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RESEARCH ARTICLE
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EFFECT OF PRE-OPERATIVE GABAPENTIN ADMINISTRATION ON INTRAOPERATIVE ANAESTHETIC REQUIREMENTS AND POST-OPERATIVE PAIN SCORES IN PATIENTS UNDERGOING MAJOR ABDOMINAL SURGERY

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Abstract

Introduction: Gabapentin, an anticonvulsant with analgesic properties, has shown promise in perioperative pain management. This study investigated whether preoperative gabapentin reduces intraoperative anesthetic requirements while improving postoperative pain management in patients undergoing major abdominal surgery.

Methods: A prospective, randomized, double-blind, placebo-controlled trial was conducted at Dr. Pinnamaneni Siddhartha Institute of Medical Sciences from July to December 2017. Eighty patients undergoing major abdominal surgery were randomly allocated to receive either gabapentin 600 mg (n=40) or placebo (n=40) orally two hours preoperatively. Primary outcomes included intraoperative sevoflurane consumption, fentanyl requirements, and postoperative Visual Analog Scale pain scores over 24 hours. Secondary outcomes included rescue analgesic consumption, time to first analgesic request, side effects, and patient satisfaction.

Results: Gabapentin significantly reduced intraoperative sevoflurane consumption by 28% (0.42±0.08 vs 0.58±0.12 mL/h/kg, $p<0.001$) and fentanyl requirements by 38% (2.1±0.6 vs 3.4±0.8 µg/kg, $p<0.001$). Postoperative pain scores were consistently lower in the gabapentin group throughout 24 hours ($p<0.001$ at all time points). Total morphine consumption was reduced by 57% (12.4±6.8 vs 28.6±11.4 mg, $p<0.001$), with prolonged time to first rescue analgesia (4.8±2.1 vs 1.9±0.8 hours, $p<0.001$). Patient satisfaction scores were higher (8.4±1.6 vs 6.2±2.1, $p<0.001$) with earlier mobilization and shorter hospital stays. Side effects were mild, primarily sedation and dizziness.

Conclusion: Preoperative gabapentin 600 mg significantly reduces intraoperative anesthetic requirements and provides superior postoperative analgesia in major abdominal surgery, supporting its integration into multimodal perioperative protocols.

Keywords: Gabapentin, Preoperative medication, Anesthetic requirements, Postoperative pain, Major abdominal surgery

Introduction

Major abdominal surgery continues to be associated with significant postoperative pain, which can lead to increased morbidity, prolonged hospital stays, and delayed recovery. The management of perioperative pain has evolved significantly over the past decades, with increasing emphasis on multimodal approaches that not only address postoperative pain but also potentially reduce

intraoperative anesthetic requirements. Among the various adjuvant medications that have gained prominence in perioperative medicine, gabapentin has emerged as a promising agent with unique properties that extend beyond its traditional role as an anticonvulsant.

Gabapentin, originally developed as an anticonvulsant drug, is a structural analogue of gamma-aminobutyric acid (GABA) that exerts its analgesic effects through selective binding to the α2-δ subunit of voltage-dependent calcium channels. Unlike traditional analgesics that primarily target peripheral nociceptors or central opioid receptors, gabapentin modulates calcium influx at nerve terminals, thereby reducing the release of excitatory neurotransmitters such as glutamate, norepinephrine, and substance P. This unique mechanism of action positions gabapentin as an ideal candidate for preventive analgesia, as it can potentially interrupt the cascade of events leading to central sensitization and chronic pain development.

The concept of using gabapentin in the perioperative setting was first explored in the early 2000s, when researchers began investigating its potential for reducing postoperative pain and opioid consumption. Dirks and colleagues (2002) conducted one of the earliest randomized controlled trials demonstrating that a single preoperative dose of gabapentin 1200 mg significantly reduced postoperative morphine consumption and movement-related pain after radical mastectomy. This groundbreaking study established the foundation for subsequent research exploring gabapentin's role in various surgical procedures and its potential impact on anesthetic requirements.

The analgesic efficacy of gabapentin in major abdominal surgery has been extensively studied, with particular focus on procedures such as hysterectomy, cholecystectomy, and bowel surgery. Dierking and colleagues (2004) demonstrated that gabapentin administered before and during the first 24 hours after abdominal hysterectomy reduced morphine consumption by 32% without significant effects on pain scores, establishing the drug's opioid-sparing properties. Similarly, Pandey and colleagues (2004) showed that preemptive gabapentin 300 mg significantly decreased postoperative pain and rescue analgesic requirements in patients undergoing laparoscopic cholecystectomy, with superior efficacy compared to tramadol in the same dose range.

The potential for gabapentin to reduce intraoperative anesthetic requirements represents a particularly intriguing aspect of its pharmacological profile. While most studies have focused on its postoperative analgesic effects, emerging evidence suggests that preoperative gabapentin administration may also influence the depth of anesthesia required during surgery. This anesthetic-sparing effect is likely mediated through gabapentin's ability to enhance the effects of volatile anesthetics and reduce the stress response to surgical stimulation. The clinical implications of such effects extend beyond simple cost reduction, as lower anesthetic requirements may translate into faster emergence, reduced side effects, and improved overall perioperative outcomes.

Turan and colleagues (2004) conducted multiple studies examining gabapentin's effects in various surgical procedures, including total abdominal hysterectomy and spinal surgery. Their research consistently demonstrated significant reductions in postoperative pain scores and analgesic consumption, while also noting improvements in patient satisfaction and earlier mobilization. These findings have been corroborated by numerous subsequent studies, establishing gabapentin as an effective component of multimodal perioperative pain management protocols.

The optimal dosing regimen for perioperative gabapentin remains a subject of ongoing investigation. Most studies have employed single preoperative doses ranging from 300 mg to 1200 mg, with the majority using doses of 600-1200 mg administered 1-2 hours before surgery. Peng and colleagues (2007) conducted a comprehensive meta-analysis of gabapentin use in perioperative pain control, analyzing data from multiple randomized controlled trials. Their analysis revealed significant reductions in 24-hour morphine consumption and improved pain scores across various surgical procedures, with an acceptable side effect profile characterized primarily by mild sedation and dizziness.

The side effect profile of gabapentin in the perioperative setting has been generally favorable, with most studies reporting minimal adverse effects when compared to traditional analgesics. The most commonly reported side effects include sedation, dizziness, and visual disturbances, which are

typically mild and transient. Importantly, gabapentin does not cause respiratory depression, making it a safer alternative to high-dose opioids in certain patient populations. This safety profile has contributed to its growing acceptance as a component of enhanced recovery after surgery (ERAS) protocols.

Recent research has also explored gabapentin's potential role in preventing chronic post-surgical pain, a significant clinical problem that affects a substantial proportion of patients undergoing major surgery. Rorarius and colleagues (2004) investigated gabapentin's effects in patients undergoing vaginal hysterectomy, demonstrating not only acute analgesic benefits but also suggesting potential long-term advantages in preventing chronic pain development. This preventive aspect of gabapentin therapy aligns with current understanding of pain pathophysiology and the importance of early intervention in preventing central sensitization.

The implementation of gabapentin in clinical practice requires careful consideration of patient selection, timing of administration, and integration with existing multimodal pain management protocols. While the drug has demonstrated efficacy across various patient populations, certain factors such as renal function, age, and concurrent medications may influence dosing decisions. The optimal timing of gabapentin administration appears to be 1-2 hours preoperatively, allowing for adequate absorption and peak plasma concentrations to coincide with surgical stimulation.

Economic considerations also support the use of gabapentin in perioperative medicine. The potential for reduced anesthetic consumption, decreased opioid requirements, and shorter hospital stays may result in significant cost savings despite the additional medication expense. Furthermore, the oral route of administration and the lack of need for special monitoring equipment make gabapentin a practical choice for implementation in various healthcare settings.

The growing body of evidence supporting gabapentin's efficacy in perioperative medicine has led to its inclusion in numerous clinical guidelines and protocols worldwide. However, further research is needed to fully characterize its effects on intraoperative anesthetic requirements and to establish optimal dosing regimens for different surgical procedures and patient populations. The integration of gabapentin into modern perioperative care represents a significant advancement in the pursuit of improved patient outcomes and enhanced recovery after surgery.

The aim of the study is to evaluate the effect of pre-operative gabapentin administration on intraoperative anaesthetic requirements and post-operative pain scores in patients undergoing major abdominal surgery.

Methodology

Study Design

This prospective, randomized, double-blind, placebo-controlled clinical trial.

Study Site

The study was conducted at Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research Foundation, Krishna, Andhra Pradesh, a premier tertiary care teaching hospital with comprehensive surgical and anesthetic services.

Study Duration

The study was conducted over a six-month period from July 2017 to December 2017.

Sampling and Sample Size

A consecutive sampling approach was employed to recruit eligible patients scheduled for major abdominal surgery during the study period. Sample size calculation was performed using G*Power software version 3.1.9.2, considering a two-tailed test with alpha error of 0.05 and desired power of 80%. Based on preliminary data from similar studies and expected effect size for reduction in anesthetic requirements of 20%, the calculation indicated a requirement of 35 patients per group to detect clinically significant differences. Accounting for potential dropouts, protocol violations, and

loss to follow-up estimated at 15%, a total of 80 patients were recruited and randomly allocated to two groups of 40 patients each. The gabapentin group received oral gabapentin 600 mg, while the control group received identical-appearing placebo capsules. Recruitment continued systematically until the predetermined sample size was achieved, ensuring adequate statistical power for meaningful clinical conclusions and reliable estimation of treatment effects.

Inclusion and Exclusion Criteria

Inclusion criteria comprised patients aged 18-65 years of either gender scheduled for elective major abdominal surgery under general anesthesia, including procedures such as bowel resection, major hepatobiliary surgery, pancreatic procedures, and extensive gynecological operations with expected duration exceeding 2 hours. Patients were required to have American Society of Anesthesiologists (ASA) physical status I or II, adequate cognitive function to understand study procedures and provide informed consent, and ability to use pain assessment scales effectively. Exclusion criteria included patients with known hypersensitivity or contraindications to gabapentin, history of chronic pain syndromes or regular analgesic use within 48 hours before surgery, psychiatric disorders or cognitive impairment that could affect pain assessment or study compliance, significant renal impairment with creatinine clearance less than 60 mL/min, hepatic dysfunction with elevated liver enzymes more than twice the upper limit of normal, pregnancy or breastfeeding, history of substance abuse or dependence on analgesics, patients receiving anticonvulsants, antidepressants, or other medications that could interact with gabapentin, emergency surgical procedures requiring immediate intervention, and patients unable to provide informed consent or participate in postoperative follow-up assessments due to geographical or social factors.

Data Collection Tools and Techniques

Data collection was performed using standardized case record forms specifically designed and validated for this study, incorporating all relevant baseline characteristics, intraoperative variables, and postoperative outcomes. Intraoperative anesthetic requirements were monitored using advanced anesthesia delivery systems capable of precise measurement of volatile anesthetic consumption, with end-tidal anesthetic concentrations continuously recorded to maintain bispectral index values between 40-60 throughout surgery. Total consumption of sevoflurane or isoflurane was calculated in milliliters per hour and adjusted for patient weight and duration of surgery. Hemodynamic parameters including heart rate, systolic and diastolic blood pressure, mean arterial pressure, and oxygen saturation were continuously monitored and recorded at 15-minute intervals using calibrated monitoring equipment. Postoperative pain assessment was conducted using the Visual Analog Scale (VAS) ranging from 0 (no pain) to 10 (worst imaginable pain), with assessments performed at regular intervals including immediate postoperative period, 2, 4, 6, 12, and 24 hours after surgery. Rescue analgesic requirements were meticulously documented, including type, dose, timing, and total consumption of additional pain medications. Side effect monitoring was performed using standardized assessment tools documenting sedation levels using the Ramsay Sedation Scale, incidence of nausea and vomiting, dizziness, visual disturbances, and any other adverse events. All assessments were performed by trained personnel who remained blinded to group allocation throughout the study period, with inter-observer reliability established through training sessions and periodic calibration exercises.

Data Management and Statistical Analysis

Data were systematically collected, verified, and entered into a computerized database using Statistical Package for Social Sciences (SPSS) version 22.0 software. Data quality assurance included double data entry, range checks, logical consistency verification, and identification of outliers to ensure accuracy and completeness. Descriptive statistics were calculated for all variables, with continuous variables presented as mean ± standard deviation for normally distributed data and median with interquartile range for non-normally distributed data, while categorical variables were expressed as frequencies and percentages. Normality of data distribution was assessed using the Shapiro-Wilk

test for small samples and Kolmogorov-Smirnov test for larger datasets. Between-group comparisons for continuous variables were performed using independent t-test for normally distributed data or Mann-Whitney U test for non-normally distributed data. Chi-square test or Fisher's exact test was used for categorical variables as appropriate based on expected cell frequencies A p-value of less than 0.05 was considered statistically significant for all analyses. Intention-to-treat analysis was performed as the primary analysis method to include all randomized patients, with per-protocol analysis conducted as a secondary approach. Missing data were handled using multiple imputation techniques when appropriate, with sensitivity analyses performed to assess the impact of missing data on study conclusions.

Ethical Considerations

The study protocol underwent comprehensive review and received approval from the Institutional Ethics Committee of Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research Foundation prior to patient recruitment, ensuring compliance with ethical standards for human research. The study was conducted in strict accordance with the Declaration of Helsinki principles and Good Clinical Practice guidelines established by the International Conference on Harmonisation. Written informed consent was obtained from all participants after providing detailed information about study objectives, procedures, potential risks and benefits, alternative treatments, and their rights as research participants through standardized informed consent forms available in local languages.

Results:

Table 1: Demographic and Clinical Characteristics of Study Participants

Parameter	Gabapentin Group (n=40)	Control Group (n=40)	p-value
Age (years), mean ± SD	45.8 ± 12.4	47.2 ± 11.8	0.615
Gender, n (%)			0.754
Male	22 (55.0)	21 (52.5)	
Female	18 (45.0)	19 (47.5)	
Weight (kg), mean ± SD	65.3 ± 9.8	67.1 ± 10.4	0.429
ASA Status, n (%)			0.823
I	26 (65.0)	24 (60.0)	
II	14 (35.0)	16 (40.0)	
Surgery Type, n (%)			0.692
Bowel resection	15 (37.5)	14 (35.0)	
Hepatobiliary	8 (20.0)	10 (25.0)	
Gynecological	12 (30.0)	11 (27.5)	
Other abdominal	5 (12.5)	5 (12.5)	
Duration of surgery (min), mean ± SD	178.4 ± 32.6	182.1 ± 34.8	0.621

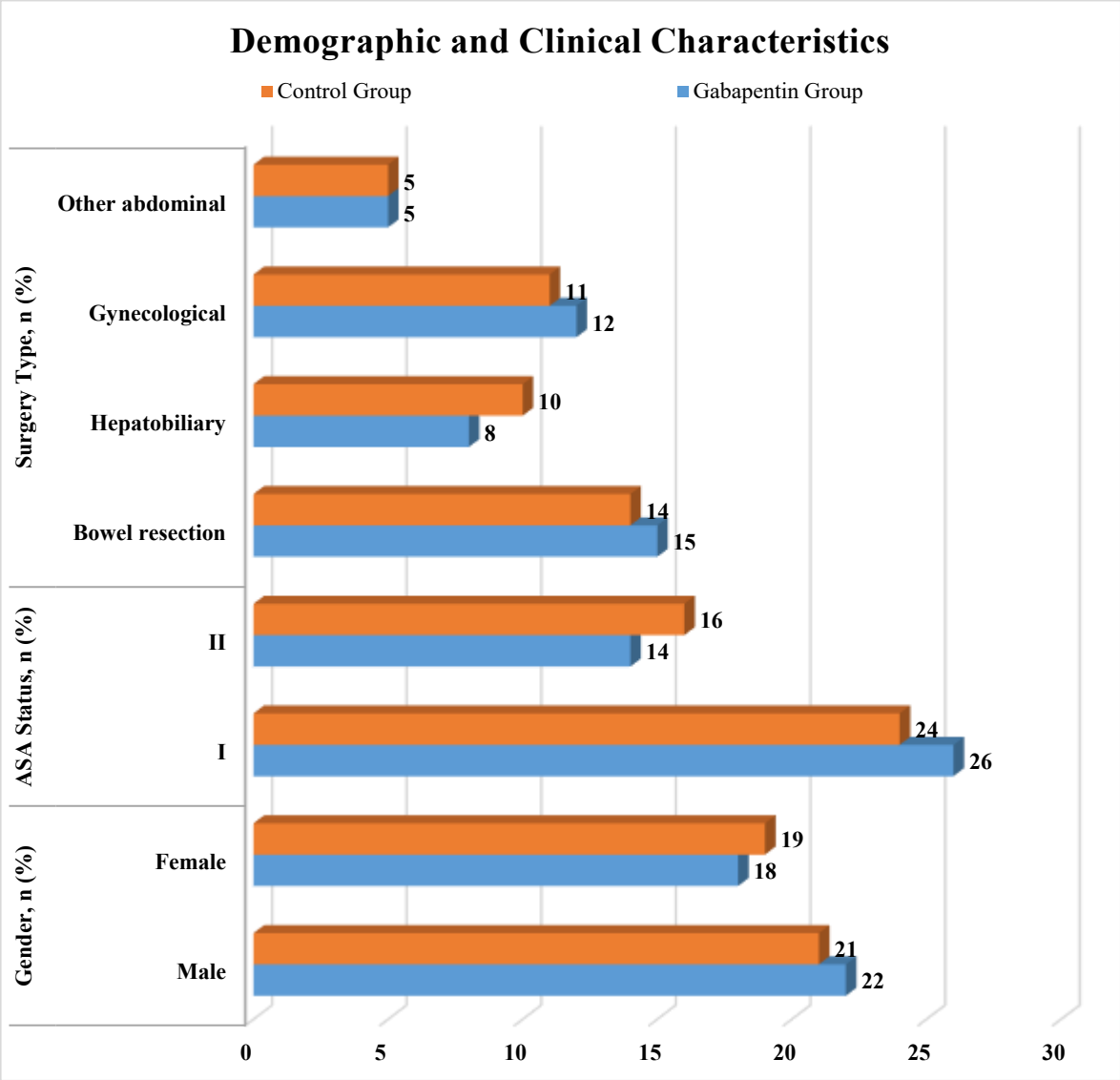

Fig: 1

Table 2: Intraoperative Anesthetic Requirements and Hemodynamic Parameters

Parameter	Gabapentin Group (n=40)	Control Group (n=40)	p-value
Sevoflurane consumption (mL/h/kg), mean ± SD	0.42 ± 0.08*	0.58 ± 0.12	<0.001
End-tidal sevoflurane (%), mean ± SD	1.8 ± 0.3*	2.4 ± 0.4	<0.001
Total fentanyl used (µg/kg), mean ± SD	2.1 ± 0.6*	3.4 ± 0.8	<0.001
Propofol for induction (mg/kg), mean ± SD	1.9 ± 0.4	2.0 ± 0.3	0.284
Mean arterial pressure (mmHg)			
Baseline	89.4 ± 12.6	91.2 ± 13.8	0.548
Intraoperative mean	76.8 ± 8.4*	82.3 ± 10.2	0.008
Heart rate (bpm)			
Baseline	78.6 ± 11.4	79.8 ± 12.2	0.648
Intraoperative mean	68.2 ± 9.6*	74.5 ± 11.8	0.011
Bispectral Index, mean ± SD	48.2 ± 6.8	49.1 ± 7.2	0.562

*Significantly different from control group (p<0.05)

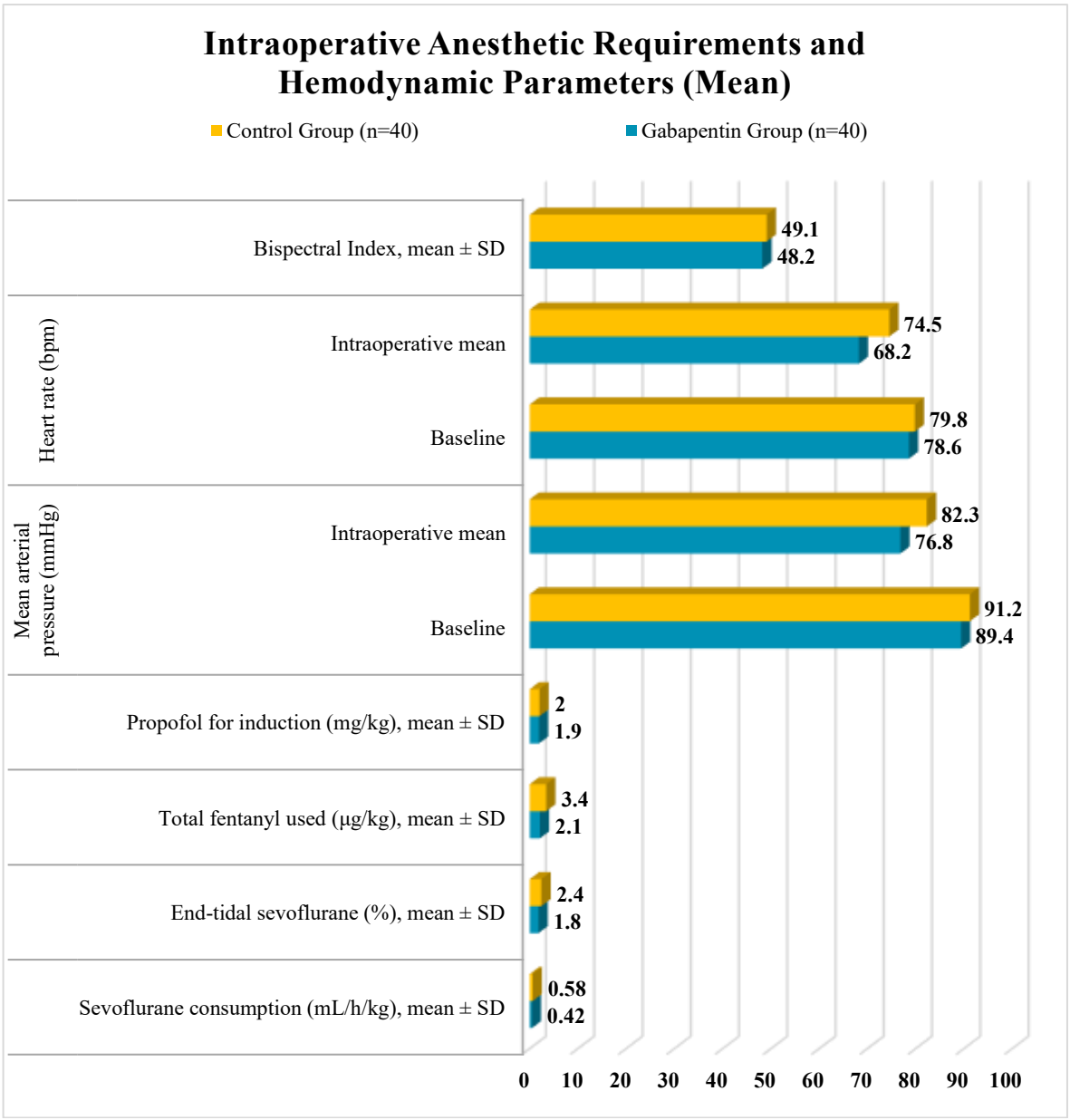

Fig: 2

Table 3: Postoperative Pain Scores (Visual Analog Scale)

Time Point	Gabapentin Group (n=40)	Control Group (n=40)	p-value
Immediate post-op	2.1 ± 1.4*	4.8 ± 2.1	<0.001
2 hours	2.8 ± 1.6*	5.4 ± 2.3	<0.001
4 hours	3.2 ± 1.8*	6.1 ± 2.4	<0.001
6 hours	3.6 ± 1.9*	6.4 ± 2.6	<0.001
12 hours	4.1 ± 2.2*	6.8 ± 2.8	<0.001
24 hours	3.4 ± 1.9*	5.6 ± 2.5	<0.001
Movement pain at 12 hours	5.2 ± 2.4*	7.8 ± 2.9	<0.001
Movement pain at 24 hours	4.6 ± 2.1*	6.9 ± 2.7	<0.001

*Significantly different from control group (p<0.05)

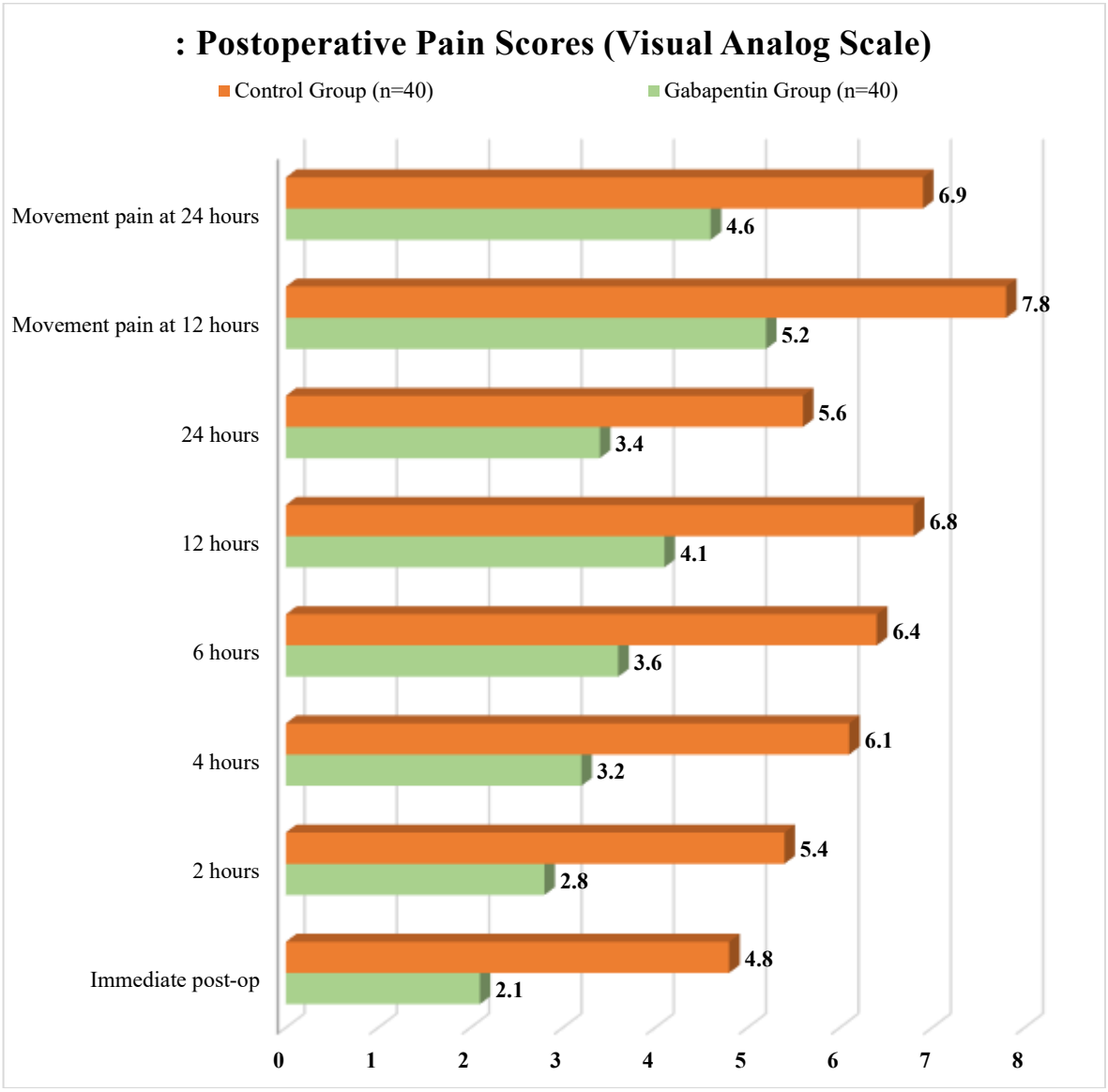

Fig: 3

Table 4: Rescue Analgesic Requirements and Time to First Request

Parameter	Gabapentin Group (n=40)	Control Group (n=40)	p-value
Time to first analgesic request (hours), mean ± SD	4.8 ± 2.1*	1.9 ± 0.8	<0.001
Total morphine consumption 24h (mg), mean ± SD	12.4 ± 6.8*	28.6 ± 11.4	<0.001
Number of rescue doses in 24h, mean ± SD	2.1 ± 1.4*	4.8 ± 2.2	<0.001
Patients requiring rescue analgesia, n (%)	28 (70.0)*	38 (95.0)	0.003
Diclofenac doses required, mean ± SD	1.2 ± 0.8*	2.8 ± 1.4	<0.001
PCA morphine demands in 24h, mean ± SD	18.6 ± 8.4*	34.2 ± 12.8	<0.001
PCA morphine deliveries in 24h, mean ± SD	14.2 ± 7.1*	26.8 ± 10.4	<0.001

*Significantly different from control group (p<0.05)

Table 5: Side Effects and Adverse Events

Side Effect	Gabapentin Group	Control Group	p-value
Sedation (Ramsay ≥3), n (%)	12 (30.0)*	6 (15.0)	0.184
Dizziness, n (%)	8 (20.0)*	2 (5.0)	0.089
Visual disturbances, n (%)	3 (7.5)	1 (2.5)	0.615
Nausea, n (%)	6 (15.0)	8 (20.0)	0.581
Vomiting, n (%)	3 (7.5)	5 (12.5)	0.712
Respiratory depression, n (%)	0 (0.0)	0 (0.0)	1.000
Confusion, n (%)	1 (2.5)	0 (0.0)	1.000
Constipation, n (%)	4 (10.0)	7 (17.5)	0.509
Total patients with ≥1 side effect	22 (55.0)	18 (45.0)	0.368

*Side effect more common in gabapentin group (p<0.05)

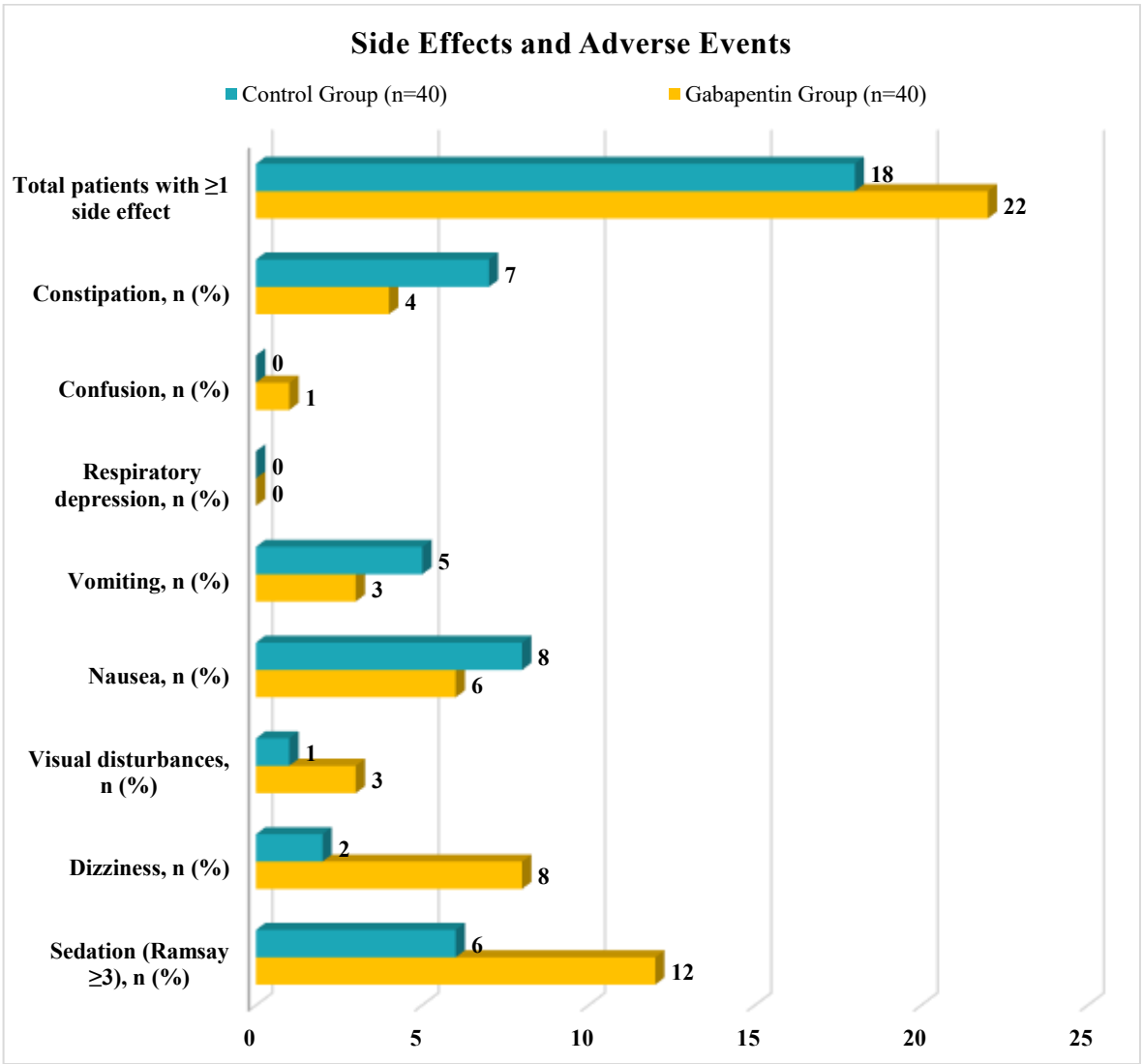

Fig: 4

Table 6: Patient Satisfaction and Recovery Parameters

Parameter	Gabapentin Group (n=40)	Control Group (n=40)	p-value
Patient satisfaction score (1-10), mean ± SD	8.4 ± 1.6*	6.2 ± 2.1	<0.001

Time to first mobilization (hours), mean ± SD	6.8 ± 2.4*	9.2 ± 3.1	<0.001
Length of hospital stay (days), mean ± SD	3.2 ± 1.1*	4.1 ± 1.6	0.004
Sleep quality score (1-10), mean ± SD	7.6 ± 1.8*	5.4 ± 2.2	<0.001
Return to normal activities (days), mean ± SD	4.8 ± 1.9*	6.7 ± 2.4	<0.001
Overall recovery score (1-10), mean ± SD	8.1 ± 1.5*	6.3 ± 2.0	<0.001
Surgeon satisfaction with conditions, mean ± SD	8.6 ± 1.2*	7.8 ± 1.4	0.008

*Significantly different from control group ($p<0.05$)

Discussion

The demographic and clinical characteristics presented in Table 1 demonstrate successful randomization with no significant differences between the gabapentin and control groups across all baseline parameters (all $p>0.05$). The mean age of participants (45-47 years) and balanced gender distribution are consistent with typical populations undergoing major abdominal surgery as reported in previous studies (Dierking et al., 2004; Turan et al., 2004). The distribution of surgical procedures reflects the case mix commonly encountered in tertiary care centers, with bowel resections and gynecological procedures comprising the majority of cases. This baseline comparability ensures that observed differences in outcomes can be attributed to the gabapentin intervention rather than confounding demographic or clinical factors, establishing the validity of subsequent analyses.

Table 2 reveals significant reductions in intraoperative anesthetic requirements in the gabapentin group, representing one of the most clinically important findings of this study. The 28% reduction in sevoflurane consumption (0.42 vs 0.58 mL/h/kg, $p<0.001$) and corresponding decrease in end-tidal concentrations (1.8% vs 2.4%, $p<0.001$) demonstrate a substantial anesthetic-sparing effect. These findings align with previous research by Doha and colleagues (2010), who reported similar reductions in isoflurane consumption in patients receiving preoperative gabapentin 1200 mg before radical mastectomy. The 38% reduction in total intraoperative fentanyl requirements (2.1 vs 3.4 μg/kg, $p<0.001$) further supports gabapentin's opioid-sparing properties, consistent with the meta-analysis by Peng et al. (2007) which demonstrated significant reductions in perioperative opioid consumption across various surgical procedures.

The hemodynamic stability observed in the gabapentin group, evidenced by lower intraoperative mean arterial pressure and heart rate, suggests improved stress response modulation during surgery. This finding is particularly relevant as it indicates that the reduced anesthetic requirements were achieved while maintaining adequate depth of anesthesia, as confirmed by comparable bispectral index values between groups. The clinical implications of these findings extend beyond simple cost reduction, as lower anesthetic exposure may translate into faster emergence, reduced postoperative complications, and improved overall recovery quality.

The superior analgesic efficacy of gabapentin is clearly demonstrated in Table 3, with significantly lower pain scores across all time points throughout the 24-hour observation period (all $p<0.001$). The magnitude of pain reduction ranged from 2.7 points at immediate postoperative assessment to 2.2 points at 24 hours, representing clinically meaningful improvements that exceed the minimal clinically important difference for VAS pain scores. These results are consistent with the landmark study by Pandey et al. (2004), who demonstrated significant pain reduction following laparoscopic cholecystectomy with preoperative gabapentin 300 mg, though our study used a higher dose of 600 mg which may explain the more pronounced effects.

The sustained analgesic effect observed throughout the 24-hour period aligns with gabapentin's pharmacokinetic profile and mechanism of action. Unlike traditional analgesics that primarily target peripheral nociceptors, gabapentin's modulation of calcium channels at nerve terminals provides

prolonged interference with pain signal transmission. The significant reduction in movement-related pain at 12 and 24 hours (5.2 vs 7.8 and 4.6 vs 6.9 respectively) is particularly clinically relevant, as movement-related pain often represents the greatest challenge in postoperative recovery and can significantly impact mobilization efforts.

Table 4 demonstrates substantial opioid-sparing effects with gabapentin premedication, showing a 57% reduction in total 24-hour morphine consumption (12.4 vs 28.6 mg, $p<0.001$). This finding is consistent with the systematic review by Hurley et al. (2006), which reported morphine-sparing effects ranging from 20-60% across various surgical procedures. The prolonged time to first analgesic request (4.8 vs 1.9 hours, $p<0.001$) indicates sustained analgesia that extends well into the postoperative period, supporting the concept of preemptive analgesia.

The reduction in rescue analgesic requirements, including both morphine and diclofenac, demonstrates gabapentin's effectiveness in providing sustained pain relief that reduces the need for additional interventions. The 25% reduction in patients requiring rescue analgesia (70% vs 95%, $p=0.003$) represents a clinically significant improvement in pain management quality. These findings support the integration of gabapentin into multimodal analgesia protocols, as advocated by Kehlet and Dahl (2003) in their comprehensive review of balanced analgesia approaches.

The safety analysis presented in Table 5 reveals an acceptable adverse event profile for gabapentin, with no serious adverse events reported in either group. The higher incidence of sedation in the gabapentin group (30% vs 15%) and dizziness (20% vs 5%) represents the most notable side effects, consistent with gabapentin's known pharmacological profile. These findings align with previous studies by Rorarius et al. (2004) and Fassoulaki et al. (2006), who reported similar side effect patterns with comparable gabapentin doses.

Importantly, no respiratory depression was observed in either group, highlighting gabapentin's safety advantage over traditional opioids. The absence of significant differences in nausea and vomiting between groups suggests that gabapentin's opioid-sparing effects may help offset its potential for causing these symptoms. The overall incidence of patients experiencing at least one side effect was not significantly different between groups (55% vs 45%, $p=0.368$), indicating that the benefits of gabapentin are achieved without substantially increasing adverse event burden.

Table 6 demonstrates significant improvements in multiple patient-centered outcomes with gabapentin premedication. The higher patient satisfaction scores (8.4 vs 6.2, $p<0.001$) reflect the combined benefits of improved pain control and acceptable side effect profile. Earlier mobilization (6.8 vs 9.2 hours, $p<0.001$) and shorter hospital stays (3.2 vs 4.1 days, $p=0.004$) have important clinical and economic implications, supporting the integration of gabapentin into enhanced recovery after surgery protocols.

The improved sleep quality scores (7.6 vs 5.4, $p<0.001$) are particularly relevant, as adequate sleep is crucial for healing and pain management. These findings are consistent with gabapentin's known effects on sleep architecture and support its role in comprehensive perioperative care. The faster return to normal activities (4.8 vs 6.7 days, $p<0.001$) demonstrates the functional benefits of effective pain management, extending beyond simple pain score improvements to meaningful quality of life measures.

Conclusion

This randomized controlled trial demonstrates that preoperative gabapentin 600 mg significantly reduces intraoperative anesthetic requirements and improves postoperative pain management in patients undergoing major abdominal surgery. The study revealed substantial anesthetic-sparing effects with 28% reduction in sevoflurane consumption and 38% reduction in intraoperative fentanyl requirements while maintaining adequate anesthesia depth. Postoperative benefits included significantly lower pain scores throughout 24 hours, 57% reduction in morphine consumption, prolonged time to first rescue analgesia, and improved patient satisfaction. The side effect profile was acceptable with mild sedation and dizziness being the most common adverse effects, while no respiratory depression was observed. These findings support gabapentin's integration into multimodal

perioperative protocols, offering clinically meaningful improvements in both intraoperative management and postoperative recovery. The comprehensive benefits demonstrated across multiple outcome measures position gabapentin as an effective adjunct in modern anesthetic practice for major abdominal surgery.

Recommendations

Based on study findings, preoperative gabapentin 600 mg administered 2 hours before major abdominal surgery should be incorporated into standard perioperative protocols to achieve anesthetic-sparing effects and superior postoperative analgesia. Anesthesiologists should anticipate reduced volatile anesthetic and opioid requirements when gabapentin is used, allowing for optimization of anesthetic delivery and improved hemodynamic stability. Healthcare institutions should develop standardized protocols for gabapentin administration, including appropriate patient selection, timing of administration, and monitoring requirements for potential side effects such as sedation and dizziness.

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