ORIGINAL RESEARCH PAPER
Volume - 15 | Issue - 07 | July - 2026 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

TO COMPARE EFFICACY OF DEXAMETHASONE VERSUS MGSO4 AS ADJUVANT TO 0.125% BUPIVACAINE IN LOWER LIMB BLOCK FOR POST OPERATIVE PAIN MANAGEMENT IN LOWER LIMB SURGERIES

Anaesthesiology

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ABSTRACT

Introduction: Persistent postoperative pain after lower limb surgeries is associated with increased opioid consumption and delayed recovery. Ultrasound-guided combined popliteal sciatic and adductor canal blocks provide effective postoperative analgesia. Although several adjuvants have been used with local anesthetics, evidence regarding higher-dose magnesium sulfate remains limited. This study compared magnesium sulfate ($MgSO_4$) and dexamethasone as adjuvants to bupivacaine in below-knee surgeries. **Objective:** To compare the analgesic efficacy of dexamethasone and magnesium sulfate added to 0.125% bupivacaine in ultrasound-guided popliteal sciatic and adductor canal blocks, using duration of postoperative analgesia as the primary outcome.**Materials and Methods:** In this randomized, double-blind, controlled study, 105 ASA I–II patients undergoing elective unilateral lower limb surgery were allocated into three groups. Group BB received bupivacaine with normal saline, Group BD received bupivacaine with dexamethasone, and Group BM received bupivacaine with magnesium sulfate. Visual Analog Scale (VAS) scores, duration of analgesia, rescue analgesic requirements, and hemodynamic parameters were assessed over 24 hours.**Results:** Group BM demonstrated significantly lower early postoperative VAS scores, the longest duration of analgesia (666.83 ± 60.08 min), and the lowest rescue analgesic requirement (1.54 ± 0.51 doses) ($p < 0.001$). Group BD showed an intermediate analgesic duration (481.97 ± 41.05 min), significantly longer than Group BB (349.89 ± 38.33 min) ($p < 0.001$). Hemodynamic parameters remained stable and comparable across groups.**Conclusion:** Magnesium sulfate (500 mg) added to bupivacaine provided superior and prolonged postoperative analgesia compared with dexamethasone and bupivacaine alone in ultrasound-guided lower limb peripheral nerve blocks.

KEYWORDS

Bupivacaine, Magnesium Sulphate, Dexamethasone, Peripheral Nerve Block, Postoperative Analgesia.

INTRODUCTION

Acute postoperative pain remains common after surgery and may result in delayed recovery, reduced physical function, poor quality of life, prolonged opioid use, increased healthcare cost, and progression to chronic postsurgical pain if inadequately treated [1–4]. Although opioids are widely used for severe postoperative pain, their adverse effects may limit adequate dosing and compromise analgesia [1]. Spinal anaesthesia is a dependable regional technique for lower limb orthopaedic procedures, providing effective anaesthesia, postoperative pain relief, minimal cognitive impairment, fewer cardiopulmonary complications, and reduced postoperative nausea and vomiting [5,6].

Peripheral nerve blocks are now an important component of multimodal analgesia, as they provide targeted pain relief, reduce opioid requirement, and improve rehabilitation. Ultrasound-guided popliteal sciatic and adductor canal blocks offer improved accuracy, fewer complications, and better postoperative analgesia; however, the duration of analgesia with local anaesthetic alone is limited [7,8]. Therefore, adjuvants are commonly added to prolong analgesia and improve block quality. Agents such as opioids, clonidine, epinephrine, and phenylephrine have been used, but each has specific limitations and adverse effects [9,10].

Dexamethasone prolongs analgesia by reducing inflammation, inhibiting nociceptive C-fibres, and suppressing ectopic neuronal discharge [11]. Magnesium sulphate, through NMDA receptor antagonism and calcium channel modulation, reduces central sensitisation, pain perception, and opioid consumption [12]. Evidence supports dexamethasone mainly in upper limb blocks, while data for lower limb blocks remain limited [13]. Hence, this study compared dexamethasone 8 mg and magnesium sulphate 500 mg as adjuvants to 0.125% bupivacaine in ultrasound-guided popliteal sciatic and adductor canal blocks for lower limb orthopaedic surgeries.

MATERIAL AND METHODS

Study Design and Setting

This randomized comparative double-blind controlled study was conducted in the Department of Anaesthesiology at a tertiary care centre in northern India over 18 months.

Sample Size

In a study carried out by Dr. Neelam et al., the number of patients requiring the first dose of analgesia was 19 (63.3%) in the first group and 9 (30%) in the second group [14].

$$n = \frac{(Z_{1-\alpha/2} + Z_{1-\beta})^2 [p_1(1-p_1) + p_2(1-p_2)]}{(p_1 - p_2)^2}$$

$$n = \frac{(1.96 + 1.24)^2 [0.633(1-0.633) + 0.3(1-0.3)]}{(0.633 - 0.30)^2} = 31.2$$

n = 31.2 ~ 35
Total sample size is 105
Z1-α/2 =Critical The standard normal variance's value for the corresponding

(α) degree of importance (at α=5%, Zσ = 1.96 & at α=1%, Zσ = 2.58)
Z1-β=Desired Power (Critical Value of normal distribution at β (Zβ= 0.84 for 80% power and Zβ= 1.28 for 90% power)

p1= 63.3% of group 1
p2= 30% of group 2

Patients were informed about the study objectives, benefits, and possible risks during the pre-anaesthesia visit. They were also instructed to request analgesia whenever required. Written informed consent was obtained from all patients. During the preoperative evaluation, patients were educated regarding the 10-point Visual Analogue Scale (VAS).

Randomization was done using a computer-generated random number table. The allocated group was placed in an opaque, sealed envelope numbered according to the master table, ensuring allocation concealment. After shifting the patient to the operation theatre, an anaesthesiologist not involved in the study opened the sealed envelope

and prepared the drug solution according to randomization. After drug preparation, 20 mL of 0.125% bupivacaine solution, with or without adjuvant, was injected around the popliteal sciatic nerve and 20 mL around the adductor canal as per group allocation (BB, BD, and BM).

Study Population
Three groups of study participants were formed:

Group BB (n = 35): Received 35 mL of 0.125% bupivacaine with 5 mL normal saline, making a total volume of 40 mL.

Group BD (n = 35): Received 35 mL of 0.125% bupivacaine with 8 mg dexamethasone and 3 mL normal saline, making a total volume of 40 mL.

Group BM (n = 35): Received 35 mL of 0.125% bupivacaine with 500 mg magnesium sulphate and 4 mL normal saline, making a total volume of 40 mL.

Inclusion Criteria
1. ASA physical status I and II patients.
2. Patients of either sex.
3. Patients aged 18–65 years.
4. Patients posted for elective unilateral lower limb orthopaedic surgery.
5. Patients who provided written informed consent.

Exclusion Criteria
1. Patient refusal to participate.
2. Contraindication to spinal anaesthesia or nerve block, such as coagulopathy or local infection.
3. Failed spinal anaesthesia.
4. Pregnancy.
5. Underlying peripheral neuropathy.
6. Height less than 150 cm.
7. Hypersensitivity to local anaesthetics.
8. Allergy to study drugs.

Data Collection
After ethical approval and written informed consent, demographic details, history, examination findings, intraoperative vitals, block details, VAS scores, time to first rescue analgesia, haemodynamic variables, and adverse effects were recorded.

Statistical Analysis
Data were entered in Microsoft Excel and analysed using SPSS version 27.0. Continuous variables were expressed as mean ± SD or median, while categorical variables were expressed as frequency and percentage. ANOVA, unpaired t-test, Mann–Whitney U test, and appropriate post hoc tests were applied. A p-value <0.05 was considered statistically significant.

RESULTS

Table 1 shows The baseline demographic parameters were comparable among the three groups. Mean age was 35.1 ± 8.8 years in Group BB, 40.8 ± 8.5 years in Group BD, and 34.7 ± 7.9 years in Group BM, with no statistically significant difference (p=0.15). Gender distribution was also comparable among the groups (p=0.17). ASA grade distribution did not show any significant difference among the groups (p=0.35), indicating that all groups were comparable at baseline.

Table 2 shows VAS score was comparable at 0 hour in all groups. Significant differences were observed at most postoperative intervals, especially from 1–11 hours and 13–18 hours, with overall p<0.001 at most time points. Group BM showed lower VAS scores during early postoperative hours, particularly from 1 to 5 hours, compared to Group BB. Group BD showed variable VAS scores, with higher values at 6 hours (3.09 ± 0.51), 7 hours (3.86 ± 0.85), and 8 hours (3.26 ± 2.15). No significant difference was seen at 12 hours (p=0.398), 19 hours (p=0.500), 20 hours (p=0.081), and 21 hours (p=0.085). Significant differences again appeared at 22 hours (p=0.022), 23 hours (p=0.041), and 24 hours (p=0.032).

Table 3 shows Heart rate showed significant intergroup differences at most time intervals. At baseline, heart rate was 81.97 ± 7.16 beats/min in Group BB, 77.49 ± 5.38 beats/min in Group BD, and 80.34 ± 7.26 beats/min in Group BM (p=0.020). Group BD generally maintained lower heart rate values compared to Group BB at several intervals, including 1 hour (75.97 ± 5.39; p=0.004), 5 hours (75.03 ± 8.26; p<0.001), 10 hours (75.00 ± 9.21; p<0.001), 11 hours (74.06 ± 8.00; p<0.001), and 18 hours (77.63 ± 11.79; p<0.001). No significant difference was noted at 9 hours (p=0.961), 15 hours (p=0.583), 22 hours (p=0.193), and 24 hours (p=0.131).

Table 4 shows that SpO_2 remained clinically stable in all three groups throughout the study period. Significant intergroup differences were observed at baseline (p=0.014), 4 hours (p=0.010), 5 hours (p=0.017), 8 hours (p=0.007), 10 hours (p=0.004), 14 hours (p=0.018), and 18 hours (p<0.001). In Group BD, SpO_2 ranged mostly between 96.46 ± 1.27% and 97.80 ± 1.30%, showing adequate oxygen saturation throughout. Although some differences were statistically significant, all groups maintained clinically acceptable oxygen saturation levels.

Table 5 shows that respiratory rate was comparable among the groups at baseline, with values of 15.94 ± 2.14 breaths/min in Group BB, 15.80 ± 1.55 breaths/min in Group BD, and 16.20 ± 2.32 breaths/min in Group BM (p=0.670). Significant differences were observed at 10 hours (p=0.006), 13 hours (p=0.025), 19 hours (p=0.013), 21 hours (p=0.012), 22 hours (p<0.001), and 23 hours (p=0.001). Group BD respiratory rate remained relatively stable across the study duration, ranging from 14.71 ± 1.66 to 16.86 ± 1.00 breaths/min. Overall, respiratory rate remained clinically stable in all groups, despite statistically significant differences at selected time points.

Fig 1 The mean duration of analgesia was highest in Group BM (666.83 ± 60.08 minutes), followed by Group BD (481.97 ± 41.07 minutes), and lowest in Group BB (349.89 ± 38.3 minutes). This indicates that Group BM provided the longest postoperative pain relief among the three groups. The gradual increase in duration of analgesia from Group BB to Group BD and further to Group BM suggests improved analgesic efficacy with the interventions used in Groups BD and BM compared to Group BB.

Fig 2 The requirement of rescue analgesia was lowest in Group BM compared to Group BD and Group BB. In Group BM, most patients required only 1 or 2 rescue analgesic doses, and none required 3 or 4 doses within 24 hours. In contrast, Group BB had the highest analgesic requirement, with 17 patients requiring 3 doses and 8 patients requiring 4 doses. Group BD showed intermediate results, with most patients requiring 2 or 3 rescue analgesic doses. These findings indicate that Group BM achieved better postoperative analgesia and reduced the need for additional rescue analgesics compared to the other groups.

DISCUSSION

Demographic variables were comparable across all three groups. Group BM showed the longest duration of analgesia (666.83 ± 60.08 min), followed by Group BD (481.97 ± 41.05 min) and Group BB (349.89 ± 38.33 min), with a highly significant difference (p<0.001). Magnesium also showed better VAS scores and lower rescue analgesic need. The 185-minute additional analgesia with magnesium over dexamethasone exceeded the 2-hour MCID, indicating clinical significance [15,16]. Similar findings were reported by Jebali et al., where magnesium prolonged sensory block and time to first analgesic request and reduced morphine consumption [17].

Magnesium sulphate significantly prolonged postoperative analgesia compared with dexamethasone and bupivacaine alone. This contrasted with Deshpande et al. and Khatoon et al., where dexamethasone showed longer analgesia, possibly due to lower magnesium doses used [12,18]. However, findings were supported by Neelam et al. [14], Jebali et al. [19], Shruthi et al. [8], and Daabiss et al. [20], who reported prolonged analgesia and reduced analgesic requirement with magnesium. The effect may be due to the 500 mg dose, NMDA receptor antagonism, calcium channel blockade, and reduced central sensitization [12]. Although dexamethasone also prolongs block duration, magnesium required fewer rescue analgesic doses in the present study.

VAS scores over 24 hours were significantly lower in the magnesium group, indicating better pain control, consistent with Sain et al. [21]. This may be due to the 500 mg dose and suppression of central sensitization [22]. Groups BD and BM also showed better hemodynamic stability than Group BB, with stable heart rate, SBP, and DBP, supporting findings by Ara et al. [23], Yehia et al. [24], Shruthi et

al. [8], and Daabiss et al. [20].

Respiratory rate and SpO_2 remained normal in all groups, with no significant respiratory depression, supporting the safety of magnesium and dexamethasone [19,20,25]. The study showed that 500 mg magnesium sulphate provided superior postoperative analgesia with low-concentration bupivacaine in combined popliteal sciatic and adductor canal blocks. Magnesium may be a cost-effective and easily available adjuvant, especially in resource-limited settings. Ultrasound guidance further improved block accuracy and safety, consistent with Tripathi et al. [26] and Ara et al. [23].

Strengths of the study:

1. The three groups were comparable at baseline, reducing selection bias.
2. Pain scores, duration of analgesia, rescue analgesic requirement, and cardiorespiratory parameters were assessed over 24 hours.
3. The study provides clinically useful comparative data on postoperative analgesic efficacy.

Limitations of the study:

1. The sample size was relatively small and from a single centre.
2. Follow-up was limited to only 24 hours, so long-term outcomes were not assessed.
3. Patient satisfaction, cost-effectiveness, and delayed adverse effects were not evaluated.

Conclusion and Future Recommendations:

The present study showed that all three groups were comparable at baseline, and postoperative haemodynamic and respiratory parameters remained clinically stable throughout 24 hours. Among the groups, Group BM demonstrated superior postoperative analgesic efficacy, with lower early VAS scores, the longest mean duration of analgesia (666.83 minutes), and the lowest requirement for rescue analgesia compared with Group BB and Group BD. Group BD showed intermediate analgesic benefit, while Group BB had the shortest analgesic duration and highest rescue analgesic requirement. Although statistically significant differences were observed in heart rate, SpO_2, and respiratory rate at some time intervals, these changes were not clinically alarming. Thus, Group BM appears to provide better and longer postoperative pain relief with stable cardiorespiratory parameters. Future studies with larger sample size, multicentric design, longer follow-up, assessment of patient satisfaction, adverse effects, functional recovery, and cost-effectiveness are recommended to confirm these findings and establish the most effective and safe analgesic regimen.

TABLES AND FIGURES

Table 1: Baseline Demographic and ASA Grade Distribution among Study Groups

Parameter	Group BB	Group BD	Group BM	P Value	Group BB vs BD	Group BB vs BM	
Age (years), Mean ± SD	35.1 ± 8.8	40.8 ± 8.5	34.7 ± 7.9	0.15	—	—	
Gender (M/F)	10 / 25	17 / 18	19 / 16	0.17	—	—	
ASA Grade	ASA I, n (%)	13 (37.1%)	15 (42.9%)		0.35	0.62	0.27
	ASA II, n (%)	22 (62.9%)	20 (57.1%)	26 (74.3%)	0.35	0.62	0.27

TABLE 2: Mean VAS Score at Different Time Intervals

SL No	Time Interval	Group BB (Mean±SD)	Group BD (Mean±SD)	Group BM (Mean±SD)	P value	Group BB vs BD (p-value	Group BB vs BM (p-value)
1	0 hour	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	NA	NA	NA
2	1 hour	0.37 ± 0.49	0.20 ± 0.41	0.00 ± 0.00	<0.001*	0.114	<0.001*
3	2 hours	1.17 ± 0.75	0.83 ± 0.62	0.31 ± 0.53	<0.001*	0.042*	<0.001*
4	3 hours	2.20 ± 0.68	1.49 ± 0.51	0.71 ± 0.83	<0.001*	<0.001*	<0.001*
5	4 hours	2.89 ± 0.53	1.97 ± 0.45	1.09 ± 0.74	<0.001*	<0.001*	<0.001*
6	5 hours	3.20 ± 0.90	2.66 ± 0.48	1.31 ± 0.68	<0.001*	0.003*	<0.001*
7	6 hours	2.37 ± 1.73	3.09 ± 0.51	2.03 ± 0.75	<0.001*	0.018*	0.211
8	7 hours	1.11 ± 1.37	3.86 ± 0.85	2.23 ± 0.97	<0.001*	<0.001*	0.001*
9	8 hours	1.57 ± 0.70	3.26 ± 2.15	2.60 ± 0.55	<0.001*	<0.001*	<0.001*
10	9 hours	1.63 ± 1.03	1.17 ± 2.12	2.77 ± 0.73	<0.001*	0.284	<0.001*
11	10 hours	2.20 ± 0.99	0.57 ± 0.61	3.43 ± 1.09	<0.001*	<0.001*	<0.001*
12	11 hours	2.54 ± 1.34	1.37 ± 0.91	2.74 ± 2.11	<0.001*	0.002*	0.642
13	12 hours	2.26 ± 1.67	1.69 ± 0.90	2.06 ± 2.42	0.398	0.096	0.481
14	13 hours	1.66 ± 1.37	2.17 ± 0.95	0.34 ± 1.19	<0.001*	0.072	<0.001*
15	14 hours	1.63 ± 1.26	2.86 ± 1.14	0.29 ± 0.52	<0.001*	<0.001*	<0.001*
16	15 hours	1.91 ± 0.78	2.80 ± 1.81	0.83 ± 0.57	<0.001*	0.009*	<0.001*
17	16 hours	2.40 ± 0.77	2.49 ± 2.17	1.20 ± 0.53	<0.001*	0.812	<0.001*
18	17 hours	2.74 ± 1.01	1.06 ± 1.35	1.66 ± 0.54	<0.001*	<0.001*	0.003*
19	18 hours	2.71 ± 1.27	1.54 ± 1.29	1.94 ± 0.59	<0.001*	0.004*	0.021*
20	19 hours	1.94 ± 1.51	2.11 ± 1.37	2.29 ± 0.67	0.500	0.621	0.184
21	20 hours	2.29 ± 1.36	2.03 ± 1.22	2.66 ± 0.87	0.081	0.421	0.268
22	21 hours	1.86 ± 1.44	2.51 ± 1.38	2.40 ± 1.03	0.085	0.157	0.141
23	22 hours	2.03 ± 1.29	2.86 ± 1.63	2.80 ± 1.16	0.022*	0.028*	0.039*
24	23 hours	1.63 ± 1.19	2.20 ± 1.68	2.51 ± 1.46	0.041*	0.118	0.012*
25	24 hours	1.60 ± 0.85	1.74 ± 1.50	2.43 ± 1.69	0.032*	0.639	0.006*

TABLE 3: Changes in Heart Rate (beats/min)

S L No	Time Interval	Group BB (Mean±SD)	Group BD (Mean±SD)	Group BM (Mean±SD)	P value	Group BB vs BD (p-value	Group BB vs BM (p-value)
1	0 hour (Baseline)	81.97 ± 7.16	77.49 ± 5.38	80.34 ± 7.26	0.020*	0.004*	0.312
2	1 hour	80.83 ± 6.52	75.97 ± 5.39	77.26 ± 6.64	0.004*	<0.001*	0.028
3	2 hours	81.89 ± 7.42	77.31 ± 6.59	82.43 ± 11.38	0.030*	0.007*	0.784
4	3 hours	83.23 ± 8.42	78.00 ± 7.94	82.34 ± 9.33	0.028*	0.009*	0.611
5	4 hours	87.46 ± 8.21	82.00 ± 9.22	78.23 ± 9.33	<0.001*	<0.001*	<0.001*
6	5 hours	91.71 ± 9.85	75.03 ± 8.26	82.63 ± 10.62	<0.001*	<0.001*	<0.001*
7	6 hours	91.40 ± 13.14	78.46 ± 11.40	82.09 ± 9.55	<0.001*	<0.001*	0.002*
8	7 hours	90.23 ± 10.11	83.37 ± 11.85	80.31 ± 11.16	0.001*	0.006*	0.001*
9	8 hours	87.06 ± 8.14	85.66 ± 13.28	79.20 ± 12.18	0.011*	0.592	0.004*
10	9 hours	84.17 ± 10.05	84.17 ± 14.65	83.49 ± 9.37	0.961	1.000	0.731
11	10 hours	84.86 ± 9.90	75.00 ± 9.21	82.43 ± 11.95	<0.001*	<0.001*	0.351
12	11 hours	88.94 ± 9.64	74.06 ± 8.00	84.89 ± 10.30	<0.001*	<0.001*	0.089
13	12 hours	90.31 ± 10.60	76.40 ± 10.59	82.94 ± 12.35	<0.001*	<0.001*	0.004*
14	13 hours	86.46 ± 9.47	78.66 ± 10.43	80.37 ± 13.34	0.011*	0.002*	0.018
15	14 hours	89.60 ± 7.79	82.09 ± 11.32	77.57 ± 10.91	<0.001*	0.003	<0.001*
16	15 hours	85.14 ± 8.76	83.91 ± 12.82	82.29 ± 12.42	0.583	0.643	0.316
17	16 hours	87.43 ± 8.25	84.31 ± 13.64	78.97 ± 12.07	0.010*	0.211	0.002*
18	17 hours	87.14 ± 11.25	78.54 ± 11.19	79.06 ± 11.16	0.002*	0.004*	0.003*
19	18 hours	91.46 ± 9.97	77.63 ± 11.79	77.97 ± 8.99	<0.001*	<0.001*	<0.001*

20	19 hours	88.09 ± 11.87	79.94 ± 13.12	80.80 ± 9.77	0.015*	0.007*	0.021*
21	20 hours	87.91 ± 10.69	78.77 ± 12.20	82.34 ± 12.94	0.009*	0.002*	0.044*
22	21 hours	89.94 ± 10.11	80.40 ± 11.57	80.57 ± 10.26	0.001*	<0.001 *	0.001*
23	22 hours	85.89 ± 7.93	81.09 ± 12.12	83.66 ± 11.33	0.193	0.083	0.412
24	23 hours	83.20 ± 8.15	74.00 ± 13.28	81.46 ± 11.89	0.003*	0.001*	0.541
25	24 hours	84.69 ± 8.12	80.17 ± 10.76	78.37 ± 13.49	0.131	0.049*	0.027*

TABLE 4: Comparison of SpO_2 (%)

S L No	Time Interval	Group BB (Mean±SD)	Group BD (Mean±SD)	Group BM (Mean±SD)	P value	Group BB vs BD (p-value	Group BB vs BM (p-value)
1	0 hour	98.26 ± 0.74	97.69 ± 1.11	97.74 ± 0.82	0.014	0.012*	0.041*
2	1 hour	—	—	—	—	—	—
3	2 hours	97.46 ± 1.60	96.69 ± 1.32	97.26 ± 1.20	0.089	0.032*	0.481
4	3 hours	97.46 ± 1.40	97.57 ± 1.60	97.00 ± 1.43	0.327	0.749	0.164
5	4 hours	98.09 ± 1.34	97.14 ± 1.63	97.94 ± 0.97	0.010*	0.009*	0.602
6	5 hours	97.71 ± 0.71	97.40 ± 1.48	96.83 ± 1.34	0.017*	0.184	0.006*
7	6 hours	97.49 ± 1.34	97.14 ± 1.56	97.06 ± 1.53	0.572	0.339	0.286
8	7 hours	97.40 ± 1.24	96.80 ± 1.23	96.94 ± 1.21	0.064	0.052	0.121
9	8 hours	97.37 ± 1.09	97.51 ± 1.44	96.49 ± 1.22	0.007*	0.624	0.002*
10	9 hours	97.43 ± 1.38	97.63 ± 1.11	96.97 ± 1.40	0.062	0.462	0.189
11	10 hours	97.43 ± 1.31	96.46 ± 1.27	97.49 ± 1.42	0.004*	0.003*	0.846
12	11 hours	97.00 ± 1.11	97.26 ± 1.48	97.11 ± 1.16	0.667	0.374	0.721
13	12 hours	97.09 ± 1.34	96.89 ± 1.32	97.17 ± 1.62	0.746	0.591	0.847
14	13 hours	96.86 ± 1.63	96.94 ± 1.64	97.49 ± 1.15	0.178	0.838	0.041
15	14 hours	97.54 ± 1.42	96.51 ± 1.50	97.31 ± 1.47	0.018*	0.006*	0.412
16	15 hours	97.40 ± 1.56	96.83 ± 1.25	97.34 ± 1.47	0.191	0.134	0.892
17	16 hours	97.46 ± 1.46	96.77 ± 1.31	97.54 ± 1.42	0.090	0.084	0.812
18	17 hours	97.69 ± 1.16	97.57 ± 1.38	97.06 ± 1.39	0.134	0.647	0.093
19	18 hours	96.40 ± 1.38	97.49 ± 1.25	97.77 ± 1.52	<0.001*	<0.001*	<0.001*
20	19 hours	97.37 ± 1.44	97.80 ± 1.30	97.40 ± 1.40	0.419	0.189	0.941
21	20 hours	97.31 ± 1.37	97.66 ± 1.21	97.11 ± 1.18	0.328	0.283	0.612
22	21 hours	97.17 ± 1.56	97.51 ± 1.29	97.23 ± 1.35	0.599	0.364	0.861
23	22 hours	97.57 ± 1.48	96.86 ± 1.57	97.23 ± 1.46	0.131	0.061	0.412
24	23 hours	97.09 ± 1.42	97.06 ± 1.45	97.23 ± 1.40	0.901	0.924	0.683
25	24 hours	97.60 ± 1.29	97.00 ± 1.51	97.11 ± 1.37	0.211	0.081	0.132

TABLE 5: Comparison of Respiratory Rate (breaths/min)

S L No	Time Interval	Group BB (Mean±SD)	Group BD (Mean±SD)	Group BM (Mean±SD)	P value	Grou p BB vs BD (p-value	Group BB vs BM (p-value)
1	0 hour	15.94 ± 2.14	15.80 ± 1.55	16.20 ± 2.32	0.670	0.781	0.589
2	1 hour	16.14 ± 2.69	16.74 ± 1.93	15.63 ± 2.16	0.143	0.276	0.428
3	2 hours	16.31 ± 2.71	16.69 ± 1.81	16.03 ± 2.42	0.648	0.489	0.648
4	3 hours	16.26 ± 2.28	15.66 ± 2.44	16.63 ± 2.14	0.221	0.236	0.512
5	4 hours	16.34 ± 2.36	16.03 ± 2.27	15.34 ± 2.35	0.181	0.574	0.078
6	5 hours	15.71 ± 2.65	15.97 ± 2.46	16.97 ± 2.26	0.056	0.643	0.022*
7	6 hours	16.17 ± 2.61	16.26 ± 1.92	14.97 ± 2.24	0.077	0.873	0.041
8	7 hours	15.37 ± 2.24	15.26 ± 2.25	15.80 ± 2.14	0.594	0.839	0.441
9	8 hours	15.77 ± 1.33	15.74 ± 1.93	24.46 ± 37.91	0.202	0.938	0.312
10	9 hours	16.74 ± 1.82	16.57 ± 2.10	16.83 ± 2.19	0.944	0.712	0.851
11	10 hours	16.57 ± 1.58	15.09 ± 2.08	15.00 ± 2.71	0.006*	0.002*	0.001
12	11 hours	15.71 ± 2.31	16.83 ± 2.23	15.94 ± 2.01	0.068	0.051	0.678
13	12 hours	15.86 ± 1.94	16.11 ± 1.89	16.63 ± 1.93	0.182	0.611	0.093
14	13 hours	15.86 ± 1.85	15.43 ± 2.13	16.63 ± 1.97	0.025*	0.317	0.041*
15	14 hours	16.09 ± 1.76	16.51 ± 2.42	19.29 ± 17.16	0.219	0.392	0.188
16	15 hours	15.23 ± 2.22	15.34 ± 2.13	15.83 ± 2.05	0.456	0.824	0.362
17	16 hours	16.40 ± 1.85	16.03 ± 2.71	15.89 ± 2.45	0.624	0.518	0.391
18	17 hours	16.09 ± 2.81	16.86 ± 1.94	15.94 ± 2.54	0.337	0.203	0.841
19	18 hours	16.26 ± 2.56	16.34 ± 1.61	16.46 ± 1.93	0.947	0.912	0.741
20	19 hours	16.74 ± 2.08	15.31 ± 2.59	15.37 ± 2.43	0.013*	0.009*	0.014*
21	20 hours	15.57 ± 2.50	16.54 ± 1.72	15.69 ± 2.18	0.159	0.083	0.872
22	21 hours	16.57 ± 1.01	16.86 ± 1.00	17.17 ± 0.75	0.012*	0.194	0.006*
23	22 hours	15.11 ± 1.11	15.63 ± 1.17	16.83 ± 0.92	<0.001 *	0.098	<0.001*
24	23 hours	15.80 ± 1.75	14.71 ± 1.66	16.46 ± 1.48	0.001*	0.007*	0.041*
25	24 hours	15.71 ± 1.89	16.26 ± 1.40	16.09 ± 1.74	0.443	0.214	0.392

Fig 1: Duration of Analgesia

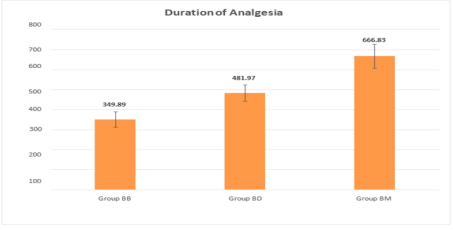
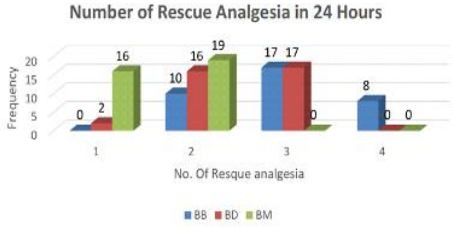


Fig 2: Number of Rescue Analgesia in 24 Hours



REFERENCES

1. Gan TJ. Poorly controlled postoperative pain: prevalence, consequences, and prevention. J Pain Res. 2017; 10:2287-2298.
2. Grigoras A, Lee P, Sattar F, Shorten G. Perioperative intravenous lidocaine decreases the incidence of persistent pain after breast surgery. Clin J Pain. 2012;28(7):567-572.
3. Andreae MH, Andreae DA. Local anaesthetics and regional anaesthesia for preventing chronic pain after surgery. Cochrane Database Syst Rev. 2012;10:CD007105.
4. Chaparro LE, Smith SA, Moore RA, Wiffen PJ, Gilron I. Pharmacotherapy for the prevention of chronic pain after surgery in adults. Cochrane Database Syst Rev. 2013;7:CD008307.
5. Kaur H, Misra R, Mittal S, Sidhu GAS. Prospective randomized control trial comparing effect of dexamethasone versus fentanyl as adjuvants to intrathecal bupivacaine 2021;13(3):e13949. for orthopedic surgery. Cureus.
6. Balavenkatasubramanian J, Senthilkumar S, Vinoth Kumar V. Current indications for spinal anesthesia: a narrative review. Best Pract Res Clin Anaesthesiol. 2023;37(2):89-99.
7. Sirvinskas E, Laurinaitis R. Use of magnesium sulphate in anaesthesiology. Medicina (Kaunas). 2002;38:147-150.
8. Shruthi AH, Sudheesh K, Nethra SS, Raghavendra Rao RS, Devika RD. Effect of a single dose of magnesium sulphate as an adjuvant to epiduralbupivacaine for infraumbilical surgeries: a prospective double-blind randomized control trial. Middle East J Anaesthesiol. 2016;23(4):449-455.
9. Raeder JC. Regional anaesthesia in ambulatory surgery. Can J Anaesth. 2001;48(10):R73-84.
10. Brown DL. Spinal, epidural and caudal anesthesia. In: Miller RD, editor. Miller's

Anesthesia. 7th ed. Philadelphia: Churchill Livingstone; 2010. p. 1611-1638.
11. Shambhavi T, Das S, Senapati LK, Padhi PP. Comparative evaluation of bupivacaine with magnesium sulphate and dexamethasone as adjuvants in ultrasound-guided transversus abdominis plane block for open unilateral inguinal hernia surgeries: a randomized controlled trial. Indian J Anaesth. 2023;67(4):370-375.
12. Deshpande J, Kulkarni P, Nashine S. Efficacy of magnesium vs dexamethasone as an adjuvant to ropivacaine in ultrasound-guided femoral and sciatic nerve block for postoperative analgesia: a prospective double-blinded randomized controlled study. Arch Anesth Crit Care. 2023.
13. Pehora C, Pearson AM, Kaushal A, Crawford MW, Johnston B. Dexamethasone as an adjuvant to peripheral nerve block. Cochrane Database Syst Rev. 2017;11(11):CD011770.
14. Dudhat DNV, Kantharia DBN. Comparison Of Magnesium Sulphate with Dexamethasone As Adjuvant To Local Anaesthetics For Supraclavicular Brachial Plexus Block: Magnesium Sulphate With Dexamethasone As Adjuvant To Local Anaesthetics. National Journal of Integrated Research in Medicine. 2022 Feb 10;13(2):01–6.
15. Myers J, et al. Determining the minimal clinically important difference in acute pain scores. J Pain Res. 2017;10:1109-1115.
16. Salaffi F, Stancati A, Silvestri CA, Ciapetti A, Grassi W. Minimal clinically important changes in chronic musculoskeletal pain intensity measured on a numerical rating scale. Eur J Pain. 2004;8(4):283-291.
17. Meng J, Li L. The efficiency and safety of dexamethasone for pain control in total joint arthroplasty: A meta-analysis of randomized controlled trials. Medicine (Baltimore). 2017 Jun;96(24):e7126.
18. Khatoon RT, Khader SS, Ullah Hussaini SA. Comparison of Magnesium Sulfate and Dexamethasone as Adjuvants to 0.75% Ropivacaine for Postoperative Pain Management in Upper Limb Surgeries Using Supraclavicular Brachial Plexus Block Under Ultrasound Guidance. International Journal of Medicine and Public Health. 2025; 15(2).
19. Jebali C, Kahloul M, Hassine NI, Jaouadi MA, Ferhi F, Naija W, Chebili N. Magnesium sulfate as adjuvant in prehospital femoral nerve block for a patient with diaphysial femoral fracture: a randomized controlled trial. Pain Research and Management. 2018;2018(1):2926404.
20. Daabiss MA, Kandil A. Evaluation of the effect of magnesium vs. midazolam as adjunct to epidural bupivacaine in patients undergoing total knee replacement. British Journal of Medical Practitioners 2013;6(1):a610.
21. Sain A, Jain T, Sood M. Analgesic effect of magnesium sulphate as an adjuvant to levobupivacaine in lower abdominal and pelvic surgeries under epidural anaesthesia: a randomized double blind controlled interventional study. J Anaesth Clin Pharmacol. 2018;34(3):328.
22. Zeng J, Chen Q, Yu C, Zhou J, Yang B. The use of magnesium sulfate and peripheral nerve blocks: an updated meta-analysis and systematic review. Clin J Pain. 2021;37(8):629-637.
23. Ara M, Sheikh TA, Benazir K. USG guided popliteal sciatic and adductor canal block for below knee surgeries and postoperative analgesia in high risk patients. International Journal of Medical Anesthesiology. 2021 Jul 1;4(3):15.
24. Yehia MF, Ahmad AE, Esmaeil EA, Eskandar AM, Sultan AA. Magnesium sulfate versus dexmedetomidine as adjuvants to bupivacaine in postoperative epidural analgesia after total knee replacement. Menoufia Medical Journal. 2019;32(2):411-6.
25. Huynh TM, Marret E, Bonnet F. Combination of dexamethasone and local anaesthetic solution in peripheral nerve blocks: a meta-analysis of randomised controlled trials. European Journal of Anaesthesiology EJA. 2015 Nov 1;32(11):751-8.
26. Tripathi R, Parikh S, Vidya V, Baranda M, Patel P. Ultrasound guided popliteal nerve block in foot and ankle surgeries. European Journal of Cardiovascular Medicine. 2024 May 31;14:655-65.