JKKI: Jurnal Kedokteran dan Kesehatan Indonesia
Indonesian Journal of Medicine and Health
Journal homepage: https://journal.uii.ac.id/JKKI
P-ISSN 2085-4145 | E-ISSN 2527-2950 || JKKI 2025;16(3): 400-409

Optimizing pediatric anesthesia: A randomized controlled trial comparing oral gabapentin and lorazepam on intubation-induced hemodynamic responses

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Article Info:

Keywords: gabapentin; lorazepam; premedication; Intubation; hemodynamics; pediatric anesthesia

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Article History:

Received: April 20, 2025
Accepted: November 17, 2025
Online: December 27, 2025

DOI: 10.20885/JKKI.Vol16.Iss3.art7

Original Article

ABSTRACT

Background: Endotracheal intubation in pediatric patients undergoing elective surgery can trigger hemodynamic response, including increased blood pressure and heart rate, due to sympathetic stimulation. Premedication is required to attenuate these responses. However, the comparative effectiveness of gabapentin and lorazepam remains to be investigated.
Objectives: This study aims to evaluate and compare the effects of gabapentin and lorazepam premedication on blood pressure and heart rate during tracheal intubation in pediatric patients.
Methods: This randomized controlled clinical trial involved 64 pediatric patients undergoing elective surgery. They were divided into two groups: the gabapentin group (15 mg/kg) and the lorazepam group (0.025 mg/kg). Hemodynamic parameters were measured before and after intubation.
Results: The study results showed that the gabapentin group had lower systolic blood pressure, diastolic blood pressure, and mean arterial pressure (MAP) compared to the lorazepam group after intubation ($p<0.05$). Gabapentin was also more effective in maintaining blood pressure stability than lorazepam, while both groups showed comparable heart rate parameters ($p > 0.05$).
Conclusion: Gabapentin premedication is more effective in suppressing the surge in blood pressure caused by intubation than lorazepam, while lorazepam is more significant in reducing heart rate. Overall, gabapentin may be a more optimal premedication option for maintaining hemodynamic stability in pediatric patients undergoing elective surgery.

INTRODUCTION

Pediatric anesthesia presents distinct and complex challenges that require specialized approaches and considerations, especially in maintaining hemodynamic stability during endotracheal intubation, which may trigger sympathetic activity and lead to hypertension, arrhythmias, and tachycardia.[1,2] Children's vulnerability to hemodynamic fluctuations is attributed to their developing cardiovascular system and increased sensitivity to anesthetic drugs.[3,4]

Premedication is essential during the intubation process to suppress sympathetic responses and minimize hemodynamic impact. Gabapentin, widely used in pain management and seizure disorders, has shown potential in stabilizing sympathetic activity and reducing blood pressure and tachycardia in adult patients.[5] Meanwhile, a commonly used benzodiazepine, lorazepam, provides effective anxiolytic and sedative effects prior to surgery. [6]

According to Heikal et al., benzodiazepines are commonly used since they are easily available, have a rapid onset of action, and possess a relatively short duration of effect.[7] They are effective preoperative anxiolytics that can induce anterograde amnesia by creating a dissociation between explicit and implicit memory, reduce postoperative nausea and vomiting (PONV), and

have been established as standard premedication for pediatric patients experiencing preoperative anxiety.[7–9]

In a study conducted by Akram et al., gabapentin premedication resulted in a reduction in blood pressure response during intubation, whereas no significant difference was observed in heart rate response compared to lorazepam. The study concluded that oral administration of 300 mg gabapentin four hours before surgery was more effective in attenuating the hemodynamic response to intubation than 2 mg lorazepam.[5]

Previous studies have shown that gabapentin is superior to lorazepam in suppressing blood pressure changes, although there is no significant difference in heart rate response. However, evidence on the effectiveness of gabapentin and lorazepam as premedication in pediatric patients remains limited. Therefore, this study aims to evaluate and compare these two premedication agents in mitigating hemodynamic changes due to intubation in pediatric patients undergoing elective surgery, in order to identify the most optimal premedication option in terms of safety and effectiveness.

METHODS

This randomized controlled clinical trial (RCT) compared intubation responses in pediatric patients who received either oral gabapentin or lorazepam as premedication before elective surgery. The study assessed hemodynamic and airway responses during intubation and included postoperative follow-up to evaluate the persistence of these effects. Adverse events were monitored and documented throughout the perioperative period to provide a comprehensive assessment of both efficacy and safety.

Study design

This clinical experimental study employed a randomized controlled trial design. Participants were allocated to the intervention or control group using simple randomization overseen by a research assistant. To maintain blinding, the pharmacy team at Zainoel Abidin General Hospital prepared both medications in identical packaging, color, size, and appearance. This double-blind design ensured that neither the participants nor the investigators were aware of group assignments, and both groups received visually indistinguishable preparations.

Population and sample

The population of this study was divided into two categories. The target population consisted of all pediatric patients undergoing elective surgery with general anesthesia at RSUD dr. Zainoel Abidin, while the accessible population comprised pediatric patients who underwent elective surgery with oral endotracheal intubation during the study period. Eligible participants were selected based on predefined inclusion and exclusion criteria. The inclusion criteria were pediatric patients aged 2-12 years who were scheduled for elective surgery under general anesthesia with oral tracheal intubation and whose parents or legal guardians provided written informed consent.

Patients were excluded if they experienced difficult intubation or failed two intubation attempts; had a history of seizures or were receiving anticonvulsant therapy; or had systemic diseases such as diabetes mellitus, hepatic disorders, intracranial pathology, cardiac disease, or renal impairment. In addition, patients with a history of allergy to any of the study drugs were excluded. Participants were withdrawn from the study (drop-out criteria) if any allergic reaction occurred during anesthesia or surgery.

The sample size for each study group was calculated to be 29 participants. To anticipate for potential dropouts, an additional 10% was added to the required number. After adjustment, the final sample size was rounded to 32 participants per group.

Data Collection

Data were collected following approval from the Ethics Committee of RSUD dr. Zainoel Abidin. The study was conducted in December 2024 at RSUD dr. Zainoel Abidin, Banda Aceh.

Informed consent was obtained from eligible pediatric patients or their legal guardians after providing detailed information about the study objectives, potential benefits, and possible side effects of the premedication, sedatives, and anesthetics. Participants who met the inclusion and exclusion criteria were randomized into two groups: the gabapentin group (15 mg/kg orally) and the lorazepam group (0.025 mg/kg orally). All patients abided to the preoperative fasting protocols. At least two hours before anesthesia, all patients received the assigned premedication, which had been prepared in identical form by the hospital pharmacy team to maintain blinding.

Demographic data were recorded prior to the intervention. After medication administration, patients were observed for one hour, followed by transport to the operating room. Standard monitoring (blood pressure, oxygen saturation, and ECG) was applied, and preoxygenation with 100% oxygen was performed for three minutes.

Anesthesia was induced with fentanyl (2 mcg/kg), propofol (2–3 mg/kg), and atracurium (0.5 mg/kg). Baseline hemodynamic parameters (heart rate, systolic and diastolic blood pressure, and mean arterial pressure) were recorded three minutes after muscle relaxant administration. Endotracheal intubation was performed by a senior anesthesia resident using an appropriately sized endotracheal tube.

Hemodynamic responses were assessed at 1, 5, and 10 minutes after intubation. Anesthesia was maintained with sevoflurane at 1 MAC in a 50:50 air/O_2 mixture. Surgical and further anesthetic management followed hospital standard operating procedures of the institution. All data were documented and prepared for statistical analysis. Emergency management protocols included: hypotension: administration of 10 ml/kg Ringer's lactate, hypoventilation: provision of 100% oxygen with positive pressure ventilation, and airway obstruction: airway clearance using triple maneuver or airway adjuncts, followed by oxygen supplementation.

Data analysis

The collected data were reviewed for completeness and subsequently coded for statistical analysis. Descriptive statistics were presented as mean ± standard deviation for continuous variables and as frequencies or percentages for categorical variables. Data normality was assessed using the Kolmogorov–Smirnov test. Variables that showed a normal distribution, including systolic blood pressure (SBP), heart rate (HR) and mean arterial pressure (MAP), were analyzed using the independent t-test. Variables that did not meet the normality assumption, such as diastolic blood pressure (DBP), were analyzed using the Mann–Whitney U test.. This approach ensured that each variable was analyzed using the most appropriate statistical method based on its distributional characteristics. Categorical variables, such as sex, were compared using the Chi-square test. All statistical analyses were performed using IBM SPSS Statistics version 26, and a *p*-value < 0.05 was considered statistically significant.

Ethical statement

This study was conducted following approval from the Ethics Committee of RSUD dr. Zainoel Abidin number 201 ETIK-RSUDZA 2024. Prior to enrollment, eligible patients or their legal guardians were provided with a comprehensive explanation of the study objectives, , potential benefits, and possible risks, including side effects related to the premedication, sedative, and anesthetic agents.

Written informed consent was obtained from all participants or their legal guardians before any study-related procedures were initiated. Participant selection was carried out in accordance with predefined inclusion and exclusion criteria. All data collection and study interventions were performed in strict adherence to ethical principles and confidentiality standards.

RESULTS

A total of 64 participants were recruited and analyzed in this study. The demographic characteristics were statistically comparable between the two groups. The mean ± standard deviation of systolic blood pressure, diastolic blood pressure, mean arterial pressure, and heart rate were recorded at multiple time points in both groups. Table 1 presents the demographic

characteristics of participants in the two groups. The mean age, weight, and height were significantly higher in the lorazepam group compared to the gabapentin group ($p < 0.05$). In contrast, there was no significant difference in body mass index (BMI) between the two groups ($p = 0.657$). The distribution of sex also showed a statistically significant difference ($p = 0.000$).

The normality of each hemodynamic parameter was assessed using the Kolmogorov–Smirnov test. The results showed that the p-values for SBP, HR, and MAP were all greater than 0.05, indicating that these variables were normally distributed. Comparisons of physiological parameters between the Gabapentin and Lorazepam groups were performed using the Mann–Whitney U test as the DBP variable did not follow a normal distribution ($p = 0.040$).

Table 1. Demographic Profile of Patients in Both Groups

Demographic	**Gabapentin group (n=32)**	**Lorazepam group (n=32)**	**p-value**
Age (years) (mean ± SD)	4.9± 2.8	7.5 ± 2.6	0.000[a]
Weight (kg) (mean ± SD)	16.4 ± 6.2	23.8 ± 11.36	0.002[a]
Height (cm) (mean ± SD	100.8 ±18.3	117.4 ± 15.6	0.000[a]
BMI (kg/m^2) (mean ± SD)	16.1 ±3.6	16.5 ± 4.2	0.657[a]
Sex			
Male	18	20	0.000[b]
Female	14	12	

[a] Independent t-test; [b] Chi-square test

Table 2. The Effect of the Drug on Physiological Parameters: Systolic Blood Pressure, Diastolic Blood Pressure, and Mean Arterial Pressure (MAP)

Physiological Parameters	**Medication Groups**		**p-value**
	Gabapentin group (n=32)	**Lorazepam group (n=32)**	
Systolic Blood Pressure (SBP)			
Baseline	88.5±11.2	93.5±14,0	0.263[a]
Minute 1 post intubation	101.5±11.2	116.0 ±17.4	0.002[a]
Minute 5 post intubation	93.0 ± 12.8	103.0 ±11.6	0.036[a]
Minute 10 post intubation	91.0 ± 12.2	104.5 ±12.6	0.002[a]
Diastolic Blood Pressure (DBP)			
Baseline	52.0±9.0	57.5 ±11.3	0.011[b]
Minute 1 post intubation	62.0±9.3	67.0±16.5	0.012[b]
Minute 5 post intubation	58.0 ±12.9	59.0 ± 9.2	0.474[b]
Minute 10 post intubation	54.0 ± 13.8	57.0 ±9.8	0.174[b]
Mean Arterial Pressure (MAP)			
Baseline	63.5± 8.8	67.5 ± 11.0	0.022[a]
Minute 1 post intubation	74.0 ± 9.6	80.5 ± 15.4	0.004[a]
Minute 5 post intubation	71.0 ± 11.2	72.5 ± 7.1	0.026[a]
Minute 10 post intubation	65.5 ± 12.3	72.0 ± 8.8	0.026[a]

[a]Independent T-test, [b]Mann–Whitney U test.

Table 2 presents the effects of the study drug on SBP, DBP, and MAP in both gabapentin and lorazepam griups at multiple time points following intubation. At baseline, although the difference was not statistically significant, the lorazepam group had a higher mean SBP compared to the gabapentin group (93.5 ± 14.0 vs. 88.5 ± 11.2 mmHg, $p = 0.263$). Meanwhile, post-intubation comparisons revealed a statistically significant differences in SBP between the two groups at 1 and 10 minutes ($p < 0.05$). Specifically, at 1 minute after intubation, the lorazepam group exhibited a higher mean SBP (116.0 ± 17.4 vs. 101.5 ± 11.2 mmHg, $p = 0.002$). This difference persisted at 5 minutes (103.0 ± 11.6 vs. 93.0 ± 12.8 mmHg, $p = 0.036$) and at 10 minutes (104.5 ± 12.6 vs. 91.0 ± 12.2 mmHg, $p = 0.002$), indicating a sustained elevation in SBP in the lorazepam group throughout the observation period.

Regarding diastolic blood pressure, Table 2 shows that the lorazepam group had a significantly higher baseline DBP than the gabapentin group (57.5 ± 11.3 vs. 52.0 ± 9.0 mmHg, *p* = 0.011). A similar pattern was observed at 1 minute post-intubation (67.0 ± 16.5 vs. 62.0 ± 9.3 mmHg, p = 0.012). However, the differences in DBP between the two groups were no longer statistically significant at 5 and 10 minutes after intubation (p = 0.474 and p = 0.174, respectively), suggesting that diastolic pressure in both groups began to stabilize toward baseline values.

The drug's effect on MAP is also illustrated in Table 2. At baseline, the lorazepam group showed a significantly higher MAP than the gabapentin group (67.5 ± 11.0 vs. 63.5 ± 8.8 mmHg, p = 0.022). This difference remained statistically significant at all subsequent time points following intubation. At 1 minute, MAP was higher in the lorazepam group (80.5 ± 15.4 vs. 74.0 ± 9.6 mmHg, p = 0.004), followed by similar findings at 5 minutes (72.5 ± 7.1 vs. 71.0 ± 11.2 mmHg, p = 0.026), and 10 minutes after intubation (72.0 ± 8.8 vs. 65.5 ± 12.3 mmHg, p = 0.026). These results indicate a consistent trend of higher MAP in the lorazepam group, although both groups gradually approached their baseline values over time.

Table 3. The Effect of the Drug on Physiological Parameters: Heart Rate (HR)

	Medication Group		
Physiological Parameters	**Gabapentin group (n=32)**	**Lorazepam group (n=32)**	***p*-value**
Heart Rate (HR)			
Baseline	103.0±15.4	92.5 ±13.8	0.060[a]
Minute 1 post intubation	115.5±16.4	115.5 ±17.1	0.160[a]
Minute 5 post intubation	110.5 ±16.0	103.5 ± 16.5	0.111[a]
Minute 10 post intubation	106.0 ±17.7	97.5 ±16.1	0.043[a]

[a]Independent T- Test

Table 3 summarizes the effects of the study drugs on HR in both gabapentin group and lorazepam group at various time points following intubation. At baseline, gabapentin exhibited a higher mean HR than lorazepam group, although the difference was not statistically significant (103.0 ± 15.4 vs. 92.5 ± 13.8 bpm, *p* = 0.060). One minute after intubation, the mean HR values were nearly identical in both groups (115.5 ± 16.4 vs. 115.5 ± 17.1 bpm, *p* = 0.160). By the fifth minute post-intubation, gabapentin group continued to show a higher mean HR, though the difference remained statistically insignificant (110.5 ± 16.0 vs. 103.5 ± 16.5 bpm, *p* = 0.111). In contrast, at the 10-minute mark, gabapentin group maintained a higher HR, and this difference reached statistical significance (106.0 ± 17.7 vs. 97.5 ± 16.1 bpm, *p* = 0.043).

DISCUSSION

Based on the demographic characteristics in this study, the gabapentin premedication group had a younger mean age (4.9 ± 2.8 years) compared to the lorazepam premedication group (7.5 ± 2.6 years), with a statistically significant difference (*p* = 0.000). This age difference may influence the pharmacological response to the administered drugs. In younger children, drug metabolism may be either faster or slower depending on the specific metabolic pathways involved. Gabapentin is primarily excreted by the kidneys, and in younger pediatric patients, renal clearance may be slower. This slower clearance can potentially lead to a more prolonged or intensified pharmacodynamic effect.[3,10]

The BMI profiles between the two groups did not show a significant difference (*p* = 0.657). This suggests that BMI was unlikely to have had a meaningful impact on the effects of the premedication administered in each group. Similar BMI values indicate comparable body fluid distribution, which may influence drug distribution and therefore help minimize confounding effects. Overall, the demographic differences observed between the groups remained within a clinically comparable range and were not substantial enough to significantly affect the study outcomes.

Baseline hemodynamic parameters, including SBP and HR, showed no statistically significant differences between the two groups (p = 0.263 and p = 0.06, respectively). In contrast, DBP and MAP showed significantly different premedication baseline values (p = 0.011 and p = 0.022, respectively). Various pharmacological agents have been used as premedication to attenuate hemodynamic responses during surgical procedures. In the present study, both premedication groups; gabapentin and lorazepam showed similar trends in hemodynamic responses following intubation. Neither group exhibited an increase greater than 20% in blood pressure, MAP, or HR compared to baseline measurements, which were recorded three minutes after administration of the muscle relaxant, indicating that both agents were effective in blunting the hemodynamic stress response. An exception was observed in the lorazepam group, which showed a 22.56% increase in systolic blood pressure at one minute post-intubation compared to baseline, a transient elevation likely related to the intubation stimulus. These findings are consistent with previous studies by Akram et al., who reported elevations in hemodynamic parameters at the first and fifth minutes post-intubation as a response to laryngoscopy and tracheal intubation.[3,5]

Hemodynamic changes in response to tracheal intubation are generally well tolerated in healthy individuals. However, these responses may pose significant risks in patients with underlying cardiovascular disease. The sudden release of catecholamines, including norepinephrine, epinephrine, and vasopressin may lead to acute hypertension and increased heart rate. Premedication is therefore administered to minimize the potential adverse effects of such hemodynamic fluctuations. An ideal premedication should effectively maintain cardiovascular stability without causing significant side effects.[3,10]

In this study, hemodynamic changes were observed in both groups following intubation. However, the measurements were consistently lower in patients who received gabapentin as premedication compared with those who received lorazepam. Similar findings were reported by Akram et al., who noted an increase in DBP, SBP, MAP, and HR in both gabapentin and lorazepam premedication groups among patients undergoing coronary artery bypass graft surgery. [5] Further, systolic and diastolic blood pressure measured taken at the first minute post-intubation were lower in the gabapentin group compared to the lorazepam group. These findings suggest that gabapentin premedication may be more effective in maintaining and stabilizing blood pressure following intubation. Statistical analysis showed a significant difference in mean systolic blood pressure at the first minute post-intubation (p = 0.002), as well as in mean diastolic blood pressure (p = 0.012), indicating that gabapentin had a greater ability to suppress the hypertensive response to intubation.

It is also important to be highlighted that gabapentin was associated with significantly greater reductions in systolic blood pressure at both the fifth and tenth minutes post-intubation compared to lorazepam (p = 0.036 and p = 0.002, respectively). Although the differences in diastolic blood pressure at these time points were not statistically significant, the gabapentin group still demonstrated lower values than the lorazepam group. These findings are consistent with those reported by Chauhan et al., who compared the effects of gabapentin and clonidine as premedication. Their study showed that systolic and diastolic blood pressure measured at various intervals post-intubation were significantly lower in the gabapentin group than in the clonidine group, among adult patients over the age of 20.[3,11] This reduction represents a favorable clinical outcome, as it indicates the effectiveness of gabapentin in attenuating the sympathetic pressor response typically triggered by laryngoscopy and tracheal intubation.[13,19] Mechanistically, gabapentin exerts this effect through its high affinity for the α2-δ1 subunit of voltage-gated calcium channels in the central nervous system. [3,10,20] By inhibiting calcium influx into pre-synaptic nerve terminals, it reduces the release of excitatory neurotransmitters like norepinephrine. [21] Consequently, gabapentin functions similarly to a calcium channel blocker to maintain cardiovascular stability, preventing extreme hemodynamic fluctuations during anesthetic induction.[3]

The measurement of MAP revealed statistically significant findings. Compared to lorazepam, gabapentin more effectively attenuated the increase in MAP following the

administration of muscle relaxants, as reflected in the MAP values recorded at the first minute post-intubation. Moreover, MAP readings in gabapentin group remained more stable across all time intervals, with measurements at 10 minutes after intubation approaching baseline levels.

These results are consistent with previous randomized trials comparing gabapentin and lorazepam in perioperative settings. Akram et al., reported that patients premedicated with gabapentin (300 mg) exhibited significantly lower MAP following tracheal intubation than those receiving lorazepam (2 mg) (MAP at 1, 5, and 10 minutes: 100.0 ± 16.7 mmHg, 89.5 ± 14.8 mmHg, and 84.9 ± 12.0 mmHg vs 114.6 ± 10.1 mmHg, 103.3 ± 10.3 mmHg, and 93.5 ± 10.0 mmHg; $p < 0.001$ for each).[5] This finding suggests that gabapentin provides more stable hemodynamic responses and attenuates pressor surges during anesthetic induction and tracheal intubation. Similarly, Patrick and Tobias described intraoperative hypotension in pediatric patients receiving gabapentin, however they emphasized that the magnitude of this effect varies with age, dose, and concomitant anesthetic use.[12] These studies indicate that although both drugs may influence cardiovascular stability, lorazepam tends to cause greater and less predictable blood pressure fluctuations, whereas gabapentin demonstrates a milder and more controlled hemodynamic profile, supporting its potential use as a safer premedicantion option in patients at risk for hypotension.

The incidence of severe hypotension (MAP < 60 mmHg) was notably higher in the lorazepam group at 18%, compared to 7% in the gabapentin group. Additionally, patients administered lorazepam more frequently exhibited compensatory sympathetic responses, manifested as transient tachycardia, although some also experienced prolonged bradycardia, unlike those receiving gabapentin. These findings suggest that lorazepam exerts a stronger depressant effect on the vasomotor center compared to gabapentin, making the latter a more favorable option for patients at risk of hemodynamic instability.

This study found no statistically significant differences in heart rate at the first and fifth minutes following intubation between the gabapentin and lorazepam groups (p = 0.160 and p = 0.111, respectively). These findings are consistent with the study conducted by Akram et al., which also reported no significant differences in heart rate responses during intubation between patients premedicated with gabapentin and those receiving lorazepam.[5] Similar results were reported by Fassoulaki et al., who found no statistical differences in heart rate elevation following gabapentin administration compared to placebo.[13]

In the present trial there was no statistically significant differences in heart rate at 1 and 5 minutes after intubation between the gabapentin and lorazepam groups (p = 0.160 and p = 0.111, respectively). This finding aligns with recent pediatric-focused reviews and clinical reports indicating that the most consistent hemodynamic effect of gabapentin is on blood pressure and pressor responses rather than on heart rate. Several contemporary reviews and small clinical trials have reported significant attenuation of SBP, DBP and MAP after preoperative gabapentin administration, while changes in HR are variable and frequently not statistically significant. This could be derived from the heterogeneity in dosing, timing, patient age, and the use of concomitant agents. These observations support our result that gabapentin and lorazepam produce comparable heart-rate profiles in the first minutes after intubation.[14–17]

Recent evidence increasingly supports the role of oral gabapentin in blunting the hemodynamic stress response to laryngoscopy and tracheal intubation. A study by Kundra et al. reported that preoperative administration of gabapentin significantly reduced fluctuations in heart rate and blood pressure, demonstrating a sympatholytic action in clinical practice.[18] Similarly, Shrestha et al. observed a marked attenuation of mean arterial pressure and pulse rate among patients who received oral gabapentin compared with those given a placebo.[19] These findings align with the meta-analysis conducted by Doleman et al, which concluded that gabapentin lowers the incidence of hypertension and tachycardia requiring pharmacological intervention during intubation.[20] Furthermore, Gayathri et al. found that gabapentin provided hemodynamic stability comparable to clonidine, suggesting its potential as a safer and better tolerated premedication option.[21] Hence, these studies suggest that oral gabapentin, when administered prior to anesthetic induction, provides a reliable attenuation of sympathetic

responses to airway manipulation without causing significant cardiovascular side effects, supporting its use as a comparator to lorazepam in the present trial.

These results, together with evidences from the existing literatures, suggest that gabapentin is preferable in patients who require premedication with a lower risk of hypotension and more stable hemodynamic control. In contrast, lorazepam remains beneficial for patients who need more profound sedation. However, its administration should be accompanied by careful monitoring of blood pressure and heart rate.

Nevertheless, this study was limited by its relatively small sample size, which may affect the generalizability of the findings. Future studies involving larger sample sizes and possibly multicenter settings are recommended to confirm these results and provide more robust evidence.

CONCLUSION

Based on the study results, gabapentin was more effective than lorazepam in attenuating hemodynamic responses following tracheal intubation. Patients in the gabapentin group demonstrated significant reductions in systolic and diastolic blood pressure as well as mean arterial pressure, particularly at 1, 5, and 10 minutes post-intubation. In the other hand lorazepam did not show significant reduction in blood pressure after intubation, and was associated with a significant increase in systolic blood pressure at the first minute after intubation. Concerning heart rate stabilization, lorazepam showed better effectiveness than gabapentin, especially at minutes 1 and 5 after intubation. Gabapentin did not show significant effect on heart rate except after 10 minutes of intubation. Overall, gabapentin was more effective in maintaining blood pressure stability, whereas lorazepam was effective in controlling increases heart rate. Therefore, gabapentin may be considered as a more optimal premedication option in pediatric patients to prevent spikes in blood pressure due to tracheal intubation procedures.

CONFLICT OF INTEREST

The authors declare no conflict of interest during the conduct of this study and the writing of this manuscript.

ACKNOWLEDGMENTS

The authors would like to express their sincere gratitude to the Department of Anesthesiology and Intensive Therapy, Faculty of Medicine, Syiah Kuala University, Aceh, Indonesia, and to the surgical and nursing teams at Dr. Zainoel Abidin General Hospital (RSUDZA) Banda Aceh for their valuable support and collaboration during the study.

DATA AVAILABILITY

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request. Due to privacy and institutional restrictions, the raw patient data are not publicly available but can be accessed upon justified request for academic purposes.

SUPPLEMENTARY MATERIAL (S)

Additional supporting information related to this article can be provided by the corresponding author upon request.

AUTHOR CONTRIBUTION

E.M. conceived, designed, and supervised the study, analyzed the data, and was the primary author responsible for drafting and finalizing the manuscript. R. contributed to the design of the research methodology, data acquisition, and critical revision of the manuscript. Z.K.J. participated in developing the research methods and reviewing the scientific content of the manuscript. All authors read and approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

DECLARATION OF USING AI IN THE WRITING PROCESS

The authors confirm that all content, analysis, and interpretations are the original intellectual work of the authors and that AI did not influence the scientific conclusions of this study.

LIST OF ABBREVIATIONS

SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; MAP: Mean Arterial Pressure; HR: Heart Rate; SD : Standard Deviation; SPSS: Statistical Package for the Social Sciences.

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