Original Research Article

Comparative Study of Intrathecal Dexmedetomidine and Buprenorphine as Adjuvant to Bupivacaine in Spinal Anaesthesia in a teaching hospital

A.Parimala*

Assistant Professor, Department of Anesthesia ,Maheshwara Medical College, Patancheru, Telangana, India

Received: 13-03-2020 / Revised: 24-04-2021 / Accepted: 30-04-2021

Abstract

Background : Spinal anesthesia is the choice of regional anesthesia technique for lower abdominal surgery and it preserves consciousness, spontaneous breathing at the same time provides for analgesia and muscle relaxation. A number of adjuvants have been used to prolong the postoperative analgesia .**Aim of the study** :To compare intrathecal buprenorphine and dexmedetomidine as an adjuvant to 0.5% hyperbaric bupivacaine for lower abdominal surgeries. **Materials & Methods**:Hospital based prospective observational study was done on 50 cases for Period of one year.ie from January 2020 to January 2021in the department of Anaesthesia, study was conducted in 50 patients undergoing lower abdominal surgeries under subarachnoid block.**Results** :The time of onset of sensory block was slower in Group BB (3.8 ±0.912) when compared with Group BD (2.36 ± 1.114) and the p value was statistically significant (P value= <0.0001).The average time taken for the onset of motor block was 3.12 minutes inGroup BB and 3.64 minutes in Group BD. It was statistically not significant (p-value 0.0964).**Conclusion**:.The present study concludes that the time of onset of sensory block and motor block was statistically significant between the groups .The mean duration of sensory block and motor block was shorter in Group BB when compared with Group BD.

Key words : Buprenorphine , Dexmedetomidine , Hhyperbaric bupivacaine.

Introduction

Spinal anesthesia is the most commonly used technique for lower abdominal and perineal surgeries. Local anesthetics-when used alone-is associated with relatively short duration of action, thus early analgesic intervention is needed in the postoperative period. Spinal anesthesia is the choice of regional anesthesia technique for surgeries on the lower limbs, as it preserves consciousness, spontaneous breathing at the same time provides for analgesia and muscle relaxation [1,2].These advantages can be minimized when local anesthetic alone is used for spinal anesthesia, as it provides for shorter duration of action.A number of adjuvants have been used to prolong the postoperative analgesia [3-5]. Opioids play a big role in the multimodal approach to postoperative pain control. Although opioids have many advantages, they are associated with numerous side effects including nausea, vomiting, central nervous system and respiratory depression, prolonged ileus, itching, and development of hyperalgesia [6,7]. Local infiltration and regional blocks have been increasingly utilized in the postoperative setting. Bupivacaine is a widely used local anesthetic that has been shown to reduce postsurgical pain; however, its utility is limited by the relative short duration of analgesia (approximately 9 h). Local anesthetics delivered through a perineural catheter are used to maintain a constant infusion of the drug; however, this technique is limited by the cost of pumps and the risk of infection [8]. Perineural catheters have been linked to complications that include infection, septicemia, intravascular placement, or intravascular catheter migration[9] Dexmedetomidine, a new highly selective ?2-agonist, is under evaluation as a neuraxial adjuvant. It provides stable hemodynamic condition, good quality of intra-operative analgesia and prolonged post-operative analgesia with minimal side effects [10].

**Correspondence*

Dr. A Parimala

Assistant Professor, Department of Anesthesia, Maheshwara Medical College, Patancheru,Telangana, India.

E-mail: draparimala111@gmail.com

Buprenorphine is a mixed agonist - antagonist narcotic with high [11] affinity at both mu (?) and kappa opiate receptors. Lanz et al demonstrated that buprenorphine is compatible with CSF and has no adverse effects when administered intrathecally. Intrathecal alpha 2 receptor agonists have antinociceptive action for both somatic and [12] visceral pain . alpha 2 receptor agonists administered intrathecally prolonged the analgesia provided by subtherapeutic doses of local anesthetics like bupivacaine due to synergistic effects with minimal [13,14,15] hemodynamic effects

Aims : To compare intrathecal buprenorphine and dexmedetomidine as an adjuvant to 0.5% hyperbaric bupivacaine for lower abdominal surgeries

Materials and methods

It is a Hospital based prospective observational study in the department of Anesthesia at , Maheshwara Medical college, Patancheru for a period of one year.ie from January 2020 to January 2021. The study was conducted in 50 patients undergoing lower abdominal surgeries under subarachnoid block. The study was approved by the Institutional Ethics Committee.Written informed consent was obtained from the all the cases included in the study.

Inclusion criteria

- Patients who are willing to participate in the study .
- Age 35 years to 65 years .
- Both genders .
- Patients undergoing elective lower abdominal surgeries

Exclusion Criteria

- Patients who are unwilling to participate in the study .
- Age less than 35 years & Patients older than 65 years
- Patients with coagulation disorders
- Patients with coagulation disorders
- Patients with cardiac disease, heart blocks and dysrhythmias

Methodology

Pre-anesthetic check-up was done on all patients and routine investigations were done including CBP,CUE,HIV ,HBsAG and

HCV, Biochemical, and radiological investigations were also done. The patients were randomly divided into two groups.
BD GROUP: 25 Patients received 3ml 0.5% bupivacaine (15mg), Dexmedetomidine (5µg) in 0.5 ml normal saline.
BB GROUP: 25 Patients received 3ml 0.5% bupivacaine(15mg) and 0.5ml Buprenorphine (75µg).
Total volume of the injected solution was 3.5ml in both groups

Anesthetic Procedure

In the operation theatre , equipment for the airway management and emergency drugs were kept ready. Blood pressure monitor, pulse oximeter, and electrocardiogram (ECG) leads were connected to the patient.Baseline systolic and diastolic blood pressure recorded and intravenous line were secured. Patients are preloaded with 10 ml/kg of ringer lactate infusion 10 min before the subarachnoid block. On sitting position, the skin over the back was prepared with antiseptic solution and draped with sterile towel. After skin infiltration lignocaine 2%, 26G Quinke needle was inserted at L3-4 intervertebral space after confirmation of free flow of cerebrospinal fluid, the prepared solution was injected. The patients were made lie after the injection immediately and time was noted.

The follow-up parameters noted are as follows:

- Time of injection of subarachnoid block,
- Time of onset and duration of the block,
- Time of onset and duration of motor block,
- Degree of sedation, (e) time for surgery regression to S1 dermatome and (f)
- Duration of surgical procedure, and
- Systolic and diastolic blood pressure,
- Mean arterial blood pressure,
- Pulse rate
- Respiratory rateand oxygen saturation were recorded at 0, 3, and 5 min and there after every 5 min up to 45 min of the procedure.

Statistical Evaluation

Data will be entered in Microsoft Excel sheet and will be analyzed using SPSS version 20.0 statistical software. Data will be depicted in the form of tables and charts.Unpaired t tests (parametric) Mann-Whitney test were used.If P value <0.05 , it is considered significant .

Results

Table 1: Demographic distribution in study

Age distribution	BB	BD	P value
<30 years	05(20%)	07(28%)	>0.9999
31-40 years	08 (32%)	05(20 %)	
41-50 years	05(20%)	07(28%)	
51-60 years	07(28 %)	06(24%)	
Total	25(100 %)	25(100 %)	
Mean ± SD	41.48 ±10.72	41.48 ±10.78	
Sex distribution			
Males	20(80%)	21(84%)	>0.9999
Females	5(20%)	4(16%)	
Total	25(100%)	25100%)	

The age distribution was in the range of 19-60 in Group BB and 18-60in Group BD. The 'p' value for mean age was not statistically significant (P value = >0.9999).Though male and female ratio is not equal in either group, statisticsbetween the groups for sex distribution was not significant. (P value= >0.9999).

Table 2: Time of onset of sensory and motor block (in minutes)

Time of onset of sensory block (in minutes)	BB	BD	P value
Range	4-5	3-4	
Mean	3.800	2.360	<0.0001
SD	± 0.9129	± 1.114	
Time of onset of motor block (in minutes)			
Range	3-5	3-5	
Mean	3.120	3.640	0.0964
SD	± 1.054	± 1.114	

The time of onset of sensory block was slower in Group BB (3.8 ±0.912) whencompared with Group BD (2.36 ± 1.114) and the p value was statisticallysignificant (P value= <0.0001).The average time taken for the onset of motor block was 3.12 minutes inGroup BB and 3.64 minutes in Group BD. It was statistically not significant (p- value 0.0964).

Table 3: Duration of Sensory and motor block

Duration of Sensory block (in hours)	BB	BD	P value
Range	5-6hrs	8-9hrs	
Mean	5.440	8.520	<0.0001
SD	± 0.5066	± 0.5099	
Duration of Motor block (in hours)			
Range	4-6hrs	7-8hrs	
Mean	4.920	7.440	<0.0001
SD	0.7594	0.5066	
SEM	0.1519	0.1013	

The mean duration of sensory block was shorter in Group BB (5.440 ±0.5066) when compared with Group BD (8.520± 0.5099). It was statisticallysignificant (p value= < 0.0001). The mean duration of sensory block inGroup BD is approximately *56.61 % longer* than Group BB.

The mean duration of motor block was shorter in Group BB (4.920±0.7594) when compared with Group BD (7.440± 0.5).
It was statisticallysignificant (p value = < 0.0001). The mean duration of motor block in Group-BD is about approximately *51.21% longer* than Group BB.

Table-4 :Comparison of Pulse rate, Systolic Blood pressure and Respiratory rate in between two groups

	Pulse rate		P Value	Systolic Blood pressure		P Value	Respiratory rate		P Value
	BB	BD		BB	BD		BB	BD	
After 15 min	83.88 ± 0.526	85.00 ± 0.000	<0.0001[a]	119.2± 0.000	130.0± 0.000	<0.0001[a]	17.00± 0.000	16.00± 0.000	<0.0001[b]
After 90 min	83.88± 0.526	84.00 ± 0.000	0.2597[a]	110.0± 0.000	120.0± 0.000	<0.0001[b]	16.00± 0.000	15.00± 0.000	<0.0001[b]
After 3hrs	83.88± 0.526	83.00 ± 0.000	<0.0001[a]	110.0± 0.000	120.0± 0.000	<0.0001[b]	16.00± 0.000	14.00± 0.000	<0.0001[b]
After 6hrs	83.88± 0.526	83.00 ± 0.000	<0.0001[a]	120.0± 0.000	119.0± 0.000	<0.0001[b]	17.00± 0.000	16.00± 0.000	<0.0001[b]
After 12 hrs.	82.00± 0.00	85.00 ± 0.000	<0.0001[b]	128.8 ± 3.317	118.0± 0.000	<0.0001[a]	16.00± 0.000	15.00± 0.000	<0.0001[b]
After 24hrs	82.84± 0.374	84.00 ± 0.000	<0.0001[a]	110.0± 0.000	119.0 ± 0.000	<0.0001[b]	16.00± 0.000	14.00± 0.000	<0.0001[b]

a = unpaired t tests (parametric) b = Mann-Whitney test
(All the values in one of the columns are identical. If this is just a matter of chance, then the Mann-Whitney results are useful.)

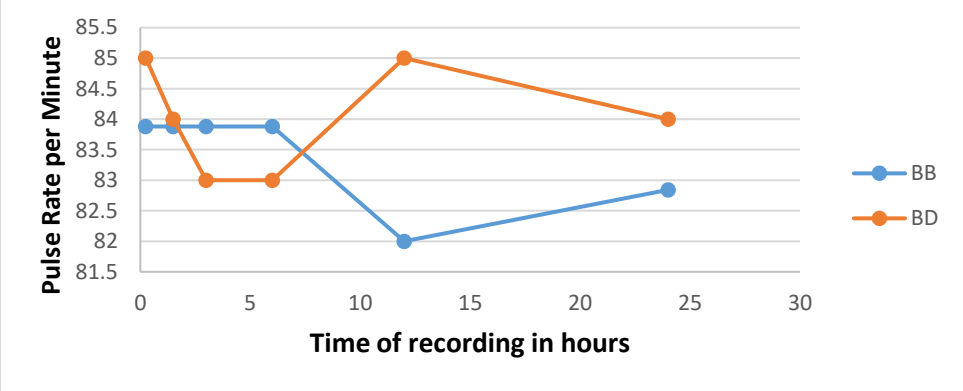

Fig 1:Comparision of Pulse rate

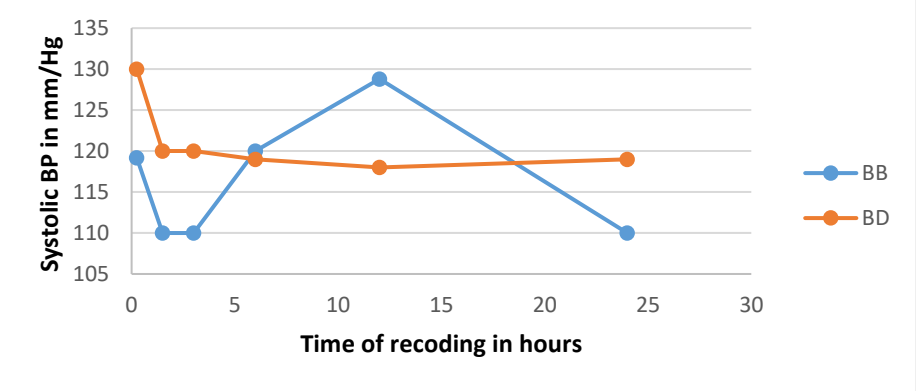

Fig 2: Comparison of systolic BP

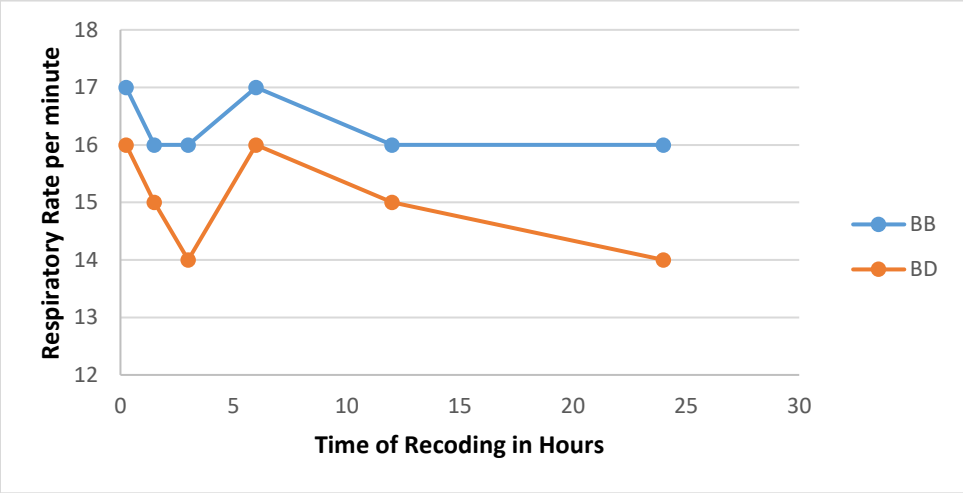

Fig 3: Comparison of Respiratory rates

Entire procedure was completed within 180 minutes. There was statistically no significantdifference in pulse rate, systolic blood pressure and respiratory rate preoperatively. During surgery and postoperative period in between two groups there was statistically significant difference of mean between Pulse rate, systolic BP and Respiratory rate respectively(P = <0.0001) except for pulse rate at 90 minutes after anesthesia (P = 0.2597) (Table No . 5).

Discussion

In the present study the age distribution was in the range of 19-60 in Group BB and 18-60in Group BD. The 'p' value for mean age was not statistically significant (P value = >0.9999). Mahima Gupta et al (16) 42.60±9.81 in group B and 46.60±12.26 in group D and The 'p' value for mean age was not statistically significant p value 0.22. In the present study though male and female ratio is not equal in either group, statistics between the groups for sex distribution was not significant. (P value= >0.9999). Mahima Gupta et al (16) male and female ratio is not equal in both the groups, statistics (10:20 and 11:19) between the groups for sex distribution was not significant (p value =0.79)In the present study the time of onset of sensory block was slower in Group BB (3.8 ±0.912) when compared with Group BD (2.36 ± 1.114) and the p value was statistically significant (P value= <0.0001). In a study done by Kannan Bojaraaj et al (17) the time of onset of sensory block was slower in group BB (3.47 ± 0.507) when compared with Group BD (2.57 ± 0.504), and the p value was statistically not significant (0.629 > 0.05) In the present study the average time taken for the onset of motor block was 3.12 minutes in Group BB and 3.64 minutes in Group BD. It was statistically not significant (p value 0.0964). whereas in Kannan Bojaraaj et al (17) study the average time taken for the onset of motor block was 3.38 min in Group BB and 4.13 min in Group BD. It was statistically not significant (*P* = 0.775 > 0.05) .

Table 5: showing comparative studies

Variables	**Mahima Gupta et al** [16]			**Present study**		
				BB	**BD**	**P value**
Onset of sensory block (minutes)*	3.26±0.9	3.52±0.9	0.76	3.800	2.360	<0.0001
Onset of motor block (minutes	3.30±0.97	3.90±0.89	0.97	3.120	3.640	0.0964

In the present study the mean duration of sensory block was shorter in Group BB (5.440 ±0.5066) when compared with Group BD (8.520± 0.5099). It was statistically significant (p value= < 0.0001. It was statisticallysignificant (p value= < 0.0001). The mean duration of sensory block inGroup BD is approximately 56.61 % longer than Group BB.In Kannan Bojaraaj et al (17) study the mean duration of sensory block was shorter in Group BB (332 ± 18.81 min) when compared with Group BD (502.13 ± 12.27 min) and statistically significant (*P* < 0.05). The mean duration of sensory block in Group BD is 51% longer than Group BB).In a study conducted by Ahuja et al (18) duration of sensory block and motor block was longer in group D than group B (p<0.001) and the difference was highly significant. Duration of analgesia was significantly longer in group D than group B (p<0.05). In Ashok kumar et al The onset of sensory block was significantly quicker in Group D compared to Group B (109. 83±12.42seconds in Group D compared to 139. 67± 12.79 seconds in Group B, Table 2). There was also a significant difference between the groups with respect to two segment regression, with Group D requiring a longer time compared to Group B. In the present study The mean duration of motor block was shorter in Group BB (4.920±0.7594) when compared with Group BD (7.440± 0.5). It was statistically significant (p value = < 0.0001).. The mean duration of motor block in GroupBDis about approximately ***51.21% longer*** than Group BB. In a study done by Kannan Bojaraaj et al study (17) the mean duration of motor block was shorter in Group BB (298.63 ± 35.79 min) when compared with Group BD (432.33 ± 12.74 min) and statistically significant (*P* < 0.05). The mean duration of motor block in Group BD is about approximately 44% longer than Group BB . In Ashok kumar et al [19] study the durations of motor block and analgesia were also significantly longer in Group D. The degree of sedation was significantly higher in Group D compared to Group B.There were no statistically significant differences between the groups in the maximum level of sensory block achieved (median level of block was T6) or onset time of motor block .The incidence of adverse effects like hypotension, bradycardia, nausea and vomiting were also similar in both the groups. In a study conducted by Akhila S et al (20) regarding sensory and motor characteristics . There was no difference between the two groups in the highest level of block achieved or the time to reach the highest sensory level. The two-segment regression was significantly slower with dexmedetomidine (134±34.76min) compared to buprenorphine (106.26 ±43min). There was no difference in the onset to Bromage 3

motor block, but the regression of motor block to Bromage 0 was significantly slower with the addition of dexmedetomidine .The time to first analgesic request and postoperative tramadol consumption were similar between the two groups.Present study All procedure completed within 180 min. There was statistically no significant (P>0.05) difference in pulse rate, systolic blood pressure and respiratory rate preoperatively, during surgery and postoperative period in between two groups.(Table No 1). Mean Sp02 % in between the groups ranged between 96%-99% with no significant (P>0.05) difference in between the groups. In Kannan Bojaraaj et al study[17]. It was noted that 2 cases of bradycardia and nil cases of hypotension in dexmedetomidine group where on 6 cases of bradycardia and 8 cases of hypotension in buprenorphine group and they were managed successfully with the use of atropine 0.6 mg intravenously and ephedrine in incremental doses of 6 mg. In Gupta et al[21]study, the incidence of bradycardia was more in dexmedetomidine group.

Dexmedetomidine causes bradycardia but the effect is more prominent when administered intravenously with higher doses.17 The sedation score (Ramsay sedation scale) was higher in patients belonging to dexmedetomidine group as compared to buprenorphine group and it is statistically significant.In Akhila S et al [20] Hemodynamic parameters (heart rate & Mean arterial pressure) and sedation scores were comparable in both groups throughout the intraoperative and postoperative period .The pain scores as assessed by VAS during the postoperative period was comparable between the two groups. The adverse effects noted were also similar in the two groups. Six patients in group D and 4 patients in group B required ephedrine for treatment of hypotension. Two patients in group D and one patient in group B had bradycardia requiring Atropine. In Ahuja et al[18] study , Both groups were comparable with respect to heart rate and mean arterial blood pressure values over different time intervals No significant difference was found between the two groups regarding fall in Mean Blood Pressure at different time intervals.

Conclusion

The present study concludes thatthe time of onset of sensory block and motor block was statistically significant between the groups. (p value= < 0.0001).The mean duration of sensory block and motor block was shorter in Group BB when compared with Group BD .It was statistically significant (p value= < 0.0001).There was statistically no significant (P>0.05) difference in pulse rate, systolic blood pressure and respiratory rate preoperatively, during surgery and postoperative period in between two groups.

References

1. Mahendru V, Tewari A, Katyal S, Grewal A, Singh MR, Katyal R. A comparison of intrath-ecal dexmedetomidine, clonidine, and fentanyl as adjuvants to hyperbaric bupivacaine for lower limb surgery: A double blind controlled study. J Anaesthesiol ClinPharmacol. 2013;29(4):496-502.
2. Gupta M, Shailaja S, Hegde KS. Comparison of intrathecal dexmedetomidine with bu-prenorphine as adjuvant to bupivacaine in spinal anaesthesia. J Clin Diagn Res. 2014;8(2):114-7.
3. Abdelhamid SA, El-lakany MH.Intrathecal dexmedetomidine: Useful or not? J AnesthClin Res. 2013;4:351.
4. Elia N, Culebras X, Mazza C, Schiffer E, Tramèr MR (2008) Clonidine as an adjuvant to intrathecal local anesthetics for surgery: systematic review of randomized trials. Reg Anesth Pain Med 33: 159-167.
5. Boussofara M, Carlès M, Raucoules-Aimé M, Sellam MR, Horn JL (2006) Effects of intrathecal midazolam on postoperative analgesia when added to a bupivacaine-clonidine mixture. Reg Anesth Pain Med 31: 501-505.
6. Loeser JD. Economic implications of pain management. Acta Anaesthesiol Sc and 1999;43(9):957–9.
7. Aguirre J, Del Moral A, Cobo I, et al. The role of continuous peripheral nerve blocks. Anesthesiol Res Pract 2012;2012: 560879.
8. Barletta JF. Clinical and economic burden of opioid use for postsurgical pain: focus on ventilatory impairment and ileus. Pharmacotherapy 2012;32(Suppl. 9):12S–8S.
9. Liu SS, Buvanendran A, Rathmell JP, et al. Predictors for moderate to severe acute postoperative pain after total hip and knee replacement. IntOrthop 2012;36(11):2261–7.
10. Al-Ghanem SM, Massad IM, Al-Mustafa MM, Al-Zaben KR, Qudaisat IY, et al. (2009) Effect of Adding Dexmedetomidine versus Fentanyl to Intrathecal Bupivacaine on Spinal Block Characteristics in Gynecological Procedures: A Double Blind Controlled Study. Am J Appl Sci 6: 882-887.
11. Lanz E, Suke G,Leiss D, and Glocke MH. Epidural buprenorphine- a double blindstudy of postoperative analgesia and side effects.AnesthAnalg 1984; 63: 593-598.
12. Kalso EA, Poyhia R, Rosenberg PH. Spinal antinociception by dexmedetomidine, ahighly selective a2-adrenergic agonist. PharmacolToxicol 1991;68:140-3.
13. Reves JG, Glass PS, Lubarsky DA, McEvoy MD, Martinez-Ruiz R. Intravenousanesthetics. In: Miller RD,editor. Miller's Anesthesia. 7th ed. Philadelphia: Elsevier,Churchill Livingstone; 2010. p. 751-7.
14. Dahlgren G, Hultstrand C, Jakobsson J, Norman M, Eriksson EW, Martin H. Intrathecal sufentanil, fentanyl, or placebo added to bupivacaine for cesarean section. AnesthAnalg 1997;85:1288-93.
15. Bajwa SJ, Arora V, Kaur J, Singh A, Parmar SS. Comparative evaluation ofdexmedetomidine and fentanyl for epidural analgesia in lower limb orthopedicsurgeries. Saudi J Anaesth 2011;5:365-70.
16. Mahima Gupta, S. Shailaja, K. Sudhir Hegde.Comparison of Intrathecal Dexmedetomidine with Buprenorphine as Adjuvant to Bupivacaine in Spinal Asnaesthesia Journal of Clinical and Diagnostic Research. 2014;8(2):114-117s.
17. Kannan Bojaraaj, S Vijayaragavan1, S Senthilkumar, M A Mohammed Thaiyub Khan Comparative Study of Intrathecal Dexmedetomidine and Buprenorphine as Adjuvant to Bupivacaine in Spinal Anaesthesia: A Randomized Controlled Trail. International Journal of Scientific Study. 2016 ;4(1):98.
18. Ahuja Neelmani, Sharma S.P., ThakoreNirdesh, Arora Sakshi: Comparison of intrathecal dexmedetomidine and buprenor-phineas adjuvant to 0.5 % hyperbaric bupivacaine in spinal anaesthesiafor orthopaedic surgery: Indian journal of applied research: 2017;7(1):9.
19. Ashok Kumar Balasubramanian, Navaneetha Krishnan Srinivasan, Girimurugan Nagarajan, Pradeep Karunagaran: Comparative effects of Dexmedetomidine and Buprenorphine as adjuvants to Bupivacaine in Spinal Anaesthesia European Journal of Molecular & Clinical Medicine, 2020; 7(08):1.
20. Akhila S, Manjunath A.C, Nagaraj M.C: A Comparative Study of Intrathecal Dexmedetomidine andBuprenorphine as Adjuvants to Hyperbaric Bupivacaine forInfraumbilical Surgeries: Indian Journal of Anaesthesia and Analgesia, 2017; 4(2):1.
21. 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.

Conflict of Interest: Nil ; **Source of support:Nil**