



## Original Article

## Comparative Effect of Intrathecal Hyperbaric 0.5% Bupivacaine Alone and With Addition of Dexmedetomidine in Post-Operative Care Unit Following Elective Cesarean Section in association to Body Mass Index and Duration of Analgesia

Muhammad Shahid<sup>1</sup>, Mujahid Ul Islam<sup>1</sup>, Imtiaz Ahmad<sup>1</sup>, Sayed Shah Hassnain<sup>2</sup>, Muhammad Haseeb Moin Ud Din Baloch<sup>2</sup>, Mohammad Shafiq<sup>1</sup>, Ahsan Shabir<sup>1</sup>, Shah Arif<sup>1</sup>, Faizan Ahmad Ali<sup>1</sup>

<sup>1</sup>Rehman medical institute, Peshawar, Pakistan

<sup>2</sup>Lady Reading Hospital, Peshawar, Pakistan

## ARTICLE INFO

**Key Words:**

Dexmedetomidine, Hyperbaric bupivacaine, Spinal anesthesia

**How to Cite:**

Shahid, M., Islam, M. U. ., Ahmad, I., Hassnain, S. S., Baloch, M. H. M. ud din, Shafiq, M., Shabir, A., Arif, S. ., & Ali, F. A. (2022). Comparative Effect of Intrathecal Hyperbaric 0.5% Bupivacaine Alone and With Addition of Dexmedetomidine in Post-Operative Care Unit Following Elective Cesarean Section in association to Body Mass Index and Duration of Analgesia : Bupivacaine & Dexmedetomidine in Analgesia . Pakistan BioMedical Journal, 5(2), 143-146. <https://doi.org/10.54393/pbmj.v5i2.286>

**\*Corresponding Author:**

Muhammad Shahid  
Rehman Medical Institute, Peshawar, Pakistan  
[shahidanesthetis@yahoo.com](mailto:shahidanesthetis@yahoo.com)

## ABSTRACT

For patients undergoing elective cesarean, spinal anesthesia has been considered a preferred method of anesthesia. Conventionally, Bupivacaine was used but now dexmedetomidine, a newer drug as compared to Bupivacaine is being used. Due to short usage tenure of dexmedetomidine as a spinal anesthesia, data regarding its efficacy is lacking in Pakistan. **Objectives:** To compare the mean duration of spinal anesthesia between hyperbaric bupivacaine 0.5% alone versus hyperbaric bupivacaine 0.5% with dexmedetomidine on first analgesic request for women undergoing elective cesarean section alongwith examining the affect of BMI on Dexmedetomidine. **Methods:** Spinal anesthesia was administered in the sitting position under sterile conditions with 25G pencil point needle. Patient was positioned in a supine position tilting towards left after successful intra thecal injection. Group A cases received hyperbaric 0.5% BPV (2.25ml) with 5ug DXM (0.25ml) and those in Group B received only 0.5% BPV (2.25ml) with 0.25ml normal saline under full aseptic measures. These patients underwent cesarean section and were assessed in post-operative time after every 30 minutes to first request of analgesia which were given if there was pain of 4 or more on visual analogue scale. **Results:** In Group A, mean and SDs for duration of analgesia was 359.73±8.021 minutes. In Group B, mean and SDs for duration of analgesia was 182.30±7.720 minutes. Results depicted mean and SD for BMI of the patients to be 25.66±1.52. **Conclusion:** In this study, hyperbaric bupivacaine 0.5% with DXM in spinal anesthesia for patients undergoing caesarean section significantly prolonged the duration of analgesia in normal to slightly overweight individuals

## INTRODUCTION

Pain has been blight for humankind and much effort has been made to understand it and steps have been taken to alleviate it. Postoperative pain by virtue of its unique transient nature is more amenable to therapy [1]. In recent years the percentage of females giving birth by c-section has increased immensely in the developed countries as well as in third world developing countries. Most preferred method for preventing pain during c-section is spinal anesthesia for patients electively undergoing c-section, as this anesthesia reduces the risk of maternal and fetal complications associated with spinal anesthesia in comparison with general anesthesia[2,3]. Bupivacaine (BPV) is amide local anesthetic used in spinal anesthesia for

c-section but it has side effects like hypotension, bradycardia etc. due to increased dose requirement and less efficient pain control in post-operative care when used alone [4]. Intrathecal adjuvant such as ketamine, opioids, Alpha 2 agonists and neostigmine has been used to enhance the effect of spinal anesthesia [5,6]. Recently, Dexmedetomidine (DXM) has emerged as an adjuvant to spinal anesthesia. DXM can effectively prolong the duration of spinal anesthesia and also provide effective pain control in postoperative period. DXM functions as an Alpha 2 agonist who in combination with BPV intrathecally elevates the sensory blockade by suppressing the secretion of c fiber neurotransmitter and by hyper

polarization of postsynaptic dorsal horn neurons. DXM has become sought after in comparison to clonidine for its better analgesic effect, and it is allied with stability of the hemodynamic condition and better quality of anesthesia and analgesia during and post-surgery with fewer side effects [7-9]. In patients undergoing cesarean delivery the ideal technique for administration of anesthesia is subarachnoid block (SAB) [10]. Opioids are consistent as the stronghold among multiple adjuvants to local anesthetics (LAs) in subarachnoid block primarily because of high merit of its numerous characteristics such as decrease in the dose of local anesthetics, less side effects, and drawing out anesthetic duration [11]. It has been recommended that instead of parenteral opioids and epidurals, neuraxial opioids for intermittent administration as a postoperative analgesia for c-section delivery should be used [12]. If smaller doses of anesthetics are used intrathecally, drug transfer to the neonates is not significant compared to other pathways of administration. An outstanding standard for postoperative analgesia is morphine, but its use can adversely affect the respiratory system and can cause nausea, vomiting, and pruritus [13, 14]. An indication was made offering that the inception time of BPV together with DXM was shorter in the control group, while the duration of anesthesia was prolonged with low dose. The duration of motor block was longer in the DXM group than control group (199 +/- 42.8 min versus 138.4 +/- 31.3 min,  $P < 0.05$ ) [15]. In females with increased BMI, the clearance time of DXM was more as compared to females with normal weight and BMI. More fat mass concentration in the female body leads to longer stay of the dexmedetomidine drug in the female body which can result in adverse side effects [16, 17].

## METHODS

A randomized controlled trial was conducted at the Department of Anesthesiology, Rehman Medical Institute (RMI), and Peshawar from 15 Aug, 2020 to 15 Feb, 2021. The sample size was 60 (30 in each group) by keeping the confidence interval equal to 95% power equal to 80% and the anticipated duration of analgesia with BPV alone vs BPV with DXM as  $187.32 \pm 16.45$  as compared to  $357.46 \pm 30.64$  minutes respectively. Samples were selected using non-probability consecutive sampling technique. Women with age 20-40 years, ASA I, II Class and pregnant females with singleton pregnancy irrespective of parity and admitted for elective cesarean sections were included. Documented cases of any bleeding disorder i.e. factor deficiencies (assessed by history and medical record), documented cases of allergy to any of the study drugs. (assessed by history and medical record) and documented cases of end stage renal failure (creatinine  $> 3$  mg/dl) and liver failure

(ALT, AST  $> 60$  IU/L) were excluded. Data from the patients were collected with the help of a pre tested questionnaire and it was analyzed using SPSS version 24.0.

## RESULTS

The frequency of patients from 20-30 years in group A is 24 while patients in between 31-40 years are 6. Similarly, in group B, the number of patients from 20-30 years is 22 while 8 are in 31-40 years age group (Table 1). Collectively, the mean age for group A is 26.80 years, mean weight is 70.27 Kg, mean height is 5.477 ft, BMI is 25.66, duration of surgery 43.7 minutes and duration of analgesia is 359.7 minutes. For group B, the mean age is 27.8 years, weight is 70.2 Kg, height is 5.4 ft, BMI is 25.57, duration of surgery is 46.0 minutes and duration of the analgesia is 182.3 minutes (Table 2). According to the results 40% females had history of c-section while in group B 33% had a history with c-section (Table 3). According to (Table 4), the mean and standard deviation for duration of the analgesia in accordance to BMI less than or equal to 25 in group A is 362.18 and 10.245 while for group B is 182.27 and 7.129. For BMI greater than 25 the mean and standard deviation was 358.32 and 6.290 for group A and 182.32 and 8.233 for group B.

Treatment Group (n=60)	Age Groups	Frequency	Percent
Group A (n=30)	20-30 Years	24	80.0%
	31-40 Years	6	20.0%
	Total	30	100.0%
Group B (n=30)	20-30 Years	22	73.3%
	31-40 Years	8	26.7%
	Total	30	100.0%

**Table 1:** Descriptive Statistics of Study; Group A = (Bupivacaine with Dexmedetomidine), Group B = (Bupivacaine alone)

Treatment Group (n=60)	Minimum	Maximum	Mean	SD	
Group A (n=30)	Age	22	36	26.80	4.278
	Weight	65	78	70.27	4.051
	Height	5.4	5.6	5.477	.0568
	BMI	24	29	25.66	1.529
	Duration of Surgery	35.0	65.0	43.700	7.4932
	Duration of Analgesia	345	385	359.73	8.021
Group B (n=30)	Age	22	36	27.80	4.582
	Weight	65	78	70.20	4.318
	Height	5.4	5.6	5.490	.0662
	BMI	24	28	25.57	1.553
	Duration of Surgery	35.0	65.0	46.000	9.0934
	Duration of Analgesia	165	192	182.30	7.720

**Table 2:** Frequencies and Percentages for Previous C Section; Group A = (Bupivacaine with Dexmedetomidine); Group B = (Bupivacaine alone)

Treatment Group (n=60)	Previous C Section	Frequency	Percent
Group A (n=30)	Yes	12	40.0%
	No	18	60.0%
	Total	30	100.0%
Group B (n=30)	Yes	10	33.3%
	No	20	66.7%
	Total	30	100.0%

**Table 3:** Stratification of Duration of Analgesia with BMI; Group A = (Bupivacaine with Dexmedetomidine), Group B = (Bupivacaine alone)

BMI (n=60)		Treatment Group	N	Mean	Std. Deviation	Std. Error Mean	P Value
≤ 25 kg/m <sup>2</sup>	Duration of Analgesia	Group A	11	362.18	10.245	3.089	0.000
		Group B	11	182.27	7.129	2.149	0.000
> 25 kg/m <sup>2</sup>	Duration of Analgesia	Group A	19	358.32	6.290	1.443	0.000
		Group B	19	182.32	8.233	1.889	0.000

**Table 4:** Age Wise Distribution; Group A = (Bupivacaine with Dexmedetomidine); Group B (Bupivacaine alone)

## DISCUSSION

Before surgery anesthetics have to take care for the maternal as well as fetal health while administrating anesthesia. Spinal anesthesia is given more preference as compared to general anesthesia to prevent side effects. For a long time Bupivacaine was used for this purpose but it had a small duration time. Now, with advancing research, Dexmedetomidine has entered the market a while ago and has gained much importance as an adjuvant to BVP for its increased duration of action during the surgery and reduced removal time from the body post surgery. The affect of bupivacaine alone and along with Dexmedetomidine were mostly observed in patients with a mean age of 26.80+4.278. A similar research carried out by Bansal P and Sood D in 2018 also conducted this type of study with the presented mean age [18]. As weight and BMI of the females paves way for the safe removal of the drug out of the body after administration without causing any harm, a normal BMI and healthy body weight of the female patient significantly decreases the dexmedetomidine within the body. Mean and SDs for BMI of the sample females for the present study was 25.66+1.52. Results aligning with the present study were found out by a research performed by Liu L et al in 2019 [19]. In another study done by Kamat SD et al., mean duration of analgesia with BVP alone was seen as 187.32±16.45 as compared to 357.46±30.64 minutes with BVP with DXM which was in agreement to the findings of this study, where in Group A, mean and SDs for duration of analgesia was 359.73+8.021. In Group B, mean and SDs for duration of analgesia was 182.30+7.720 [20].

## CONCLUSION

In this study, intrathecal hyperbaric 0.5% bupivacaine

alone did not increase the duration of the analgesic whereas bupivacaine with addition of dexmedetomidine in post-operative care unit following elective cesarean section significantly increased the duration of the analgesia.

## REFERENCES

- [1] Pogatzki-Zahn E, Segelcke D, Zahn P. Mechanisms of acute and chronic pain after surgery: update from findings in experimental animal models. *Curr Opin Anaesthesiol*. 2018;31(5):575-585. doi: 10.1097/ACO.0000000000000646.
- [2] Reynolds F. General anesthesia is unacceptable for elective cesarean section. *Int J Obstet Anesth*. 2010;19(2):212-7. doi: [10.1016/j.ijoa.2009.10.003](https://doi.org/10.1016/j.ijoa.2009.10.003)
- [3] Heesen M, Stewart A, Fernando R. Vasopressors for the treatment of maternal hypotension following spinal anesthesia for elective caesarean section: past, present and future. *Anaesthesia*. 2015;70(3):252-257. doi: [10.1111/anae.13007](https://doi.org/10.1111/anae.13007)
- [4] Onish E, Murakami M, Hashimoto K, Kaneko M. Optimal intrathecal hyperbaric bupivacaine dose with opioids for cesarean delivery: a prospective double blinded randomized trial. *Int J Obstet Anesth*. 2017;31:68-73. doi: [10.1016/j.ijoa.2017.04.001](https://doi.org/10.1016/j.ijoa.2017.04.001)
- [5] Sia HAT, Tan KH, Sng BL, Lim Y, Chan E.S.Y, Siddiqui FJ. Hyperbaric versus plain bupivacaine for spinal anesthesia for cesarean delivery. *Anesth Analg*. 2015;120(1):132-40. doi: [10.1213/ANE.0000000000000443](https://doi.org/10.1213/ANE.0000000000000443)
- [6] Furqan A, Mohsin M, Sattar M, Ali A. Intravenous dexmedetomidine has synergistic effect on subarachnoid block with hyperbaric bupivacaine. *Cureus*. 2019;11(11):e6051. doi: [10.7759/cureus.6051](https://doi.org/10.7759/cureus.6051)
- [7] Kavya UR, Laxmi S, Ramkumar V. Effect of intravenous dexmedetomidine administered as bolus or as bolus-plus-infusion on subarachnoid anesthesia with hyperbaric bupivacaine. *J Anaesthesiol Clin Pharmacol*. 2018;34:46-50. doi: [10.4103/joacp.JOACP\\_132\\_16](https://doi.org/10.4103/joacp.JOACP_132_16)
- [8] Al-Mustafa MM, Badran IZ, Abu-Ali HM, et al. Intravenous dexmedetomidine prolongs bupivacaine spinal analgesia. *Middle East J Anaesthesiol* 2009; 20: 225-231.
- [9] Kamat SD, Puram NN, Dhupal PR, Agrawal PI, Ramanand JB, Bhosale RR. Comparative study of hyperbaric 0.5% bupivacaine and hyperbaric 0.5% bupivacaine with low dose dexmedetomidine in spinal anaesthesia. *Int J Basic Clin Pharmacol* 2017;6:410-3. doi: [10.4103/aer.AER\\_163\\_17](https://doi.org/10.4103/aer.AER_163_17)
- [10] Kan RK, Lew E, Yeo SW, Thomas E. General Anaesthesia for cesarean section in a Singapore

- maternity hospital: a retrospective survey. *Int J Obstet Anesth.* 2004;13:221-6. doi: [10.1016/j.ijoa.2004.04.007](https://doi.org/10.1016/j.ijoa.2004.04.007)
- [11] Sia ATH, Fun WL, Tan TU. The ongoing challenges of regional and general anesthesia. *Best prac Res Clin Obstetrics Gyn.* 2009;24:303-12. doi:10.1016/j.bpobgyn.2009.12.001
- [12] Maronge L, Bogod D. Complications in obstetric anesthesia. *Anaesthesia.* 2018;73:61-66. doi: 10.1111/anae.14141.
- [13] Bucklin BA, Hawkins JL, Anderson JR, Ullrich FA. Obstetric Anesthesia Workforce Survey. Twenty year update. *Anesthesiology.* 2005;103:645-53.
- [14] Metodiev Y, Mushambi M. Supraglottic airway devices for Caesarean delivery under general anaesthesia: for all, for none, or for some? *Br J Anaesth.* 2020;125(1):e7-e11. doi: 10.1016/j.bja.2020.02.012.
- [15] Väänänen AJ, Kainu JP, Eriksson H, Lång M, Tekay A, Sarvela J. Does obesity complicate regional anesthesia and result in longer decision to delivery time for emergency cesarean section? *Acta Anaesthesiol Scand.* 2017 Jul;61(6):609-618. doi: 10.1111/aas.12891.
- [16] Cortínez LI, Anderson BJ, Holford NH, Puga V, de la Fuente N, Auad H, Solari S, Allende FA, Ibacache M. Dexmedetomidine pharmacokinetics in the obese. *European journal of clinical pharmacology.* 2015 Dec;71(12):1501-8.
- [17] Sharma M, Chandak A. A Comparative Study Of An Intrathecal 2.5 Mg Dexmedetomidine And The Fentanyl 25Mgas Adjuvants To Bupivacaine 2.5 Mg For Labour Analgesia. *European Journal of Molecular & Clinical Medicine.*;7(11):2020.
- [18] Bansal P, Sood D. Effect of dexmedetomidine as an adjuvant to ropivacaine in ultrasound-guided transversus abdominis plane block for post-operative pain relief in cesarean section. *Journal of Obstetric Anaesthesia and Critical Care.* 2018 Jul 1;8(2):79.
- [19] 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. *Medicine.* 2019 Mar;98(9).
- [20] Kamat SD, Puram NN, Dhumal PR, Agrawal PI, Ramanand JB, Bhosale RR. Comparative study of hyperbaric 0.5% bupivacaine and hyperbaric 0.5% bupivacaine with low dose dexmedetomidine in spinal anaesthesia. *Int J Basic Clin Pharmacol* 2017;6:410-3. doi: [10.4103/aer.AER\\_163\\_17](https://doi.org/10.4103/aer.AER_163_17)