Original Article

Comparison Between Dexmedetomidine Plus Bupivacaine and Simple Bupivacaine for Post-Operative Pain Relief Among Pregnant Women Undergoing Cesarean Section Under Spinal

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ABSTRACT

Objective: To compare the effects of Bupivacaine plus dexmedetomidine versus Bupivacaine in terms of postoperative pain relief in c-section patients under spinal anesthesia.

Study Design: Randomized Controlled Trial study

Place and Duration of Study: This study was conducted at the Department of Anesthesiology / ICU, DHQ Teaching Hospital Gujranwala from August-21 to September 22.

Methods: After Hospital Ethical Committee approval, 60 eligible inpatients were enrolled. Group D received 1.5 ml of hyperbaric 0.75% bupivacaine plus 1 ml of dexmedetomidine (10 mcg/ml), while Group B received only 1.5 ml of hyperbaric bupivacaine. The first analgesic requirement, pain intensity, vitals, and side effects were recorded. Analgesia was given only if pain was reported: paracetamol 1g IV for mild pain, ketorolac 30 mg IV for moderate pain, and nalbuphine 4-6 mg IV for severe pain.

Results: The mean patient age was 25.77 ± 5 years. In Group D (n=30), 6 (20%) required ketorolac 30 mg IV, 15 (50%) needed paracetamol 1 g IV, and 9 (30%) required no analgesia within 120 minutes postoperatively. In Group B (n=30), 9 (30%) required nalbuphine 4-6 mg IV, 6 (20%) needed ketorolac, 8 (27%) required paracetamol, and 7 (23%) required no analgesia. The Chi-square test showed no significant difference in comorbidities ($p=0.44$) or baseline HR, DBP, SBP, and MAP ($p>0.05$). However, HR, DBP, SBP, and MAP differed significantly between groups throughout the study ($p<0.001$).

Conclusion: The use of dexmedetomidine with Bupivacine significantly reduce the need of analgesia as compared to Bupivacaine alone.

Key Words: Dexmedetomidine, Bupivacaine , Post operative analgesia, Spinal anesthesia

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INTRODUCTION

Dexmedetomidine a new drug introduced in market which claims to provide better analgesia and prolongation of post operative pain relief.[1] The efficacy of Dexmedetomidine has been assessed in terms of post operative pain relief when used with Bupivacaine in subarachnoid block for cesarean section patients. Its administration with Bupivacaine also reduces the chance of neurotoxicty.

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It also provides good analgesia with minimum interaction with other drugs. Dexmedetomidine administration also reduces the chances of shivering in post operative anesthetized patient.[2,3]

Studies have shown that this combination enhances pain relief, extends analgesic duration, reduces opioid consumption, and improves patient satisfaction.[4] One of the primary benefits of dexmedetomidine is its ability to prolong analgesic duration. Patients receiving only bupivacaine typically require rescue analgesics around 7 hours after the subarachnoid block. However, when dexmedetomidine is added, the duration of analgesia extends significantly, often lasting up to 9 hours or more.[5] Some studies even report that the analgesic effect nearly doubles compared to bupivacaine alone. Pain control is a key advantage, as patients receiving bupivacaine with dexmedetomidine experience consistently lower postoperative Visual Analog Scale (VAS) pain scores compared to those receiving bupivacaine alone. The enhanced pain relief becomes

noticeable within the first hour after surgery and remains superior throughout the postoperative period.[6]

The safety profile of this combination is also favorable. Both groups maintain hemodynamic stability, with no significant differences in blood pressure or oxygen saturation levels. Importantly, dexmedetomidine does not lead to an increased incidence of adverse effects such as hypotension or bradycardia. Additionally, patients receiving dexmedetomidine report a lower incidence of adverse effects. Neonatal health outcomes remain unaffected, further supporting the safety of this combination for cesarean section patients.

Another important benefit of dexmedetomidine is its opioid-sparing effect. Patients receiving this combination require fewer rescue opioid doses postoperatively compared to those in the bupivacaine-only group.[7] This reduction in opioid use helps minimize opioid-related side effects and enhances overall recovery. Moreover, maternal satisfaction is higher in the dexmedetomidine group due to prolonged pain relief and a decreased need for additional analgesics.[8] The improved comfort and reduced opioid consumption contribute to a better overall postoperative experience.

This study evaluated the effectiveness of pre-operative administration of Dexmedetomidine in post Operative pain in patient undergoing Cesarean Section with Spinal Anesthesia. Dexmedetomidine mixed with Bupivacainehas been given intratheacal and their effect has been compared with cases in which only Bupivacaine given intrathecal for cesarean sections and the post operative pain relief has been assessed.

METHODS

In this study, postoperative pain intensity of pain was measured using the Numeric Rating Scale (NRS) and the Verbal Rating Scale (VRS), where patients were asked to rate their pain on a scale of 0 to 10. The study duration was twelve months following the approval of the synopsis. The calculated sample size comprised 80 patients, with 40 in each group. The sample size was determined using the formula $n=Z^2 Pq/d^2$, where Z=1.96 at a 95.9% confidence interval, P=the proportion of patients requiring analgesia, q=1-0.959, and d=0.05. The sampling technique employed was non-probability purposive sampling.

The inclusion criteria for this study encompassed patients aged 18-40 years, weighing between 45-85 kg, and undergoing cesarean section under spinal anesthesia. Patients with a history of previous spinal surgery, diagnosed pregnancy-induced or essential hypertension, and diabetes mellitus were excluded. The patients were divided into two groups: Group B, which received 1.5 ml of 0.75% hyperbaric Bupivacaine, and Group D, which received 1.5 ml of 0.75% hyperbaric Bupivacaine combined with 10 mcg of Dexmedetomidine.

Following approval from the hospital's ethical committee, 60 patients who met the inclusion and exclusion criteria were recruited from the inpatient department. Baseline data, including name, age, weight, and hospital registration number, were recorded. The patients were randomly assigned to one of the two groups using the draw method before the induction of anesthesia.

All patients received spinal anesthesia using a 25G Quincke needle at the L3-L4 or L4-L5 space in a sitting position. Patients in Group D were administered 1.5 ml of hyperbaric 0.75% Bupivacaine along with 1 ml of Dexmedetomidine (10 mcg/ml), whereas Group B received only 1.5 ml of hyperbaric Bupivacaine. After the administration of spinal anesthesia, patients were placed in a supine position and observed for sensory and motor block. The duration of surgery was recorded.

Postoperative pain assessment was conducted at predefined time intervals: 30 minutes, 60 minutes, 120 minutes, 240 minutes, 360 minutes, and 720 minutes following spinal anesthesia. At each of these time points, patients were asked to rate their pain intensity. The time of the first request for analgesia was noted, along with pain severity, heart rate, blood pressure. Pain intensity was classified according to the predefined operational definitions. No analgesic was administered to patients who reported no pain. For mild pain, Paracetamol 1 g intravenous infusion was used; for moderate pain, Ketorolac 30 mg intravenous was given; and for severe pain, Nalbuphine 4-6 mg was administered. All data were meticulously recorded on a structured proforma.

Quantitative variables such as age, numeric rating system scores, blood pressure, heart rate, and the number of analgesic doses were presented as mean ± standard deviation (SD). An independent t-test was applied for the comparison of quantitative variables between the two groups. Qualitative variables, including pain severity, visual rating scores, and time to first analgesia, were presented as frequencies and percentages. A t-test was also used for comparing these categorical variables.

RESULTS

A total of 60 participants were enrolled in this study from the Department of Anesthesiology and Intensive Care Unit (ICU) at DHQ Teaching Hospital, Gujranwala, affiliated with the University of Health Sciences, Lahore, Pakistan. The mean age of the participants was 25.00 ± 5.99 years. In Group D (Bupivacaine + Dexmedetomidine), out of 30 participants, 6 required Ketorolac (30 mg), 15 required Paracetamol (1 g), and 9 did not require any analgesia. In Group B (Bupivacaine alone), out of 30 participants, 9 required Nalbuphine (4-6 mg), 6 required Ketorolac (30 mg), 8 required Paracetamol (1 g), and 7 did not require any analgesia.

The overall mean Numeric Rating Scale (NRS) pain score for all patients was 1.30 ± 0.93, with a minimum score of 0 and a maximum score of 3. A comparison of pain scores between the two groups revealed that the mean NRS pain score in Group D was 0.80 ± 0.71, whereas in Group B, it was 1.80 ± 0.84. This difference was statistically significant (p-value < 0.001) (Table 1).

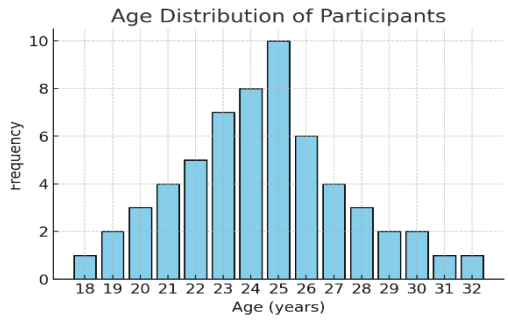

Figure No. 1: Age Distribution (Histogram) – Shows the frequency of participants in different age groups.

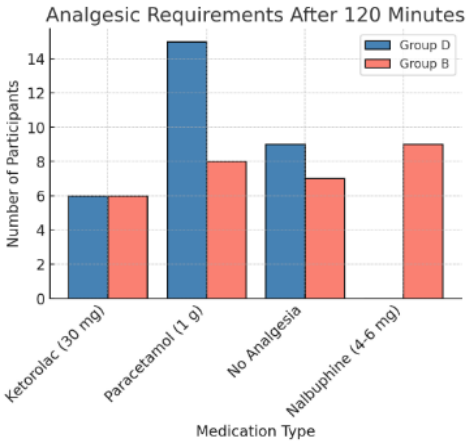

Figure No. 2: Analgesic Requirements (Stacked Bar Chart) – Compares the number of participants requiring different analgesics between Group D and Group B.

Table No. 1: showing the details of the NRS Pain Scores between Groups

Study Group	n	Mean NRS Score	Standard Deviation	p-value
Group D (Bupivacaine + Dexmedetomidine)	30	0.80	0.71	<0.001
Group B (Bupivacaine Alone)	30	1.80	0.84	

DISCUSSION

The addition of either Nalbuphine or Dexmedetomidine to epidural Bupivacaine significantly enhances postoperative analgesia; however, Dexmedetomidine offers several advantages, making it the superior choice. It provides a faster onset of pain relief by acting on α2-adrenergic receptors, which reduce nerve excitability and enhance local anesthetic effects. Additionally, Dexmedetomidine ensures a longer duration of analgesia by modulating nociceptive transmission in the spinal cord and central nervous system, reducing the need for rescue analgesics.[10] Compared to Nalbuphine, which, as an opioid, can cause pruritus, nausea, and mild respiratory depression, Dexmedetomidine demonstrates better hemodynamic stability and fewer sedation-related side effects. Furthermore, due to its ability to provide better pain control, fewer adverse effects, and reduced dependence on additional analgesics, Dexmedetomidine results in higher patient satisfaction.[11] Given its superior analgesic profile and safety, Dexmedetomidine emerges as the preferred epidural adjuvant for postoperative pain management in lower limb orthopedic surgeries, offering an effective and well-tolerated option in multimodal pain management strategies.[12]

Data collection was done at Department of Anesthesia DHQ Hospital, Gujranwala. In this study, mean age of patients was 25.77 ± 5 years. Out of 30 participants of group D only 6 need ketorolac 30mg I/V(20%) & 15 participants need 1 gm I/V Paracetamol (50%) while 9 participants need no analgesic (30%) after first 120 min of post op care. On the other hand out of 30 participants of group B,9 participants need nelbuphine 4-6 mg(30%), 06 participants need ketorolac 30 mg I/V (20%), 8 participants need 1gm paracetamol (27%) and only 7 participants need no analgesic (23%) after first 120 min of post op care. On statistical analysis using the Chi-square test, it was found that the co-morbidities between those in groups A and B were not statistically significant (p = 0.44). There was no significant difference in baseline values between HR, DBP, SBP, and MAP groups (p-value > 0.05). Throughout the study, there was a statistically significant difference in HR, DBP, SBP, and MAP between Group (A) and Group (BP) (p < 0.001).

One study by Houman Teymourian et al[13] concluded that intrathecal usage of the dexmedetomidine as adjuvant therapy with bupivacaine during obstetric surgeries like c-sections provide very impressive analgesic properties both intra or post-operative periods by showing no significant effect on the child APGAR scores or any sort of adverse reactions. The bupivacaine group showed delayed initiation of pain post-operatively and also sedation score based on Ramsay sedation score was improved with values initially as 0 to 3 and then 1 to 4. The APGAR score was insignificant within the two groups under consideration.

But significant distinction found regarding BIS among the two groups during their c-sections.

In another study by Sun et al[14] demonstrated that using bupivacaine with dexmedetomidine showed similar results as using fentanyl with bupivacaine regarding APGAR score with insignificant difference among both groups.

A study by Hala Ezzat Abdelnaim et al found that injecting a dexmedetomidine–bupivacaine mixture into the wound before making the skin incision reduces the need for anesthesia during surgery, provides longer-lasting pain relief.[15] One study by Urvashi Yadav et al[16] documented that analgesia duration was significant among patient with group D showing higher value (19.93 ± 3.2) as compared to group B (12.13 ± 1.8) with lesser demand of analgesia among group D individuals in comparison to group B respondents. The total rescue analgesics requirement in group D was 62.51 ± 39.13 and in other one (group B) was 95.68 ± 33.5 with significant p-value <0.05.

A recent study by Deshwal et al[17] found that adding dexmedetomidine to ropivacaine for wound infiltration in microdiscectomy patients provides effective postoperative pain relief while maintaining stable hemodynamics and avoiding sedation. Dexmedetomidine has been widely used as an adjuvant to local anesthetics in various surgeries, consistently showing similar benefits.

This discussion and our results suggest that dexmedetomidine enhances the analgesic duration and reduces the need for postoperative analgesics. The combination of bupivacaine and dexmedetomidine provides superior postoperative analgesia compared to bupivacaine alone, making it a more effective option for pain management in C-section patients under spinal anesthesia.

CONCLUSION

These results demonstrate that the addition of dexmedetomidine to bupivacaine in spinal anesthesia significantly improves postoperative analgesia, reducing pain scores and the need for stronger analgesics.

LIMITATIONS: One of the key limitations of this study is its relatively small sample size, which may limit the generalizability of the findings. Additionally, the study was conducted at a single center, which may introduce selection bias and restrict the applicability of the results to broader populations. Another limitation is the relatively short follow-up period, which prevents an assessment of long-term analgesic efficacy and potential delayed adverse effects of dexmedetomidine. The study also did not account for potential confounding factors such as variations in individual pain tolerance, postoperative care differences, and anesthesia provider experience, which could have influenced the outcomes. Furthermore, while the study effectively compared pain relief between the two groups, it did not evaluate patient satisfaction comprehensively, which is a crucial component of postoperative care. Future studies with larger sample sizes, multicenter designs, and extended follow-up periods are needed to validate these findings and explore additional clinical outcomes.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Salman Athar Qureshi
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Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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REFERENCES

1. Bajwa SJ. Dexmedetomidine and ketamine–comrades on an eternal journey. Ind J Anaesth 2021;65(Suppl 1):S1-4.
2. Mowafy SM, Ellatif SE. Effectiveness of nebulized dexmedetomidine for treatment of post-dural puncture headache in parturients undergoing elective cesarean section under spinal anesthesia: a randomized controlled study. J Anesth 2021;35:515-24.
3. Sobhy YS, Gadalla RR, Nofal WH, Nasef MA, Abdou KM. A comparative study between the use of dexmedetomidine vs. dexamethasone as adjuvants to bupivacaine in ultrasound-guided transversus abdominis plane block for postoperative pain relief in patients undergoing lower abdominal surgeries. Anaesth Pain Intensive Care 2022;26(5):681-8.
4. Alansary AM, Badawy A, Elbeialy M. Dexmedetomidine added to bupivacaine versus bupivacaine in transincisional ultrasound-guided quadratus lumborum block in open renal surgeries: a randomized trial. Pain Physician 2020; 23(3): 271.
5. Tilkar Y, Dawer S, Dawer RA, Kumbhare S. Study comparing bupivacaine alone and bupivacaine with dexmedetomidine for postoperative analgesia during Caesarean section under spinal anaesthesia. Int J Acad Med Pharm 2022;4(3):244-50.
6. Thakur J, Gupta B, Gupta A, Verma RK, Verma A, Shah P. A prospective randomized study to compare dexmedetomidine and dexamethasone as an adjunct to bupivacaine in transversus abdominis

plane block for post-operative analgesia in caesarean delivery. Int J Reprod Contracept Obstet Gynecol 2019;8(12):4903-8.
7. Liu L, Qian J, Shen B, Xiao F, Shen H. Intrathecal dexmedetomidine can decrease the 95% effective dose of bupivacaine in spinal anesthesia for cesarean section: a prospective, double-blinded, randomized study. Med (Baltimore). 2019;98(9):e14666.
8. Rizk RS, Refky MA, Zanfaly HI, Ibraheam AM. Postoperative analgesic effect of using bupivacaine versus bupivacaine with dexmedetomidine or ketamine in cesarean section operations. Egypt J Hosp Med. 2022;88(1):3374-9.
9. Zhao Y, He J, Yu N, Jia C, Wang S. Mechanisms of Dexmedetomidine in Neuropathic Pain. Front Neurosci 2020;14:330.
10. Ye Q, Wang F, Xu H, Wu L, Gao X. Effects of dexmedetomidine on intraoperative hemodynamics, recovery profile and postoperative pain in patients undergoing laparoscopic cholecystectomy: a randomized controlled trial. BMC Anesthesiol 2021;21(1):63.
11. Ter Bruggen FFJA, Ceuppens C, Leliveld L, Stronks DL, Huygen FJPM. Dexmedetomidine vs propofol as sedation for implantation of neurostimulators: A single-center single-blinded randomized controlled trial. Acta Anaesthesiol Scand 2019;63(10):1321-1329.
12. Sarkar A, Bafila NS, Singh RB, Rasheed MA, Choubey S, Arora V. Comparison of Epidural Bupivacaine and Dexmedetomidine with Bupivacaine and Fentanyl for Postoperative Pain Relief in Lower Limb Orthopedic Surgery. Anesth Essays Res 2018;12(2):572-580.
13. Teymourian H, Khorasanizadeh S, Ansar P, Nazari L, Dehkordy ME. Comparison of the effect of bupivacaine in combination with dexmedetomidine with bupivacaine plus placebo on neonatal Apgar score, bispectral index, and sedation level of parturient women. Anesth Pain Med 2018;8.
14. Sun Y, Xu Y, Wang GN. Comparative evaluation of intrathecal bupivacaine alone, bupivacaine-fentanyl, and bupivacaine-dexmedetomidine in Caesarean section. Drug Res 2015;65:468-72.
15. Abdelnaim HE, Mohamed NN, Saleh AH, Youssef AN. Comparison between bupivacaine–dexmedetomidine mixture and bupivacaine–magnesium mixture when used for wound infiltration before skin incision in surgeries for hernia repair regarding their intraoperative and postoperative analgesic effects. Ain-Shams J Anesthesiol 2018;10:1-9.
16. Yadav U, Srivastava S, Srivastav D. Postoperative analgesic effect of bupivacaine alone and with dexmedetomidine in wound instillation for lumbar laminectomy: a randomized control trial. Anesth Essays Res 2020;14:149.
17. Deshwal R, Kumar N, Sharma JP, Kumar R. Efficacy of dexmedetomidine added to ropivacaine infiltration on postoperative pain following spine surgeries: a randomized controlled study. Anesth Essays Res 2018;12:700..