine hydrochloride to 0.5% bupivacaine (heavy) and 1.4 mg nalbuphine hydrochloride to 0.5% bupivacaine (heavy), the onset, maximum level, duration of sensory blockade, motor blockade, and hemodynamic parameters were studied.

Results: It was discovered that group B (1.4 mg of nalbuphine added to 0.5% bupivacaine [H]) results in a later onset and greater degree of sensory and motor blockage. This group also considerably extended the time of analgesia, sensory and motor blockage, and both. The statistical examination of the mean blood pressure and mean pulse rate, together with the study of hemodynamic parameters, revealed that the p value was significant for the mean pulse rate and diastolic blood pressure but negligible for the systolic blood pressure.

Conclusion: It can be concluded that intrathecal 0.5% bupivacaine (H)+nalbuphine (1.4 mg) when compared to intrathecal 0.5% bupivacaine (H)+nalbuphine (0.8 mg) in the patients undergoing lower abdominal surgeries.

Keywords: Nalbuphine, Lower abdominal surgeries, Bupivacaine, Sensory blockade and motor blockade.

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INTRODUCTION

One of the procedures used the most frequently in contemporary anesthesia is central neuraxial blocking. The procedure, which was once referred to as "cocainization of the spinal cord," has been improved throughout time and has given rise to the contemporary ideas of intrathecal, spinal, or subarachnoid block. By slowly injecting a tiny amount of dextrose-containing hyperbaric local anesthetic solution, spinal effects are achieved. For operations below the umbilicus, spinal anesthesia is the recommended kind of anesthesia. Intense sensory, motor, and sympathetic blockage are the results. When compared to general anesthesia, the benefits include reduced cost, improved postoperative pain management, lower postoperative nausea and vomiting, and a low incidence of thromboembolism.

Patients can immediately resume their regular oral intake after a subarachnoid block, which reduces the length of stage I recovery. Due to these advantages, spinal anesthesia is currently one of the procedures being used more frequently in daycare surgeries. Reduced intraoperative blood loss, a dampening of the stress response to operation, and a decrease in morbidity and death in high-risk surgical patients are all effects of spinal anesthesia. When a patient has diminished respiratory drive, gastroesophageal reflux disease, obesity, or a full stomach, they are more likely to benefit from a subarachnoid block [1].

The short-lived duration of anesthesia associated with subarachnoid block is a drawback. Bupivacaine-heavy (H) spinal anesthesia typically lasts for 2–2.5 h [2]. The duration of anesthesia is extended when adjuvants such as opioids, neostigmine, and epinephrine are combined with local anesthetics intravenously. Chronic cancer pain, traumatic pain, obstetric discomfort, postoperative pain, and intraoperative pain are all commonly treated with intrathecal opioids. The quality of analgesia can be increased and the need for postoperative analgesics can be reduced by intrathecal opioid delivery in conjunction with local anesthetics [3,4].

Since these two medication classes work at distinct locations to produce analgesia, this combination of local anesthetics and opioids makes sense. Opioids act at a receptor location in the spinal cord, whereas local anesthetics act at the spinal nerve axon [5]. Numerous opioids, including morphine, fentanyl, buprenorphine, and nalbuphine, have been administered intrathecally to hasten the onset and lengthen the duration of sensory and motor blockage.

Synthetically produced nalbuphine is an opioid with mixed K agonist and antagonist characteristics [6]. Intrathecally given nalbuphine binds to kappa receptors in the brain and spinal cord, causing analgesia and drowsiness without any negative side effects. Compared to other centrally acting opioid analgesics, it has a negligible respiratory depressive effect and a limited potential for misuse. Shivering, nauseousness, vomiting, and urine retention are uncommon side effects of nalbuphine hydrochloride. Since nalbuphine achieves its ceiling effect at lower intrathecal dosages, an increase in medication dose is not necessary. This also explains the drug's safety margin.

In this study, a comparison is made between two doses of intrathecal injection of nalbuphine (0.8 mg, 1.4 mg) with injection of bupivacaine heavy 0.5% 3.5 cc in lower abdominal surgeries.

Objectives of the study
To compare the outcomes of subarachnoid block (onset and regression of blockade, analgesia, and side effects) between the two groups who were given different doses of nalbuphine as an additive.

METHODS

A comparative study will be conducted on 60 patients undergoing lower abdomen surgeries in OGH Hospital. They will be randomly divided into two groups involving 30 patients each. One group will receive 0.8 mg nalbuphine (3 units in insulin syringe) and the other group will receive 1.4 mg of nalbuphine (6 units in insulin syringe) intrathecally with 3.5 cc of injection bupivacaine 0.5% (heavy). Patients who fulfill the inclusion criteria and undergo lower abdomen surgeries in OGH Hospital, Hyderabad for 24 months (2019–2021).

The study population comprised 60 adult patients classified under the ASA PS 1 and 2 posted for lower abdominal surgeries.

Inclusion criteria
18–40 years of age, ASA grade I and II and patients scheduled to undergo course abdominal surgeries.

Exclusion criteria
Females who are pregnant, nursing, or menstruation; baseline heart rate <60 beats per minute; baseline blood pressure <90/50 ml of mercury; and patients with a history of hypertension, ischemic heart disease, heart block, left ventricular failure, heart block, or severe renal or liver disease.

Pre-operative assessment
On the day before surgery, each patient underwent a duty examination, and the pre-operative evaluation sheet was reviewed. The patients' body mass index, height, and weight were assessed. The patient's dietary state, spine examination, and airway assessment were all assessed.

A thorough systematic and general evaluation was conducted. According to the patient's history and current health, preoperative tests such as complete blood picture, random blood sugar, blood grouping and type, electrocardiogram, chest X-ray, renal and liver function tests, bleeding time, clotting time, TLC, serum creatinine, HIV, hepatitis B surface antigen and prothrombin time, activated partial thromboplastin time, and international normalized ratio were carefully assessed. All of the patients received valid informed written permission after being told of the study's purpose.

The night before surgery, all of the patients were pre-medicated with tablets containing 150 mg of ranitidine and 10 mg of metoclopramide.

Standard monitors such noninvasive blood pressure (NIBP), electrocardiography (ECG), and pulse oximetry were attached when people entered the opening room, and baseline readings were collected. With the use of an 18G cannula, an intravenous line was set up, and 10 mL/kg of ringer lactate solution was preloaded into the patients. Patients were randomly assigned to either group A or group B using the slips-in-the-box method.

The right lateral decubitus posture was used to position the patients. The median technique was used to perform a lumbar puncture in the L3–L4 intervertebral space under rigorous aseptic conditions. The drug was given at 0.2 mL/s after clear cerebrospinal fluid was allowed to freely circulate.

- Group A (study group) received 3.5 cc of 0.5% bupivacaine (H) and nalbuphine 0.8 mg (3 units in insulin syringe)
- Group B (control Group) received 3.5 cc of 0.5% bupivacaine (H) and nalbuphine 1.4 mg (6 units in insulin syringe)

Hemodynamic measures such as peripheral oxygen saturation, NIBP, and pulse rate were measured at regular intervals both throughout the operation and for up to 12 h after it ended. Oxygen was supplied at a rate of 41/min through a face mask.

Hypotension – Systolic blood pressure <90 mm Hg or <20% from baseline. Treatment given – Injection Mephentermine 6 mg IV Bolus.

Bradycardia-Heart rate <50 beats/min. Treatment is given – Injection Atropine 0.6 mg.

Block evaluation sensory block
Every minute, a 27G needle was used to prick the midclavicular line to check for a sensory block until it reached the T6 dermatome. Once the maximum sensory block was reached, the level was monitored every 2 min after that.

Grades of sensory blockade

- Grade 0 – Sharp pain felt
- Grade 1 – Analgesia, dull sensation felt
- Grade 2 – Anesthesia, no sensation felt.

The onset of sensory blockade was defined as the time interval between the end of the anesthetic injection and to loss of sensation to pinprick at T10 level.

Motor blockade
Modified Bromage scale was used to evaluate the motor block's quality.

- Grade 0 – being able to raise the leg at the hip with no motor blockage
- Grade 1 – Able to flex the knee and ankle but not able to lift the leg at the hip (hip blocked)
- Grade 2 – Only the foot can move since the hip and knee are restricted
- Grade 3 – Unable to move even the foot (hip, knee, and ankle blocked.).

The period between the end of the study medication injection and the time that Bromage 3 registered was used to determine the beginning of total motor blockage. Once total anesthesia had been achieved, the procedure was begun. Both the sensory and motor levels were recognized following surgery. Regression to level L1 and a two-segment regression time from the maximum level were also recorded.

Statistical methods
In this study, descriptive statistics have been used. Results for categorical data are reported in number (%) whereas results for continuous measurements are shown as Mean±standard deviation (SD) (min-max). The 5% level of significance is used to determine significance. Assumption: The following data assumptions are made: (1). Dependent variables must be evenly spaced out, (2). Samples taken from the population should be picked at random, with separate cases.

The significance of research parameters on a continuous scale between two groups (inter-group analysis) has been determined using the Student's *t* test (two-tailed, independent). Chi-square/fisher The significance of research factors on a categorical scale between two or more groups has been fine-tuned using the exact test.

The data were analyzed statistically using the Chi-square test, analysis of variance test, and students 't' test, and a p value was calculated.

- $p>0.05$ is not significant
- $p<0.05$ is significant
- $p<0.001$ is highly significant.

RESULTS

Demographic variables are insignificant (Table 1).

There was a significant difference in the time of onset of sensory blockade for group A (mean=2.18; SD=0.758) and group B (mean=4.35; SD=1.606), t=6.681, p=0.001 (significant). These results suggest time of onset of sensory blockade A was less when compared with group B (Fig. 1).

The above results show that majority of group A had maximum level of sensory blockade at the level of T4 and T6 (96.7%), when compared with group B, which had the maximum level of sensory blockade at level of T8 abd T10 (53.3%) which is significant (p=0.001) (Table 2).

The mean time to reach sensory block at T6 level is 4.11 mins in group A (0.5% bupivacaine (H)+0.8 mg nalbuphine) and 7.96 mins in group B (0.5% bupivacaine (H) + 1.4 mg nalbuphine). There is a statistically highly significant difference between two groups (p<0.05) (Fig. 2).

The mean time taken for the onset of motor blockade is 3.23 min in group A (0.5% bupivacaine (H)+ 0.8 mg nalbuphine) and in group B (0.5% bupivacaine (H)+ 1.4 mg nalbuphine) is 5.94 mins. There is a statistically significant difference between two groups (p=0.001) (Fig. 3).

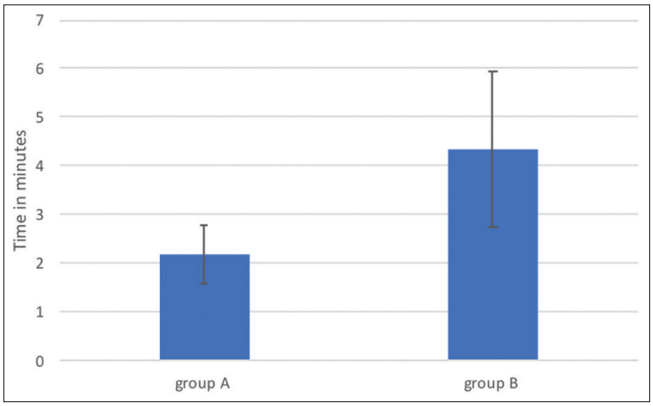

Fig. 1: Onset of sensory blockade in the present study

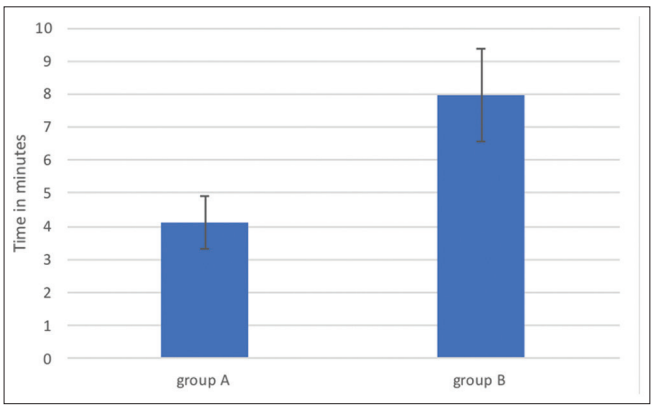

Fig. 2: Mean time to reach sensory block

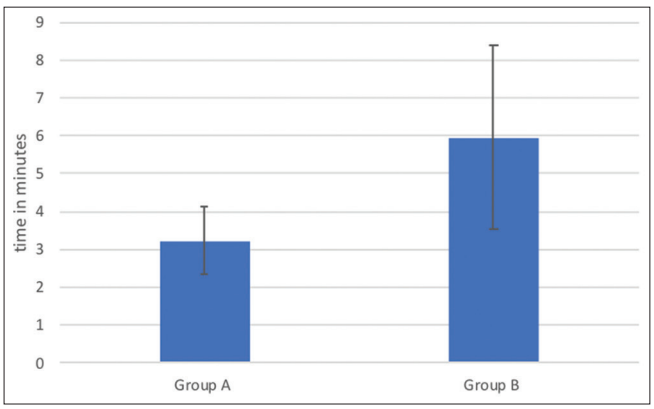

Fig. 3: Mean time taken for the onset of motor blockade

The mean duration of analgesia is 176.33 min in group A (0.5% bupivacaine (H)+0.8 mg nalbuphine) and 208.47 min in group B (0.5% bupivacaine (H)+1.4 mg nalbuphine). There is statistically significant difference between the two groups (p=0.001) (Fig. 4).

The mean duration of sensory blockade and motor block is statistically significant between the two groups (p=0.001). According to Student *t*-test, the time for two-segment regression is found to be statistically significant between group A and group B at 96.7±20.5 (min)% and 128.5±21.2 (min)%, respectively (Fig. 5).

There is statistically significant difference in the mean pulse rate between two groups at 30 min (Group A: 85.86±10.31, Group B: 74.26±13.52), 1 h (Group A: 85.93±10.81, Group B: 75.16±12.78), 2 h (Group A: 87.33±12.34, Group B: 79.46±14.70) (p<0.05).

Throughout the study, the systolic blood pressures remained below the baseline in both groups. No significant changes were noted between the two groups at any interval during the study (p>0.05) (Table 3).

There is statistically significant difference in the mean diastolic blood pressure between the two groups at 30 min (group A: 76.90±10.46, group B: 68.80±10.49), and 2 h (Group A: 80.06±7.69, Group B: 73.03±8.18). (p<0.05).

There is no statistical difference in the need for analgesia supplementation between the two groups. (p>0.05) (Table 4).

The side effects reported between the two groups were not statistically different. Hence, the two doses of (0.8 mg, 1.4 mg) nalbuphine can be safely administered intrathecally (Table 5).

DISCUSSION

Age, weight, and height were equivalent across the study and control groups in terms of demographic factors. The mean age of the patients in the 0.5% bupivacaine (H)+0.8 mg nalbuphine (group A) was 31.2 (±7) years. The mean age of the patients in the 0.5% bupivacaine (H)+1.4 mg nalbuphine (group B) was 31.5 (±6.38) years. The mean weight of the

Table 1: Demographic variables in the present study

Variables	Group A, n (%)	Group B, n (%)	Total, n (%)
Age			
21–30	14 (46.7)	13 (43.3)	27 (45)
31–40	16 (53.3)	17 (56.7)	33 (55)
Total	30 (100)	30 (100)	60 (100)
Mean±SD	31.2±7	31.5±6.38	>0.05
Height			
141–150	5 (16.7)	3 (10)	8 (17.3)
151–160	8 (26.7)	11 (36.7)	19 (31.7)
161–170	14 (46.7)	10 (33.3)	24 (40)
171–180	3 (10)	6 (20)	9 (15)
Mean±SD	161.9±8.7	162±8.53	>0.05
Weight (years)			
<50	1 (3.3)	8 (26.7)	9 (15)
51–60	10 (33.3)	9 (30)	19 (31.7)
61–70	17 (56.7)	8 (26.7)	25 (41.7)
>70	2 (6.7)	5 (16.7)	7 (11.7)
Mean±SD	64.96±7.06	61±11.48	>0.05

SD: Standard deviation

Table 2: Maximum level of sensory blockade attained

Dermatome	Group A, n (%)	Group B, n (%)	Total, n (%)
T4	10 (33.3)	3 (10)	13 (21.7)
T6	19 (63.3)	11 (36.7)	30 (50)
T8	1 (3.3)	14 (46.71)	15 (25)
T10	0	2 (6.7)	2 (3.3)
Total	30 (100)	30 (100)	60 (100)

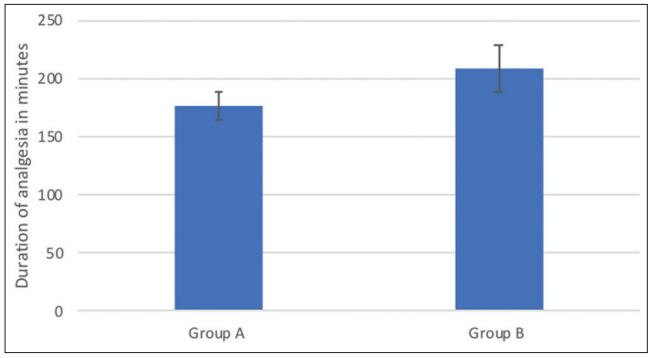

Fig. 4: Mean duration of analgesia in the present study

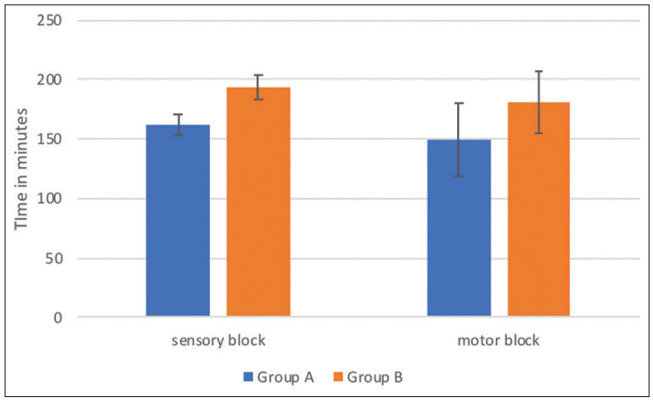

Fig. 5: Mean duration of sensory blockade and motor block

Table 3: Hemodynamic variables in the present study

Mean pulse rate	Group A (mean±SD)	Group B (mean±SD)	p (from student+test
Preoperative	89.63±11.80	85.23±16.23	0.235
2 min	86.13±12.01	82.80±17.08	0.386
10 min	86.36±11.43	81.13±17.58	0.178
30 min	85.86±10.31	74.26±13.52	0.00*
1 h	85.93±10.81	75.16±12.78	0.001*
2 h	87.33±12.34	79.46±14.70	0.029*
Systolic blood pressure (mmHg)			
Preoperative	126.87±12.31	127.07±16.27	0.957
2 min	115.40±12.87	118.77±16.06	0.374
10 min	115.80±12.86	114.63±15.45	0.152
30 min	116.50±12.48	112.47±12.18	0.210
1 h	117.77±11.09	116.10±9.99	0.559
2 h	115.10±14.0	117.73±14.04	0.470
Diastolic blood pressure (mmHg)			
Preoperative	79.0±9.52	80.46±10.48	0.573
2 min	72.60±9.08	72.80±12.12	0.943
10 min	73.66±12.47	69.26±13.84	0.201
30 min	76.90±10.46	68.80±10.49	0.004*
1 h	73.36±6.77	69.56±8.94	0.069
2 h	80.06±7.69	73.03±8.18	0.001*

*p<0.05 - significant. SD: Standard deviation

patients in the 0.5% bupivacaine (H)+0.8 mg nalbuphine (group A) was 64.96 kgs. The mean weight of the patients in the 0.5% bupivacaine (H)+1.4 mg nalbuphine (group B) was 61 kgs. The mean height of the patients in the 0.5% bupivacaine (H)+0.8 mg nalbuphine (group A) was 161.93 cm. The mean height of the patients in the 0.5% bupivacaine (H)+1.4 mg nalbuphine (group B) was 162.43 cm. Levene's test for equality of variances and the independent sample test were used to compare the variables, and the p value was determined to be non-significant.

Table 4: Analgesia supplementation give in both the groups in study

Analgesic supplementation	Group A, n (%)	Group B, n (%)	Total, n (%)
Given	0	4 (13.3)	4 (6.7)
Not given	30 (100)	26 (86.7)	56 (93.3)
Total	30 (30)	30 (30)	60 (100)

p=0.112 (not significant)

Table 5: Side effects appeared in both groups in study

Side effect	Group A, n (%)	Group B, n (%)	Total, n (%)
No side effect	20 (66.7)	14 (46.7)	34 (56.7)
Hypotension (based on MAP)	4 (13.3)	6 (20)	10 (16.7)
Nausea	2 (6.7)	4 (13.3)	6 (10)
Shivering	4 (13.3)	6 (20)	10 (16.7)
Total	30 (100)	30 (100)	60 (100)

p=0.502 (not significant). MAP: Mean arterial pressure

The mean pulse rate of the patients in the 0.5% bupivacaine (H) + 0.8 mg nalbuphine (group A) was around 85.93±10.81 bpm whereas in the 0.5% bupivacaine (H)+1.4 mg nalbuphine (group B) it was around 75.16±12.78 bpm at the end of 1 h. The systolic and diastolic pressures of the patients in the 0.5% bupivacaine (H)+0.8 mg nalbuphine (group A) were 117.77±11.09 mmHg and 73.36±6.77 mmHg, respectively, whereas in the 0.5% bupivacaine (H)+1.4 mg nalbuphine (group B) it was 116.10±9.99 mmHg and 69.56±8.94 mmHg at the end of 1 h. When the mean blood pressure and mean pulse rate were statistically analyzed, it was discovered that the p value was significant for the mean pulse rate and diastolic blood pressure but negligible for the systolic blood pressure.

The sensory and motor blocks were checked after the performance of subarachnoid block using pinprick and modified Bromage scale, respectively. The mean onset time of sensory block (T10) in the 0.5% bupivacaine (H)+0.8 mg nalbuphine (group A) was found to be 4.11 mins whereas in the 0.5% bupivacaine (H)+1.4 mg nalbuphine (group B) it was found to be 7.96 mins. The mean onset time of motor block was found to be 3.23 mins in the 0.5% bupivacaine (H)+0.8 mg nalbuphine (group A) whereas in the 0.5% bupivacaine (H)+1.4 mg nalbuphine (group B), it was found to be 5.94 mins. The statistical analysis by the independent sample test and the *t*-test for equality of means has shown a faster onset time for sensory and motor block significantly with a p<0.05 in the 0.5% bupivacaine (H)+0.8 mg nalbuphine (group A).

The mean duration of sensory blockade in the 0.5% bupivacaine (H)+0.8 mg nalbuphine (group A) was 161.93 mins and in 0.5% bupivacaine (H)+1.4 mg nalbuphine (group B) was 193.17 mins. The mean duration of motor blockade in the 0.5% bupivacaine (H)+0.8 mg nalbuphine (group A) was 148.97 mins and in the 0.5% bupivacaine (H)+1.4 mg nalbuphine (group B) was 181.23 mins. Statistical analyses were done and p value (<0.05) was found to be significant. According to Student's *t* test, the time for two-segment regression is found to be statistically significant between group A and group B at 96.7±20.5 (min)% and 128.5±21.2 (min)%, respectively.

The mean duration of analgesia in the 0.5% bupivacaine (H)+0.8 mg nalbuphine (group A) was found to be 176.33 mins and in the 0.5% bupivacaine (H)+1.4 mg nalbuphine (group B) it was found to be 208.47 mins. Statistical analysis revealed a significant p value (<0.05) between the two groups. Because of the longer duration of analgesia and motor blocking, greater hemodynamic stability even after 2 h, statistical significance, and low side effects, the use of 1.4 mg intrathecal nalbuphine is advised for lengthier procedures like hysterectomy. However, because of its quicker onset of effect, the use of 0.8 mg intrathecal nalbuphine is indicated in shorter-duration procedures such as appendicectomy and elective lower segment cesarean section.

Between the two groups, there was no statistically significant difference in the side effects observed. Despite administering antiemetics, it was discovered that the incidence of nausea and vomiting was higher with 1.4 mg intrathecal nalbuphine.

Mukherjee *et al*. [2] show that two-segment regression time of sensory blockade and duration of effective analgesia was prolonged in groups C (0.4 mg nalbuphine) and D (0.8 mg nalbuphine) ($p<0.05$), and the incidence of side-effects was significantly higher in group D ($p<0.05$) compared with the other groups.

Although his study suggested 0.4 mg as the ideal dose in the present investigation, the present study's use of 1.4 mg produced great analgesia but with a delayed start of sensory and motor blockage.

A research evaluating the various nalbuphine dosages conducted by Culebras *et al*. [1] revealed that 0.8 mg was the most efficient dose when administered intrathecally to 90 obstetric patients undergoing cesarean sections. In contrast to 1.6 and 2.4 mg of nalbuphine, a study by Jyothi *et al*. [3] demonstrates that adding 0.8 mg of nalbuphine to 0.5% bupivacaine for subarachnoid block offers good analgesia with a longer duration of effect.

The Verma *et al*. study [4] compared the postoperative analgesic efficacy of intrathecal tramadol versus nalbuphine added to bupivacaine in spinal anesthesia for lower limb orthopedic surgery and came to the conclusion that the addition of nalbuphine (2 mg) to intrathecal hyperbaric bupivacaine (12.5 mg) for spinal anesthesia is effective in extending the duration It resulted in a large extension (62%) of the post-operative analgesia duration and a significant decrease (38%) in the use of rescue analgesics in the first 24 h following surgery. However, compared to when bupivacaine was taken alone, the addition of intrathecal tramadol (50 mg) could not significantly alter postoperative analgesia. As a result, the study proves that nalbuphine (2 mg) works well as an intrathecal adjuvant to bupivacaine for improving postoperative analgesia. By using sealed envelope procedures, 90 research participants were randomly assigned to three groups, each with 30 participants, depending on the intrathecal dosing regimen. A dosage of 1.4 mg is proven in the current study to give great analgesia with no danger of associated adverse effects including nausea, vomiting, shivering, or hypotension.

Tiwari *et al*. [5] performed a randomized prospective double-blind clinical study. Nalbuphine hydrochloride (400 mg) significantly lengthens the duration of sensory blockade and postoperative analgesia when introduced intrathecally along with hyperbaric bupivacaine, according to research comparing intrathecal bupivacaine with a combination of nalbuphine and bupivacaine for subarachnoid block. Similar results were obtained in the current investigation using 1.4 mg of nalbuphine as an adjuvant to 0.5% bupivacaine (H).

Shraddha *et al*.'s [6] study effects of intrathecal nalbuphine as an adjuvant for postoperative analgesia and concluded that improvement in the duration of sensory and motor blockade with minimal side effects was observed, thus proving that it is an effective intrathecal adjuvant for postoperative analgesia. In the present study, the adverse effects reported by the two groups in the current investigation did not vary significantly. Thus, the two dosages of nalbuphine (0.8 mg and 1.4 mg) can be supplied intrathecally without risk.

In Ahmed *et al*. [7] comparative study of three different doses of nalbuphine as an adjuvant to intrathecal bupivacaine for postoperative analgesia in abdominal hysterectomy and concluded that intrathecal nalbuphine is an effective adjuvant to 0.5% hyperbaric bupivacaine in a 1.6 mg dose in patients undergoing total abdominal hysterectomy under subarachnoid block. With side effects that are well tolerated by the patients, it prolongs postoperative analgesia. Utilizing a 2.4 mg dosage has no significant benefits in terms of analgesia duration.

In the present study, individuals who get 1.4 mg of nalbuphine as an adjuvant (group B) experience analgesia for a longer period than those who receive 0.8 mg of nalbuphine (group A) (176.33 min). However, it was shown that group B had a longer time before motor and sensory blocking set in than group A. The two-segment regression time achieved for nalbuphine dosages of 0.8 mg and 1.4 mg is comparable to the values found in the previous investigation.

In Das *et al*. [8] compared efficacy of intrathecal nalbuphine in different doses as an adjuvant to L-bupivacaine in subarachnoid block and concluded that intrathecal nalbuphine (0.75 mg and 1 mg) was associated with prolonged motor and sensory block, compared to 0.5 mg nalbuphine and L-bupivacaine alone. In the current study, individuals who took 0.8 mg of nalbuphine as an adjuvant (group A) had motor and sensory blockage for 148.97 min and 161.93 min, respectively, whereas group B experienced blockade for 181.23 min and 193.17 min.

In Singhal *et al*. [9] compared two different doses of nalbuphineas an adjuvant to bupivacaine intrathecally in lower abdominal and lower limb surgeries and concluded that the addition of 0.4 mg of nalbuphine to 0.5% bupivacaine for subarachnoid block provides excellent analgesia with long duration of action compared with 0.8 mg of nalbuphine with minimal side-effects. Patients were divided into three groups at random. In each group, there are 30 patients. They were given one of the medication solutions listed below.

Das *et al*. (2015) [10] in their study of 5 g and 10 g of intrathecally administered dexmedetomidine as an adjuvant to 15 mg of bupivacaine, Das *et al*. (2015) [10] found that dose-dependent intrathecal dexmedetomidine lengthens the duration of the sensory and motor block, delays the onset of the first analgesic, and decreases analgesic consumption. According to Das *et al*. (2015) [10], intrathecal dexmedetomidine extends the duration of the motor block in a dose-dependent manner.

Halder et al. [11] concluded that the addition of 10 μg in comparison to 5 μg dexmedetomidine to 0.5% hyperbaric bupivacaine more efficiently hastens the onset and prolongs the duration of sensory and motor blockade and reduces the requirement of rescue analgesia in postoperative period which provided postoperative analgesia for 241.80 min with 10 μg and 227.0 min with 5 μg of dexmedetomidine.

Although Singhal *et al*.'s study suggested 0.4 mg of nalbuphine as the ideal dose, the current study found that 1.4 mg of nalbuphine also produced great analgesia, but with a delayed start compared to 0.8 mg and very few side effects.

In their study, Bhalavat *et al*. [12] found that using dexmedetomidine as an adjuvant resulted in lower mean heart rate (HR) and mean arterial pressure (MAP) than nalbuphine. At all follow-up intervals, there was no discernible difference between the two groups' HR and MAP.

A randomized trial by Dubey *et al*. (2014) [13] found that nalbuphine offers a superior grade of block than bupivacaine alone. When administered as an adjuvant to spinal bupivacaine in older individuals, it also prolongs postoperative analgesia ($p<0.001$).

Gupta *et al*. [14] in group dexmedetomidine, 6.6% had bradycardia and hypotension, respectively. Dexmedetomidine is identical to nalbuphine and is therefore a safe substitute that may be used as an adjuvant without changing vital signs.

Limitations of the study

In our experiment, a lower intrathecal nalbuphine dosage may have been investigated. Despite the fact that none of the dosages were associated with any adverse effects, a dose of 0.8 or 0.4 mg may have been used instead. In our study, postoperative pain ratings were not calculated. We may have gotten information on nalbuphine's postoperative analgesic effectiveness from a 24 h follow-up.

Prospects for further research

According to our findings, nalbuphine can be a beneficial adjuvant in spinal anesthesia for patients having abdominal hysterectomies. It greatly extended the analgesia while without lengthening the motor block's duration or having any negative effects. As a result, patients can leave the operating room early and without discomfort or other side effects, which might be helpful in daycare procedures. Future research must verify this, though, by assessing pain levels during mobilization. Nalbuphine can be a useful auxiliary in settings where fentanyl would not be accessible because of licensing concerns.

CONCLUSION

Due to the longer duration of analgesia and motor blockage with greater hemodynamic stability even after 2 h, which is statistically significant, and fewer side effects, the use of 1.4 mg intrathecal nalbuphine is advised for lengthier procedures like hysterectomy. However, because of its quicker onset of effect, the use of 0.8 mg intrathecal nalbuphine is indicated in shorter-duration procedures such as appendicectomy and elective lower segment cesarean section. Between the two groups, there was no statistically significant difference in the side effects observed.

Despite administering antiemetics, it was discovered that the incidence of nausea and vomiting was higher with 1.4 mg intrathecal nalbuphine. The results of subarachnoid block (onset and regression of blockade, analgesia, and side effects) between the two groups that received nalbuphine at various additive dosages were studied in this study. The duration of motor blockade and analgesia of nalbuphine at 1.4 mg was shown to be superior than that of 0.8 mg without any significant side effects, save for the late start of sensory and motor blockade.

It can be concluded that intrathecal 0.5% bupivacaine (H)+nalbuphine (1.4 mg) when compared to intrathecal 0.5% bupivacaine (H)+nalbuphine (0.8 mg) in the patients undergoing lower abdominal surgeries. Extends the time it takes for sensory and motor blockage to begin. A higher amount of sensory blockage is produced. A long-lasting sensory and motor blockage is the result. Produces analgesia that lasts for a long time.

DATA AVAILABILITY

Data will be made available on reasonable request.

Choose one of the options and indicate it in the text of the manuscript:

- Manuscript has associated data in a data repository
- Manuscript has data included as electronic supplementary material
- Data will be made available on reasonable request
- Data cannot be made available for reasons disclosed in the data availability statement
- Manuscript has no associated data.

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CONFLICT OF INTEREST

Nil.

It is necessary to indicate the absence or presence of a conflict of interest. If there is a conflict of interest, it must be specified.

When there is no conflict of interest, it is necessary to specify the phrase:

The authors declare that there is a noconflict of interest in relation to this paper, as well as the published research results, including the financial aspects of conducting the research, obtaining and using its results, as well as anynon-financial personal relationships.

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REFERENCES

1. Culebras X, Gaggero G, Zatloukal J, Kern C, Marti RA. Advantages of intrathecal nalbuphine, compared with intrathecal morphine, after Cesarean delivery: An evaluation of postoperative analgesia and adverse effects. Anesth Analg 2000;91:601-5. doi: 10.1097/00000539-200009000-00019, PMID 10960384
2. Mukherjee A, Pal A, Agrawal J, Mehrotra A, Dawar N. Intrathecal nalbuphine as an adjuvant to subarachnoid block: What is the most effective dose? Anesth Essays Res 2011;5:171-5. doi: 10.4103/0259-1162.94759, PMID 25885383
3. Jyothi B, Gowda S, Shaikh SI. A comparison of analgesic effect of different doses of intrathecal nalbuphine hydrochloride with bupivacaine and bupivacaine alone for lower abdominal and orthopedic surgeries. Indian J Pain 2014;28:18-23. doi: 10.4103/0970-5333.128881
4. Verma D, Naithani U, Jain DC, Singh A. Postoperative analgesic efficacy of intrathecal tramadol versus nalbuphine added to bupivacaine in spinal anaesthesia for lower limb orthopaedic surgery. J Evol Med Dent Sci 2013;2:6196-206. doi: 10.14260/jemds/1118
5. Tiwari AK, Tomar GS, Agrawal J. Intrathecal bupivacaine in comparison with a combination of nalbuphine and bupivacaine for subarachnoid block: A randomized prospective double-blind clinical study. Am J Ther 2013;20:592-5. doi: 10.1097/MJT.0b013e31822048db, PMID 21904194
6. Shraddha B, Sharma NA, Niharika V, Kavya M, Shankaranarayana P. Effects of intrathecal nalbuphine as an adjuvant for postoperative analgesia: A randomized, double blind, control study. Karnataka Anaesth J 2016;2:112.
7. Ahmed F, Narula H, Khandelwal M, Dutta D. A comparative study of three different doses of nalbuphine as an adjuvant to intrathecal bupivacaine for postoperative analgesia in abdominal hysterectomy. Indian J Pain 2016;30:23. doi: 10.4103/0970-5333.173457
8. Das T, Ray H, Baliarsingh AP. Comparative study of efficacy of intrathecal nalbuphine in different doses as an adjuvant to levo bupivacaine in subarachnoid block Sch. J Appl Sci 2017;5:2388-92.
9. Singhal D, Chowdhary A, Mehta N. Two different doses of nalbuphine as an adjuvant to bupivacaine intrathecally in lower abdominal and lower limb surgeries-a comparative study. IOSR JDMS 2018;17:81-6.
10. Das A, Halder S, Chattopadhyay S, Mandal P, Chhaule S, Banu R. Effect of two different doses of dexmedetomidine as adjuvant in bupivacaine induced subarachnoid block for elective abdominal hysterectomy operations: A prospective, double-blind, randomized controlled study. Oman Med J 2015;30:257-63. doi: 10.5001/omj.2015.52, PMID 26366259
11. Halder S, Das A, Mandal D, Chandra M, Ray S, Biswas MR, *et al*. Effect of different doses of dexmedetomidine as adjuvant in bupivacaine-induced subarachnoid block for traumatized lower limb orthopaedic surgery: A prospective, double-blinded and randomized controlled study. J Clin Diagn Res 2014;8:GC01-6. doi: 10.7860/JCDR/2014/9670.5118, PMID 25584237
12. Bhalavat S, Bhavsar I, Parikh DR, Shah DR. Comparative study between intrathecal nalbuphine and dexmedetomidine for postoperative analgesia in lower abdominal surgeries. BJkines-NJBAS 2018;10:9-16.
13. Dubey R, Bisht S. To study the effect of addition of nalbuphine to intrathecal bupivacaine used for elderly patient in lower abdominal surgeries under spinal anesthesia: A Randomized double blinded control study. J Evol Med Dent Sci 2014;3:14364-71.
14. Gupta R, Bogra J, Verma R, Kohli M, Kushwaha JK, Kumar S. Dexmedetomidine as an intrathecal adjuvant for postoperative analgesia. Indian J Anaesth 2011;55:347-51. doi: 10.4103/0019-5049.84841, PMID 22013249