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Original Article

Anaesthesia Section

Efficacy of Magnesium Sulphate versus Dexamethasone with Bupivacaine in Ultrasound-guided Transverse Abdominis Plane Block for Postoperative Pain Relief in Lower Abdominal Surgery: A Randomised Double-blinded Clinical Study

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ABSTRACT

Introduction: Transversus Abdominis Plane (TAP) block is an effective regional anaesthesia technique used to provide analgesia for lower abdominal surgeries. Adjuvants like magnesium sulphate and dexamethasone needs to be explored with regards to prolonged duration and efficacy of analgesia when combined with local anaesthetics such as bupivacaine.

Aim: This study aimed to assess the efficacy of 200 mg of magnesium sulphate versus 8 mg of dexamethasone as adjuvants to 0.25% bupivacaine in ultrasound-guided TAP blocks in patients undergoing lower abdominal surgeries under subarachnoid anaesthesia.

Materials and Methods: The present randomised, double-blinded, clinical study was conducted at Department of Anaesthesiology, Dr. DY Patil Medical College, Hospital and Research Centre in Pune, Maharashtra, India, from January 2023 to January 2025, eighty American Society of Anaesthesiologists (ASA) grade I and II patients aged 18-65 years, scheduled for lower abdominal surgeries under spinal anaesthesia were recruited and divided into two groups to receive TAP block postoperatively with either 18 mL of 0.25% bupivacaine with magnesium sulphate 200 mg in 2 mL saline (Group A, n=40), or 18 mL of 0.25% bupivacaine with dexamethasone 8 mg (Group B, n=40). Total duration of analgesia, Visual Analogue Scale (VAS) scores, first rescue analgesic, haemodynamic parameters and any related side-effects were observed in each group post block. The Chi-square test was applied to assess categorical variables, while the student's t-test was utilised for comparisons of continuous variables. A p-value of less than 0.05 was considered to indicate statistical significance.

Results: Both groups were comparable in demographic characteristics with mean (SD) age being 27.6±7.78 and 28.8±8.15 years in group A and group B, respectively. Group A had 57.5% female patients and 42.5% male patients, while group B had 65% female patients and 35% male patients. The mean duration of analgesia was significantly longer in group B (501±43.02 mins) compared to group A (399±29.93 mins), ($p<0.001$). Visual Analog Scale (VAS) scores showed significant differences beginning at 4 hours post block, with group B reporting lower VAS scores than group A at 4, 6, and 8 hours, ($p<0.05$). Time to first rescue analgesia was also significantly delayed in group B (580±48.58 mins) compared to group A (448±32.50 mins), ($p<0.001$). Minimal side-effects such as nausea and vomiting were observed in both groups, with no statistically significant difference.

Conclusion: The addition of dexamethasone to bupivacaine significantly prolongs analgesia duration, reduces pain scores and delays the need for rescue analgesia without any adverse effects, making it a more suitable adjuvant for TAP blocks in lower abdominal surgeries.

Keywords: Postoperative pain management, Rescue analgesia, Visual analog scale score

INTRODUCTION

Pain is an uncomfortable sensory and emotional experience associated with actual or possible tissue damage [1]. In patients undergoing lower abdominal surgeries, moderate to severe pain often persists for up to 48 hours postoperatively, necessitating the need for a well-structured, effective pain management strategy [2]. Among the various techniques available, the TAP block has emerged as a valuable tool in the multimodal methods and preemptive and preventive analgesia. The TAP block specifically targets the sensory nerves of the anterior abdominal wall, which originate from the T7 to L1 spinal roots, by administering the local anaesthetic drug in the plane between the internal oblique and transversus abdominis muscles [3,4]. Administered via the anatomical landmark known as the triangle of Petit, the block effectively numbs the skin, muscles and peritoneum, significantly reducing postoperative pain in infra-umbilical procedures [5].

Ultrasound guidance has markedly improved the safety and efficacy of regional anaesthesia techniques, including the TAP block, by allowing real-time visualisation of relevant anatomical structures [6]. This enhances the precision of the block, minimises complications such as nerve damage or vascular puncture, and improves the overall success rate. To further extend the duration of pain relief, adjuvants are often added to the local anaesthetic solution. Agents like opioids, clonidine, midazolam, dexmedetomidine, ketamine, magnesium sulphate and dexamethasone not only extend pain relief but also reduce opioid requirements and shorten hospital stays, offering a safer alternative to epidural analgesia, which carries potential risks like hypotension and infection [2,7].

Magnesium sulphate, a naturally occurring calcium channel blocker, acts on NMDA receptors to block central sensitisation caused by noxious peripheral stimuli [8]. It also inhibits acetylcholine release at the neuromuscular junction, thereby extending the effect of the block. Dexamethasone is a long-acting corticosteroid and enhances analgesia by modulating C-fibre activity and exerting anti-inflammatory effects. Its vasoconstrictive properties also contribute to prolonged drug retention at the site of action [9].

Although both magnesium sulphate and dexamethasone had been increasingly used as adjuvants, direct comparisons of their efficacy with bupivacaine in TAP blocks were limited [9,10]. This gap in the literature prompted the study, which aimed to compare the duration of analgesia provided by the addition of magnesium sulphate versus dexamethasone to bupivacaine in TAP blocks for lower abdominal surgeries. The results of the current study may aid in determining the effective drug combination for TAP blocks, aiming to enhance the quality and duration of postoperative analgesia in patients undergoing lower abdominal surgeries. It was hypothesised that the addition of dexamethasone to bupivacaine would offer superior postoperative pain relief compared to other adjuvants.

The primary outcome of the study was to compare the total duration of analgesia provided by magnesium sulphate and dexamethasone when used as adjuvants to bupivacaine. Secondary outcomes included VAS scores, time to first rescue analgesia and occurrence of side-effects such as Postoperative Nausea and Vomiting (PONV).

MATERIALS AND METHODS

The present randomised, double-blinded, clinical study was conducted at Department of Anaesthesiology, Dr DY Patil Medical College, Hospital and Research Centre in Pune, Maharashtra, India, from January 2023 to January 2025, following approval from the Institutional Ethics Committee (IESC/PGS/2023/154) and was registered with the Clinical Trials Registry of India (CTRI/2024/06/069447).

Inclusion and Exclusion criteria: A total of eighty patients, aged 18 to 65 years, of either gender, classified as American Society of Anaesthesiologists (ASA) physical status I or II, scheduled for lower abdominal surgeries under subarachnoid anaesthesia were included in the study. Exclusion criteria comprised unwillingness to participate, the presence of uncontrolled systemic conditions such as neurological, cardiac, metabolic, renal, or pulmonary disorders, hepatic dysfunction, gestational diabetes, preeclampsia and eclampsia, intraoperative complications like postpartum haemorrhage, use of calcium channel blockers, local infection at the intended block site, known bleeding or coagulation disorders and documented allergy to any of the study drugs. Patients meeting the inclusion criteria were enrolled in the study and written consent was obtained for participation, as well as for the use of patient data for research and educational purposes.

Sample size calculation: Based on the study by Rana S et al., which evaluated the use of magnesium sulphate as an adjuvant to bupivacaine in ultrasound-guided TAP blocks for patients undergoing total abdominal hysterectomy under subarachnoid block, the mean±SD of the VAS scores at four hours were reported as 1.40±1.70 for magnesium sulphate and 2.40±1.43 for dexamethasone [2]. Using these values and considering a power of 80% and a significance level of 5%, the minimum required sample size was calculated to be 78 (39 participants in each group) using WINPEPI software version 11.3. Each group, consisting of 40 patients, was randomly assigned to receive one of the study drugs.

Study Procedure

During the pre-anaesthetic evaluation conducted the day before surgery, all patients underwent thorough general and systemic examinations, including cardiovascular, respiratory and central nervous system assessments. Routine laboratory investigations-complete blood count, Liver Function Tests (LFT), Renal Function Tests (RFT), serum electrolytes, urine analysis, Bleeding Time (BT), Clotting Time (CT), and Prothrombin Time/International Normalised Ratio (PT/INR)- were recorded. The purpose of the study, the nature of the Transverse Abdominis Plane (TAP) block and spinal anaesthesia, along with potential benefits and associated risks, were clearly explained to all patients. Informed written consent was obtained from all patients, who were also advised to request analgesia whenever they experienced pain. They were also educated on the use of the 10 cm VAS during the preoperative assessment. All patients were kept Nil Per Oral (NPO) for six hours for solids and two hours for clear liquids prior to surgery and no premedication was administered.

In the operating theatre, a 20-gauge intravenous (i.v.) cannula was secured and an infusion of 500 mL Ringer's Lactate (RL) was initiated. Standard anaesthetic monitoring was established, including Heart Rate (HR), Non-Invasive Blood Pressure (NIBP), peripheral Oxygen Saturation (SpO_2), and continuous Electrocardiography (ECG), with baseline values recorded. Spinal anaesthesia was administered in the sitting position under strict aseptic precautions using a 26-gauge Quincke spinal needle at the L3–L4 intervertebral space. After confirming the free flow of Cerebrospinal Fluid (CSF), 3.0 mL of 0.5% hyperbaric bupivacaine was injected. Surgery commenced once an adequate sensory level (T6) was confirmed. Intraoperative vital parameters were continuously monitored at regular intervals and documented in the proforma. Any adverse effects, such as hypotension or bradycardia, were noted. Postoperative vital signs were similarly recorded.

Following the completion of surgery, an ultrasound-guided TAP block was performed under aseptic conditions using a Hitachi Arietta S70 ultrasound machine equipped with a linear high-frequency probe. After sterile preparation of the abdominal region between the twelfth rib and iliac crest, with the umbilicus positioned centrally, the external oblique, internal oblique and transversus abdominis muscles along with their fascial planes were identified. A 25-gauge spinal needle was advanced using an in-plane technique along the anterior axillary line under ultrasound guidance. Once the needle tip was accurately positioned, 1 mL of normal saline was injected for hydrodissection to confirm correct placement. Following visualisation of a hypoechoic plane on the ultrasound image, 10 mL of the assigned study drug was injected on one side. The procedure was then repeated on the contralateral side using the same technique and volume. Any signs of neurotoxicity such as perioral numbness, metallic taste in mouth, tinnitus, slurring of speech and mental status changes were closely monitored. The dosage of the study drugs was determined based on previously published literature [2,11,12].

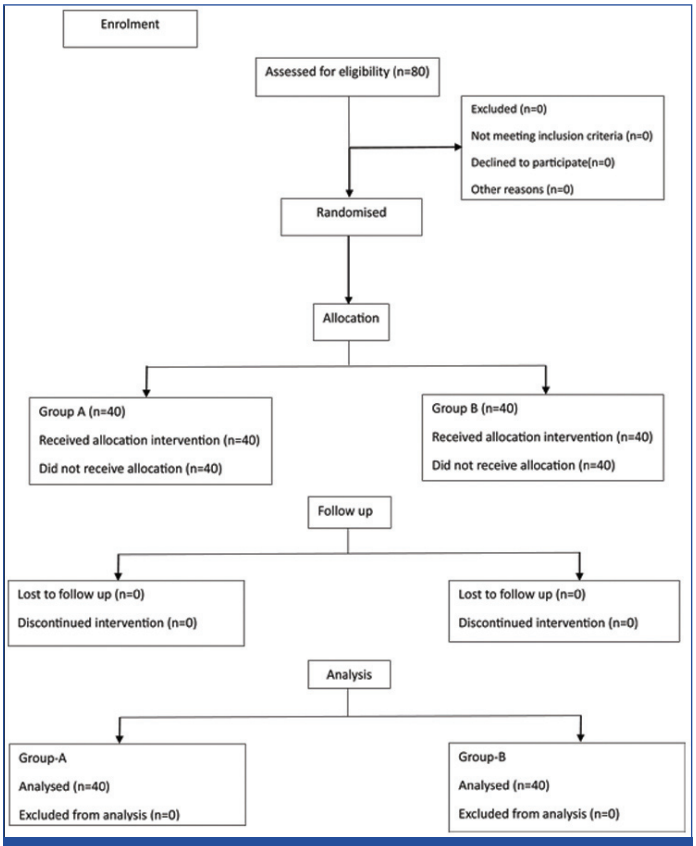
Group A: In this group, patients received 18 mL of 0.25% bupivacaine hydrochloride + 200 mg magnesium sulphate in 2 mL normal saline.

Group B: In this group, patients received 18 mL of 0.25% bupivacaine hydrochloride + 8 mg of dexamethasone.

Postoperatively, patients were assessed for pain, nausea and vomiting in the post-anaesthesia care unit. The VAS scores were recorded at <5 minutes and subsequently at 1, 2, 4, 6, 8, and 12 hours or till the rescue analgesia was requested, by an investigator blinded to the group allocation. In both groups, i.v. tramadol 1.5 mg/kg was administered as rescue analgesia upon patient request when the VAS pain score exceeded four. Rescue antiemetics (i.v. ondansetron 0.1 mg/kg) was offered to patients who complained of nausea or vomiting.

The VAS consisted of a 10-centimeter horizontal line with 1 cm markings at each end, where patients were asked to indicate their level of pain. A score of 0 represented no pain, 1-3 mild pain, 4-7

moderate pain and scores above seven reflected severe pain. Several measures were taken to reduce bias, including the use of a double-blind protocol, standardised drug preparation and objective outcome assessment. The random allocation sequence was generated by an independent statistician using a computer-generated randomisation table [Table/Fig-1]. Participant enrolment was performed by the principal investigator and co-investigators, who assessed eligibility based on inclusion and exclusion criteria. To ensure a double-blind design and minimise potential bias, participant assignment to interventions was carried out by an independent Anaesthesiologist who was not involved in patient care or data collection. This Anaesthesiologist prepared the study medications, 18 mL of 0.25% bupivacaine hydrochloride combined with either 200 mg of magnesium sulphate in 2 mL normal saline or 8 mg of dexamethasone as an adjuvant. The medications were filled in identical transparent syringes labelled with preassigned unique codes known only to the preparing Anaesthesiologist. These coded syringes were then handed over to the Anaesthesiologist performing the block, who remained blinded to the group allocation throughout the study. Patients were informed they would receive a standard local anaesthetic for TAP block, without disclosure of the specific drug. The allocation and blinding were maintained with strict confidentiality until complete data collection and initial analysis was completed. A pilot study was not performed prior to the main study.



[Table/Fig-1]: CONSORT flow diagram.

STATISTICAL ANALYSIS

All cases were completed within the designated study timeframe. Data were collected, organised, and initially processed using Microsoft Excel 2019. Statistical analysis was carried out utilising the Statistical Package for the Social Sciences (SPSS), Version 22 for Windows. Categorical data were presented as frequencies ('n'), whereas continuous data were expressed as mean±Standard Deviation (SD). Information was systematically compiled for both the magnesium sulphate group (group A) and the dexamethasone group (group B). The Chi-square test was applied to assess categorical variables, while the Student's t-test was utilised for comparisons of continuous variables. A p-value of less than 0.05 was considered to indicate statistical significance.

RESULTS

The baseline characteristics such as age, gender, and ASA classification were comparable between the two groups. The 20-30 years age group was predominant in both groups, with group A comprising 29 (72.5%) patients and group B comprising 28 (70%) patients. Both groups were comparable in demographic characteristics with mean (SD) age being 27.6±7.78 and 28.8±8.15 years in group A and group B, respectively. Females were predominant in both groups, with group A having 57.5% and group B 65% female participants [Table/Fig-2].

Parameters	Group A (n=40)	Group B (n=40)
Age (years)		
20-30 years	29 (72.5%)	28 (70%)
31-40 years	4 (10%)	7 (17.5%)
41-50 years	7 (17.5%)	5 (12.5%)
Gender		
Male	17 (42.5%)	14 (35%)
Female	23 (57.5%)	26 (65%)
ASA grading		
ASA I	8 (20%)	9 (22.5%)
ASA II	5 (12.5%)	6 (15%)
ASA IIE	27 (67.5%)	25 (62.5%)

[Table/Fig-2]: Demographic and clinical characteristics of patients in group A and group B.
*Chi-square test

No abnormalities were found in the complete blood count, LFT, RFT, serum electrolytes, urine analysis, BT, CT or PT/INR.

Primary outcome: Based on our results duration of analgesia which was longer in group B (501±43.02 minutes) than in group A (399±29.93 minutes), (p-value<0.001) indicating significant difference between mean duration of analgesia among the groups [Table/Fig-3]. From the present study, group B experienced a significantly prolonged period of analgesia compared to group A.

Duration of analgesia	Group A (n=40)	Group B (n=40)	p-value
Minutes	399±29.93	501±43.02	<0.001

[Table/Fig-3]: Comparison of duration of analgesia in study.
*independent t-test

Secondary outcomes: The mean VAS scores at <5 minutes, one and two hours was statistically not significant. At 4-, 6- and 8-hours VAS scores were lower in group B, (1.1±0.871 for group A vs 0.13±0.41 for group B, 3.45±1.41 for group A vs 1.33±0.88 for group B and 4.35±0.48 for group A vs 3.58±0.78 for group B) (p<0.05), respectively, making it statistically significant. Maximum mean VAS score recorded by group A was at eight hours (4.35±0.48) and group B was at 12 hours (4.08±0.57) [Table/Fig-4].

VAS	Group A (n=40)	Group B (n=40)	p-value
<5 min	0	0	-
1 h	0	0	-
2 h	0	0	-
4 h	1.1±0.871	0.13±0.41	<0.001
6 h	3.45±1.41	1.33±0.88	<0.001
8 h	4.35±0.48	3.58±0.78	<0.001
12 h	4.27±0.66	4.08±0.57	0.120

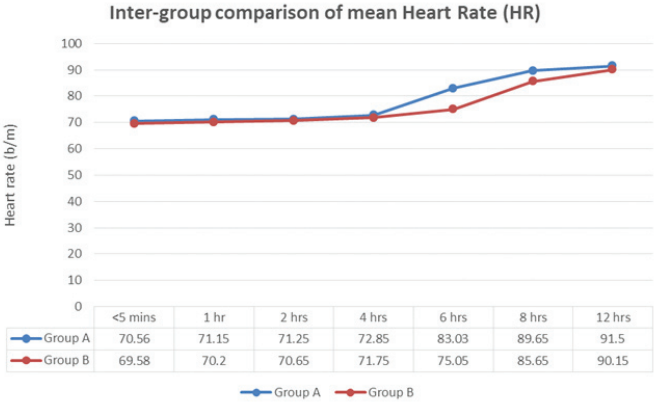
[Table/Fig-4]: Comparison of mean Visual Analog Scale (VAS) scores among study groups.
*independent t-test

The time to first rescue analgesia was observed to be longer in group B (580±48.58 minutes) than in group A (448±32.50 minutes), (p-value<0.001) [Table/Fig-5].

Time to first rescue analgesia	Group A (n=40)	Group B (n=40)	p-value
Minutes	448±32.50	580±48.58	<0.001

[Table/Fig-5]: Comparison of time to first rescue analgesia.
*independent t-test

On comparing mean HR, a significant difference was observed at 6, 8, and 12 hours (p<0.05) [Table/Fig-6]. However, no substantial changes were detected in Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP) or mean arterial pressures between the groups. Baseline HR was 79.45±7.50 in group A and 78.40±6.80 in group B (p-value=0.50), NIBP with mean SBP of 109.15±5.80 vs.109.65±5.41, respectively, (p-value=0.69), mean DBP of 70.60±4.03 vs. 71.0±4.11, respectively, (p-value=0.66), peripheral SpO_2 measured at 99.93±0.31 vs. 99.85±0.38, respectively, (p-value=0.30) and continuous ECG.



[Table/Fig-6]: Heart Rate (HR) distribution in two groups at different intervals.
*Independent t-test

Incidence of PONV was not statistically significant (p-value of 0.305) between the two groups [Table/Fig-7].

Nausea/Vomiting	Group A (n=40)	Group B (n=40)	p-value
Yes	3 (7.5%)	1 (2.5%)	0.305
No	37 (92.5%)	39 (97.5%)	
Total	40 (100%)	40 (100%)	

[Table/Fig-7]: Distribution of patients according to side-effects.
*Chi-square test

DISCUSSION

Lower abdominal surgeries are often associated with moderate to severe postoperative pain, making effective pain management crucial for optimal recovery. Adequate postoperative analgesia has been shown to reduce morbidity, attenuate the physiological stress response, and improve overall surgical outcomes. The TAP block, as a part of multimodal analgesia, has significantly contributed to faster recovery following abdominal procedures [13]. It is known to reduce pain intensity, lower the incidence of analgesic-related side-effects, improve patient comfort and facilitate earlier mobilisation and discharge. The addition of perineural magnesium sulphate or dexamethasone to local anaesthetics has demonstrated efficacy in prolonging the duration of analgesia [14,15]. However, limited studies have directly compared their analgesic efficacy in TAP blocks [1,2,9,12,13,16]. Therefore, the study aimed to evaluate and compare the analgesic effectiveness of magnesium sulphate and dexamethasone when used as adjuvants to bupivacaine in TAP blocks.

Magnesium sulphate ($MgSO_4$), a physiological calcium channel blocker, also acts as an N-Methyl-D-Aspartate (NMDA) receptor antagonist, thereby inhibiting central sensitisation triggered by peripheral nociceptive stimuli. It is commonly used to prolong the duration of nerve blocks [8,9]. It also exerts presynaptic inhibitory effects on acetylcholine release at the neuromuscular junction. Dexamethasone, a potent, highly selective and long-acting glucocorticoid, enhances analgesia and prolongs motor block duration by reducing nociceptive C-fibre activity and exerting systemic anti-inflammatory effects [9]. Additionally, its vasoconstrictive properties may further contribute to prolonged analgesic action [13].

In the present study, the magnesium sulphate dose was selected based on the findings of Rana S et al., who used 150 mg of magnesium sulphate with bupivacaine in TAP blocks for patients undergoing abdominal hysterectomy [2]. Their results showed that the magnesium group experienced a longer duration of analgesia and a reduced requirement for rescue analgesics.

Several studies have evaluated the efficacy of magnesium sulphate as an adjuvant to local anaesthetics in enhancing the quality and duration of TAP blocks and other regional blocks. Al-Refaey K et al., evaluated the efficacy of adding magnesium sulphate to bupivacaine in patients undergoing laparoscopic cholecystectomy [17]. In this study, group M (bupivacaine with 0.5 g magnesium sulphate) demonstrated a prolonged duration of analgesia compared to the control group and the bupivacaine-only group (7±2.8 h in the group C, 16±2.5 h in the group B and 19±2.2 h in the group M). Additionally, group M had reduced morphine consumption and a lower incidence of PONV. Similarly, Balakrishna KP et al., studied patients undergoing total abdominal hysterectomy and randomised them to receive either bupivacaine alone (group B) or bupivacaine with 150 mg of magnesium sulphate (group BM) [18]. The BM group showed significantly lower VAS scores at 4, 6, 12, and 24 hours postoperatively. Moreover, the time to first rescue analgesia was significantly prolonged in the BM group (882.94±70.22 minutes) compared to group B (459±100.53 minutes), along with fewer analgesic requirements overall. Bhat WM et al., assessed the analgesic efficacy of magnesium sulphate as an adjuvant to ropivacaine in patients undergoing laparoscopic cholecystectomy [19]. They reported a longer time to first rescue analgesia in group A (ropivacaine with 0.5 mL of 50% magnesium sulphate) compared to group B (ropivacaine alone) with durations of 743.5±58.21 minutes versus 668.5±214.37 minutes, respectively. The authors concluded that magnesium sulphate significantly improved early postoperative pain scores, prolonged analgesia duration and enhanced patient comfort and satisfaction. Gunduz A et al., evaluated the addition of magnesium sulphate to prilocaine for axillary brachial plexus block [20]. The study had four groups: Group I (i.v. saline), group II (150 mg i.v. magnesium with local anaesthetic), group III (100 mg magnesium added to local anaesthetic), and group IV (150 mg magnesium added perineurally). The addition of magnesium significantly prolonged both sensory and motor block durations, with the most pronounced effect observed in group IV. Goyal P et al., compared 100 mg and 200 mg doses of magnesium sulphate as adjuvants in axillary blocks [21]. Both magnesium groups reported better postoperative analgesia compared to the control, with the 200 mg dose providing a longer duration of analgesic effect. Morphine consumption was also lower in both magnesium groups compared to the control group.

In the present study, the addition of 8 mg of dexamethasone resulted in a significantly longer duration of analgesia compared to 200 mg of magnesium sulphate (501±43.02 minutes vs. 399±29.93 minutes). A similar finding was reported by Shambhavi T et al., who demonstrated that incorporating 8 mg of dexamethasone into bupivacaine for TAP blocks significantly prolonged the time to the first rescue analgesia [9]. In the study, the dexamethasone group (group BD) had a duration of 596.13±57.93 minutes, compared to 422.50±51.95 minutes in the magnesium group (group BM), which received 250 mg of magnesium sulphate. Sharma UD et al., compared the addition of dexamethasone to 0.5% ropivacaine in ultrasound-guided TAP block for inguinal hernia repair [11]. In this study, the dexamethasone group (RD) showed significantly longer

duration of analgesia compared to the control group (RS) (547.5 vs. 387.5 minutes), highlighting improved postoperative pain relief. Several other studies, including those by Dolma L et al., Amany AS et al., and Thomas SM et al., have compared dexamethasone and magnesium sulphate as adjuvants to local anaesthetics in various regional blocks [13,16,22]. These studies reported a longer duration of analgesia with dexamethasone as adjuvant compared to magnesium sulphate or plain local anaesthetic drug.

However, a contrasting result was noted by Gad M et al., who found that 200 mg of magnesium sulphate provided a longer analgesic duration than 8 mg of dexamethasone when combined with bupivacaine in TAP blocks for total abdominal hysterectomy (669±131 minutes vs. 420±78 minutes, respectively) [12]. This discrepancy may be attributed to differences in surgical procedures, anaesthetic techniques, and the intraoperative use of general anaesthesia.

The intensity of postoperative pain was assessed using the VAS. A statistically significant increase in VAS scores was observed at 4, 6, and 8 hours postoperatively in group A compared to group B (1.1±0.87 vs. 0.13±0.41; 3.45±1.41 vs. 1.33±0.88; and 4.35±0.48 vs. 3.58±0.78, respectively; $p<0.05$). The maximum mean VAS score recorded was at 8 hours in group A (4.35±0.48) and at 12 hours in group B (4.08±0.57). However, the difference in mean VAS scores between the two groups at 12 hours was not statistically significant (4.27±0.66 vs. 4.08±0.57; $p=0.120$). At all recorded time points, group B consistently exhibited lower mean VAS scores than group A. These findings are in line with previous studies by Shambhavi T et al., and Dolma L and Nazareth A, who reported lower postoperative pain scores when dexamethasone was used in comparison to magnesium sulphate as an adjuvant in TAP blocks [9,13]. In contrast, Gad M et al., observed lower VAS scores at both 8 and 12 hours in the magnesium sulphate group compared to the dexamethasone group [12].

In the present study, the time to the first request for rescue analgesia was significantly longer in group B than in group A (580±48.58 minutes vs. 448±32.50 minutes). Similar findings were reported by Shambhavi T et al., and Amany AS et al., who observed that the addition of dexamethasone to bupivacaine in TAP blocks significantly prolonged the time to the first analgesic requirement [9,16]. Shambhavi T et al., reported a duration of 596.13±57.93 minutes in the dexamethasone group (BD) compared to 422.50±51.95 minutes in the magnesium group (BM), while Amany AS et al., found a longer duration in the dexamethasone group (459.8 minutes) versus the control group (325.4 minutes) [9]. Abd-Elsalam K et al., compared the efficacy of 0.25% bupivacaine with and without magnesium sulphate (200 mg) in ultrasound-guided TAP blocks for patients undergoing total abdominal hysterectomy [7]. Group I, which received bupivacaine with magnesium sulphate, showed significantly lower postoperative VAS scores at all recorded intervals, a longer time to first rescue analgesia (15.67 vs. 7.33 hours) compared to the bupivacaine-alone group, with no significant differences in adverse effects.

However, Gad M et al., reported the addition of magnesium sulphate to bupivacaine in ultrasound-guided TAP block significantly prolonged the time to first rescue analgesia (548.3±48.2 minutes) compared to dexamethasone (444.2±52.7 minutes), highlighting its superior analgesic efficacy [12]. Such discrepancies across studies may be attributed to differences in the timing of TAP block administration (e.g., after general anaesthesia vs. after subarachnoid block) as well as variations in the type of surgical procedure performed.

In the present study, the incidence of PONV was higher in group A compared to group B, likely due to the antiemetic properties of dexamethasone. Additionally, the greater use of tramadol, an opioid associated with nausea and vomiting in group A may have contributed to this finding. However, the difference in PONV incidence between the two groups was not statistically significant. A key strength of this study is its direct comparison of magnesium sulphate and dexamethasone as adjuvants to bupivacaine in TAP blocks specifically for lower abdominal surgeries, an area with limited existing comparative research.

Limitation(s)

This study has some limitations as it included only patients undergoing lower abdominal surgeries. Since pain intensity varies with surgical type and extent, further research involving a broader range of procedures, including major surgeries, is necessary. Additionally, an increased sample size could provide a more comprehensive assessment of drug efficacy. Serum magnesium levels were not measured, so it remains unclear whether the analgesic effects were due to local or systemic mechanisms and a higher dose of magnesium sulphate (>300 mg) was not explored, which may have further prolonged analgesic effects.

CONCLUSION(S)

This study demonstrated that the use of dexamethasone as an adjuvant to bupivacaine in ultrasound-guided TAP blocks resulted in a statistically significant longer duration of analgesia, lower VAS scores and delayed need for rescue analgesia compared to magnesium sulphate. It was also observed that both the agents were associated with haemodynamic stability, extended analgesic duration and had minimal side-effects.

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