Section: Anesthesiology

Original Research Article

DEXMEDETOMIDINE FOR PREVENTION OF EMERGENCE DELIRIUM FOLLOWING SEVOFLURANE ANAESTHESIA IN PAEDIATRIC SURGICAL PATIENTS: A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

Background: Emergence delirium (ED) is a common postoperative behavioural disturbance observed in children recovering from general anaesthesia, particularly following sevoflurane-based anaesthesia. It is characterized by agitation, inconsolability, crying, disorientation, and restlessness during the early recovery period. The incidence of ED has been reported to range from 10% to 80% and is associated with increased risk of self-injury, accidental removal of intravenous catheters, disruption of surgical dressings, prolonged post-anaesthesia care unit (PACU) stay, and increased parental anxiety. Dexmedetomidine, a highly selective α2-adrenergic receptor agonist, possesses sedative, analgesic, and anxiolytic properties and has emerged as a promising agent for preventing ED in paediatric patients. The objective is to evaluate the efficacy of intravenous dexmedetomidine in preventing emergence delirium in children undergoing surgery under general anaesthesia with sevoflurane. **Materials and Methods:** This prospective, double-blind, randomized controlled trial was conducted in 80 paediatric patients aged 2–7 years with American Society of Anesthesiologists (ASA) physical status I–II undergoing elective surgery under general anaesthesia. Patients were randomly allocated into two groups. Group A received dexmedetomidine 0.5 µg/kg diluted in 20 mL normal saline administered intravenously over 10 minutes after induction of anaesthesia, whereas Group B received an equal volume of normal saline. Standardized anaesthetic protocols were followed in all patients. Emergence delirium was assessed using the Paediatric Anaesthesia Emergence Delirium (PAED) scale. Secondary outcomes included postoperative pain assessed by FLACC score, sedation score, haemodynamic parameters, adverse events, and PACU stay. **Result:** Demographic characteristics were comparable between the groups. The incidence and severity of emergence delirium were significantly lower in patients receiving dexmedetomidine. Postoperative pain scores were reduced, and sedation scores indicated a smoother recovery profile in Group A compared with Group B. Haemodynamic parameters remained clinically stable, and no significant increase in adverse events was observed. **Conclusion:** Intravenous dexmedetomidine at a dose of 0.5 µg/kg effectively reduces the incidence and severity of emergence delirium in children undergoing surgery under sevoflurane anaesthesia. In addition, it provides favourable postoperative analgesia and sedation without significant haemodynamic instability or respiratory adverse effects. Dexmedetomidine may be considered a valuable adjunct for improving recovery quality in paediatric anaesthetic practice.

INTRODUCTION

Emergence delirium (ED), also referred to as emergence agitation, is a well-recognized postoperative behavioural disturbance observed in children during recovery from general anaesthesia. It is characterized by confusion, disorientation, restlessness, inconsolable crying, thrashing, and lack of awareness of the surrounding environment.[1-6] The incidence of ED in paediatric patients varies widely, ranging from 10% to 80%, depending on patient age, type of surgery, anaesthetic technique, and

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assessment methods used.[7-10] Although ED is usually self-limiting, it can result in significant postoperative complications, including self-injury, accidental removal of intravenous catheters, disruption of surgical dressings, increased nursing workload, delayed recovery, and considerable anxiety among parents and caregivers.[11-15]

Sevoflurane is one of the most commonly used inhalational anaesthetic agents in paediatric practice because of its pleasant odour, rapid induction, minimal airway irritation, and favourable recovery profile.[5,6] Its low blood-gas partition coefficient facilitates rapid emergence from anaesthesia, making it particularly suitable for short surgical procedures. However, this rapid recovery has also been associated with a higher incidence of emergence delirium compared with other anaesthetic agents.[5,14] The exact pathophysiology of sevoflurane-associated ED remains unclear, but several contributing factors have been proposed, including rapid awakening, postoperative pain, preoperative anxiety, young age, unfamiliar recovery environments, and neurophysiological effects of volatile anaesthetic agents.[14,15]

Various pharmacological strategies have been investigated to reduce the incidence of emergence delirium, including opioids, benzodiazepines, propofol, ketamine, melatonin, magnesium sulphate, and α2-adrenergic agonists.[5,14] Among these, dexmedetomidine has attracted considerable attention because of its unique pharmacological profile. Dexmedetomidine is a highly selective α2-adrenergic receptor agonist that produces sedation, anxiolysis, sympatholysis, and analgesia without causing significant respiratory depression.[2,6,7] Sedation produced by dexmedetomidine resembles natural sleep and allows easy arousability while maintaining cardiorespiratory stability.[6]

The beneficial effects of dexmedetomidine in paediatric anaesthesia have been demonstrated in several clinical settings, including premedication, procedural sedation, intensive care sedation, and prevention of emergence delirium.[6,7] Previous studies have reported that dexmedetomidine decreases the incidence and severity of ED, reduces postoperative analgesic requirements, and improves the quality of recovery.[3,4,8,9] However, differences in dosage, timing of administration, surgical procedures, and study populations have resulted in varying outcomes across studies.[5,10]

Considering the clinical significance of emergence delirium and the potential advantages of dexmedetomidine, further evaluation of its effectiveness in children undergoing surgery under sevoflurane anaesthesia remains important. Therefore, the present prospective, double-blind, randomized controlled trial was conducted to evaluate the efficacy of intravenous dexmedetomidine in preventing emergence delirium in paediatric patients undergoing surgery under general anaesthesia with sevoflurane. In addition to the incidence of emergence delirium, postoperative pain, sedation profile, haemodynamic parameters, adverse events, and duration of post-anaesthesia care unit stay were also assessed.

MATERIALS AND METHODS

Study Design and Setting: This prospective, double-blind, randomized controlled trial was conducted in the Department of Anaesthesiology, Virudhunagar Government Medical College, Virudhunagar, Tamil Nadu, India, from April 2025 to April 2026. A total of 80 paediatric patients aged 2–7 years with American Society of Anesthesiologists (ASA) physical status I–II undergoing elective surgery under general anaesthesia with sevoflurane were enrolled. Patients were randomly allocated into two groups using a sealed-envelope randomization method. The study was undertaken to evaluate the efficacy of intravenous dexmedetomidine in preventing emergence delirium and improving postoperative recovery.

Study Population: A total of 80 paediatric patients aged between 2 and 7 years scheduled for elective surgery under general anaesthesia were enrolled in the study. Children belonging to the American Society of Anesthesiologists (ASA) physical status I or II were considered eligible for participation.

Sample Size: A total of 80 paediatric patients were included in the study. Based on sample size calculation and eligibility criteria, 40 patients were allocated to Group A (Dexmedetomidine group) and 40 patients were allocated to Group B (Control group). The sample size was considered adequate to detect a clinically significant difference in the incidence of emergence delirium between the two groups with a confidence level of 95% and a study power of 80%.

Inclusion Criteria

1. Age between 2 and 7 years.
2. ASA physical status I or II.
3. Elective surgical procedures requiring general anaesthesia.
4. Written informed consent obtained from parents or guardians.

Exclusion Criteria

1. Emergency surgical procedures.
2. History of neurological or psychiatric disorders.
3. Weight greater than 40 kg.
4. Significant cardiovascular, respiratory, renal, or hepatic disease.
5. Known hypersensitivity or allergy to dexmedetomidine.
6. Developmental delay or cognitive impairment affecting postoperative assessment.

Randomization and Blinding: After obtaining informed consent and confirming eligibility, the enrolled patients were randomly assigned into two groups in a 1:1 ratio using a sealed opaque envelope

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randomization method. A total of 80 patients were included, with 40 patients allocated to Group A (Dexmedetomidine group) and 40 patients allocated to Group B (Control group). Group A received dexmedetomidine 0.5 μg/kg diluted in 20 mL of normal saline, whereas Group B received an equal volume of normal saline. The study drugs were prepared in identical syringes by an anaesthesiologist who was not involved in patient management or data collection. Both the patients and their parents were unaware of the treatment allocation. The anaesthesiologist administering anaesthesia, the postoperative observer assessing outcomes, and the nursing staff were also blinded to the group assignment. Thus, the study was conducted using a double-blind design to minimize selection and observer bias.

Group Allocation

Group A (Dexmedetomidine Group): Patients allocated to Group A (n = 40) received dexmedetomidine 0.5 μg/kg diluted in 20 mL of normal saline administered intravenously over 10 minutes following induction of general anaesthesia. The study drug was prepared in identical syringes and administered under standardized anaesthetic conditions.

Group B (Control Group): Patients allocated to Group B (n = 40) received 20 mL of normal saline administered intravenously over 10 minutes following induction of general anaesthesia. The placebo solution was prepared in identical syringes to maintain blinding and was administered using the same protocol as Group A.

Anaesthetic Protocol: All patients were kept nil per oral according to standard fasting guidelines and were shifted to the operating room after confirming eligibility. Standard monitoring, including electrocardiography (ECG), non-invasive blood pressure (NIBP), heart rate (HR), and peripheral oxygen saturation (SpO_2), was instituted and baseline values were recorded. Intravenous access was secured, and fentanyl 2 μg/kg was administered intravenously. Anaesthesia was induced using 5–8% sevoflurane in a mixture of 50% oxygen and 50% nitrous oxide via face mask. After achieving adequate depth of anaesthesia, endotracheal intubation was facilitated with intravenous succinylcholine 2 mg/kg. Following induction, patients received the allocated study drug according to their group assignment. Anaesthesia was maintained with sevoflurane under controlled ventilation, and haemodynamic parameters were monitored throughout the procedure. Intravenous paracetamol 15 mg/kg was administered for postoperative analgesia before the completion of surgery. At the end of the procedure, residual neuromuscular blockade was reversed with neostigmine 0.04 mg/kg and glycopyrrolate 0.01 mg/kg, followed by extubation after adequate spontaneous respiration and airway reflex recovery.

Postoperative Management: Following completion of surgery, all patients were transferred to the Post-Anaesthesia Care Unit (PACU) for monitoring and recovery. Postoperative analgesia was provided with intravenous paracetamol 15 mg/kg administered approximately 15 minutes before the end of surgery. Emergence delirium was assessed using the Paediatric Anaesthesia Emergence Delirium (PAED) scale, while pain was evaluated using the FLACC scale. Sedation was assessed using the Brussels Sedation Score. Haemodynamic parameters, including heart rate, blood pressure, and oxygen saturation, were continuously monitored. Adverse events such as bradycardia, hypotension, oxygen desaturation, laryngospasm, severe coughing, and postoperative nausea and vomiting were recorded. Patients remained in the PACU until they achieved a Modified Aldrete Score of ≥9 and were considered fit for transfer to the ward.

Outcome Measures

Primary Outcome: The primary outcome of the study was the incidence of emergence delirium within 30 minutes following extubation. Emergence delirium was assessed using the Paediatric Anaesthesia Emergence Delirium (PAED) scale. A PAED score of ≥10 was considered indicative of emergence delirium, while a score of ≥15 was considered severe emergence delirium.

Secondary Outcomes: The secondary outcomes included postoperative pain assessed using the Face, Legs, Activity, Cry, and Consolability (FLACC) scale, sedation level assessed using the Brussels Sedation Score, and perioperative haemodynamic parameters including heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, and oxygen saturation. The incidence of adverse events such as bradycardia, hypotension, oxygen desaturation, laryngospasm, severe coughing, and postoperative nausea and vomiting was also recorded. In addition, the duration of post-anaesthesia care unit (PACU) stay was assessed until patients achieved a Modified Aldrete Score of ≥9.

Ethical Considerations: The study was conducted after obtaining approval from the Institutional Ethics Committee of Virudhunagar Government Medical College. Written informed consent was obtained from the parents or legal guardians of all participating children prior to enrolment in the study. Confidentiality and anonymity of patient information were strictly maintained throughout the study. The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and Good Clinical Practice guidelines.

Statistical Analysis: The collected data were entered into a Microsoft Excel spreadsheet and analysed using Statistical Package for Social Sciences (SPSS) software version 16.0. Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages. Comparison of continuous variables between the two groups was performed using the student's independent t-test. Categorical variables were analysed using the Chi-square test or Fisher's exact test wherever appropriate. A p-value of less than 0.05 was considered statistically significant.

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RESULTS

A total of 80 paediatric patients aged 2–8 years who fulfilled the inclusion criteria were enrolled in the study and randomly allocated into two equal groups. Group A received intravenous dexmedetomidine 0.5 µg/kg diluted in normal saline, while Group B received an equal volume of normal saline. All patients completed the study protocol and were included in the final analysis. There were no protocol deviations, dropouts, or exclusions following randomization.

Baseline Characteristics: The demographic and clinical characteristics of patients in both groups were comparable. The mean age of patients in Group A was 4.33 ± 1.54 years, whereas the mean age in Group B was 4.80 ± 1.62 years (p = 0.183). The mean body weight was 16.02 ± 3.81 kg in Group A and 16.32 ± 4.35 kg in Group B (p = 0.750). Gender distribution was similar between the groups, with males constituting 55.0% and 50.0% of patients in Groups A and B, respectively (p = 0.823). The majority of patients belonged to ASA physical status I in both groups, and the mean duration of surgery was comparable (p = 0.826). These findings confirmed successful randomization and baseline homogeneity of the study population.

Table 1: Baseline Characteristics of the Study Population

Variable	Group A (n=40)	Group B (n=40)	p-value
Age (years), Mean ± SD	4.33 ± 1.54	4.80 ± 1.62	0.183
Weight (kg), Mean ± SD	16.02 ± 3.81	16.32 ± 4.35	0.750
Male, n (%)	22 (55.0)	20 (50.0)	0.823
Female, n (%)	18 (45.0)	20 (50.0)	0.823
ASA I, n (%)	39 (97.5)	38 (95.0)	0.967
ASA II, n (%)	1 (2.5)	2 (5.0)	0.967
Duration of surgery (minutes), Mean ± SD	75.75 ± 15.17	75.00 ± 15.19	0.826

Table Note: Baseline demographic and clinical characteristics were comparable between the two groups. No statistically significant differences were observed in age, weight, gender distribution, ASA physical status, or duration of surgery (p>0.05).

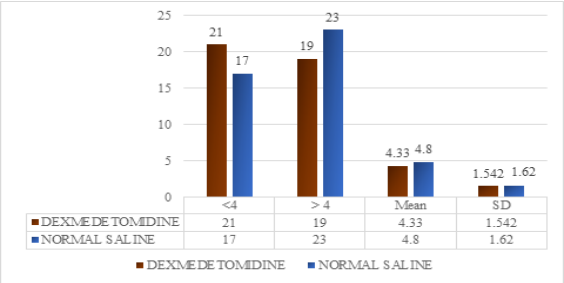

Figure 1: Age Distribution of Patients Included in the Study

Figure Note: Values are expressed as number of patients and percentages. Age distribution was comparable between Group A and Group B, indicating homogeneity of the study population at baseline. Statistical analysis showed no significant difference in mean age between the groups (Student's t-test, p = 0.183).

Emergence Delirium: The incidence of emergence delirium was significantly lower among patients who received dexmedetomidine. Emergence delirium occurred in only 5 patients (12.5%) in Group A compared with 30 patients (75.0%) in Group B (p<0.001). Assessment using the Paediatric Anaesthesia Emergence Delirium (PAED) scale demonstrated significantly lower scores in Group A throughout the postoperative observation period.

At extubation, the mean PAED score was 8.48 ± 0.88 in Group A compared with 13.10 ± 1.09 in Group B. At 15 minutes post-extubation, the mean PAED score decreased to 6.30 ± 1.00 in Group A but remained elevated at 9.80 ± 0.64 in Group B. At 30 minutes, the PAED score further decreased to 3.10 ± 0.72 in Group A, whereas it remained 9.00 ± 0.74 in Group B. The differences between groups were statistically significant at all assessment intervals (p<0.001).

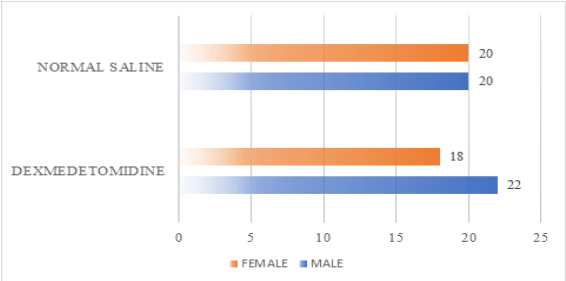

Figure 2: Gender Distribution of Patients Included in the Study

Figure Note: Values are expressed as number of patients and percentages. Gender distribution was comparable between Group A and Group B, indicating successful randomization and homogeneity of the study population. Statistical analysis showed no significant difference in gender distribution between the groups (Chi-square test, p = 0.823).

Table 2: Incidence of Emergence Delirium and PAED Scores

Variable	Group A (n=40)	Group B (n=40)	p-value
Emergence Delirium, n (%)	5 (12.5)	30 (75.0)	<0.001
No Emergence Delirium, n (%)	35 (87.5)	10 (25.0)	<0.001
PAED Score at Extubation	8.48 ± 0.88	13.10 ± 1.09	<0.001
PAED Score at 15 min	6.30 ± 1.00	9.80 ± 0.64	<0.001
PAED Score at 30 min	3.10 ± 0.72	9.00 ± 0.74	<0.001

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Table Note: Group A demonstrated a significantly lower incidence of emergence delirium and significantly lower PAED scores at all postoperative time points when compared with Group B ($p<0.001$).

Postoperative Pain and Sedation: Postoperative pain was assessed using the FLACC scale. Group A exhibited significantly lower pain scores throughout the recovery period. At extubation, the mean FLACC score was 3.10 ± 0.55 in Group A compared with 6.80 ± 0.66 in Group B ($p<0.001$). At 15 minutes post-extubation, the mean FLACC score in Group A had decreased to zero, whereas patients in Group B continued to demonstrate moderate pain scores. Similar findings persisted at 30 minutes postoperatively.

Sedation was evaluated using the Brussels Sedation Score. Patients in Group A achieved an ideal level of postoperative sedation with scores ranging between 3 and 4, indicating calm and easily arousable children. In contrast, Group B patients consistently demonstrated sedation scores of 5 during the early recovery period, reflecting agitation and undersedation. The differences in sedation scores between the groups remained statistically significant throughout the postoperative observation period ($p<0.001$).

Table 3: Comparison of Postoperative Pain and Sedation Scores

Variable	Group A	Group B	p-value
FLACC Score at Extubation	3.10 ± 0.55	6.80 ± 0.66	<0.001
FLACC Score at 15 min	0.00 ± 0.53	5.60 ± 0.76	<0.001
FLACC Score at 30 min	0.00 ± 0.50	4.00 ± 0.47	<0.001
Sedation Score at Extubation	3.0 ± 0.0	5.0 ± 0.0	<0.001
Sedation Score at 15 min	3.8 ± 0.24	5.0 ± 0.0	<0.001
Sedation Score at 30 min	4.0 ± 0.39	4.5 ± 2.2	<0.001

Table Note: Group A experienced significantly lower postoperative pain scores and achieved optimal sedation levels, whereas patients in Group B demonstrated persistent agitation and undersedation during the early recovery period.

Haemodynamic Parameters and Recovery Characteristics: Preoperative heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, respiratory rate, and oxygen saturation were comparable between the groups ($p>0.05$). Following administration of dexmedetomidine, Group A demonstrated a significant reduction in heart rate, systolic blood pressure, diastolic blood pressure, and mean arterial pressure between 3 and 15 minutes compared with Group B ($p<0.001$). However, all haemodynamic changes remained within clinically acceptable limits and did not require pharmacological intervention.

The duration of stay in the post-anaesthesia care unit (PACU) was similar between the groups. The mean PACU stay was 36.6 ± 3.19 minutes in Group A and 35.5 ± 3.25 minutes in Group B ($p=0.345$). No clinically significant adverse events such as postoperative nausea and vomiting, laryngospasm, severe coughing, oxygen desaturation, or severe bradycardia requiring treatment were observed in either group. These findings indicate that dexmedetomidine was well tolerated and did not adversely affect postoperative recovery.

Table 4: Haemodynamic Changes and Recovery Characteristics

Variable	Group A	Group B	p-value
Significant Reduction in Heart Rate (3–15 min)	Present	Absent	<0.001
Significant Reduction in SBP (3–15 min)	Present	Absent	<0.001
Significant Reduction in DBP (3–15 min)	Present	Absent	<0.001
Significant Reduction in MAP (3–15 min)	Present	Absent	<0.001
PACU Stay (minutes), Mean ± SD	36.6 ± 3.19	35.5 ± 3.25	0.345

Table Note: Dexmedetomidine administration resulted in transient reductions in haemodynamic parameters during the intraoperative period; however, these changes remained clinically insignificant. PACU stay was comparable between the groups, indicating that dexmedetomidine did not prolong recovery.

Summary of Findings: The administration of intravenous dexmedetomidine 0.5 µg/kg significantly reduced the incidence and severity of emergence delirium in children undergoing surgery under sevoflurane anaesthesia. Dexmedetomidine was associated with lower PAED and FLACC scores, improved postoperative sedation, stable haemodynamic parameters, and no prolongation of PACU stay. These findings support the efficacy and safety of dexmedetomidine as a preventive strategy for emergence delirium in paediatric patients undergoing general anaesthesia with sevoflurane.

DISCUSSION

Emergence delirium (ED) is a common and distressing behavioural disturbance observed during recovery from general anaesthesia in children, particularly following the use of sevoflurane. It is characterized by agitation, confusion, inconsolability, and disorientation, which may lead to self-injury, accidental removal of intravenous lines, increased parental anxiety, and delayed recovery. Various pharmacological strategies have been investigated to reduce the incidence of ED, among

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which dexmedetomidine has gained considerable attention because of its sedative, analgesic, and anxiolytic properties without causing significant respiratory depression.[6,14]

The present randomized controlled trial evaluated the effectiveness of intravenous dexmedetomidine 0.5 μg/kg in preventing emergence delirium in paediatric patients undergoing surgery under sevoflurane anaesthesia. The findings demonstrated that dexmedetomidine significantly reduced both the incidence and severity of emergence delirium. Only 12.5% of children in Group A developed ED compared with 75% in Group B ($p<0.001$). Furthermore, PAED scores were significantly lower at all postoperative assessment intervals in the dexmedetomidine group. These findings indicate that dexmedetomidine provides a smoother emergence profile and facilitates a calmer postoperative recovery.

The results of the present study are consistent with those reported by Ibacache et al., who demonstrated that dexmedetomidine significantly reduced emergence agitation following sevoflurane anaesthesia in children undergoing ambulatory surgery.[3] Similarly, Shukry and Miller reported a marked reduction in emergence delirium with dexmedetomidine administration, attributing its beneficial effects to central α2-adrenergic receptor stimulation and attenuation of sympathetic activity.[2] Patel et al. also observed significantly lower PAED scores and improved postoperative behaviour among children receiving dexmedetomidine during adenotonsillectomy procedures.[4] These findings collectively support the role of dexmedetomidine as one of the most effective agents for prevention of sevoflurane-related emergence delirium.

In addition to reducing emergence delirium, dexmedetomidine significantly improved postoperative analgesia in the present study. FLACC scores were substantially lower in Group A at all postoperative time points, with pain scores approaching zero within 15 minutes after extubation. Effective pain control is an important factor influencing the occurrence of emergence delirium because pain and agitation often coexist during the early recovery period.[15] The analgesic action of dexmedetomidine is mediated through activation of α2 receptors in the locus coeruleus and spinal cord, resulting in inhibition of nociceptive neurotransmission. Similar findings were reported by Sato et al. and Guler et al., who demonstrated reduced postoperative analgesic requirements and lower pain scores among paediatric patients receiving dexmedetomidine.[8,11]

Sedation quality was another important finding of this study. Patients in Group A maintained Brussels Sedation Scores between 3 and 4, representing calm and easily arousable children, whereas patients in Group B frequently exhibited agitation and undersedation with scores of 5 during the early postoperative period. Appropriate sedation during emergence is essential to ensure patient comfort and safety. The sedative effect of dexmedetomidine resembles natural sleep through selective activation of α2 receptors in the locus coeruleus, thereby providing cooperative sedation without significant respiratory depression.[6] Similar observations have been reported by Mason and Lerman, who highlighted the unique sedative profile of dexmedetomidine in paediatric anaesthesia.[6]

The haemodynamic effects observed in the present study were expected and clinically acceptable. Group A demonstrated a transient reduction in heart rate, systolic blood pressure, diastolic blood pressure, and mean arterial pressure during the first 15 minutes following dexmedetomidine administration. However, none of the patients required pharmacological treatment for bradycardia or hypotension, and all haemodynamic parameters remained within physiological limits. These findings are comparable to those reported by Mahmoud and Mason, who noted mild reductions in heart rate and blood pressure following dexmedetomidine administration without clinically significant cardiovascular compromise.[7]

An important observation in the present study was that dexmedetomidine did not prolong postoperative recovery. The duration of PACU stay was similar in both groups (36.6 ± 3.19 minutes versus 35.5 ± 3.25 minutes; $p=0.345$). This finding is clinically relevant because concerns regarding delayed discharge often limit the routine use of sedative medications in ambulatory paediatric surgery. Similar results have been reported by Peng et al. and Lin et al., who demonstrated that low-dose dexmedetomidine effectively prevents emergence delirium without delaying recovery or discharge readiness.[9,10]

The overall findings of the present study reinforce the growing body of evidence supporting dexmedetomidine as an effective adjunct in paediatric anaesthesia. By reducing emergence delirium, improving postoperative analgesia, providing optimal sedation, and maintaining haemodynamic stability without prolonging PACU stay, dexmedetomidine offers multiple perioperative benefits. The observed reduction in emergence delirium from 75% to 12.5% highlights its substantial clinical utility and supports its routine consideration in children receiving sevoflurane anaesthesia.

In summary, the findings of the present study are in agreement with contemporary literature and further strengthen the evidence that intravenous dexmedetomidine 0.5 μg/kg is a safe and effective intervention for preventing emergence delirium in paediatric patients undergoing surgery under sevoflurane-based general anaesthesia. Its favourable effects on pain control, sedation quality, and recovery characteristics make it a valuable component of modern paediatric anaesthetic practice.[3,6,7,10]

Strengths And Limitations

Strengths of the Study: The present study was a prospective randomized controlled trial with adequate sample size and standardized anaesthetic protocol, which minimized selection and

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performance bias. Emergence delirium was assessed using the validated Paediatric Anaesthesia Emergence Delirium (PAED) scale, while postoperative pain and sedation were evaluated using established FLACC and Brussels Sedation Scales. The study also assessed multiple clinically relevant outcomes including emergence delirium, pain, sedation, haemodynamic changes, adverse events, and recovery characteristics, thereby providing a comprehensive evaluation of the effects of dexmedetomidine in paediatric patients undergoing sevoflurane anaesthesia.

Limitations of the Study: The present study has certain limitations. First, it was conducted at a single tertiary care centre, which may limit the generalizability of the findings to other institutions and patient populations. Second, the sample size was relatively small, and larger multicentric studies are required to validate the results. Third, only one dose of dexmedetomidine (0.5 µg/kg) was evaluated; therefore, the optimal dose for prevention of emergence delirium could not be determined. Fourth, postoperative follow-up was limited to the immediate recovery period, and long-term behavioural outcomes were not assessed. Finally, the study included only children undergoing elective surgeries under sevoflurane anaesthesia, which may restrict extrapolation of the findings to other surgical procedures, emergency surgeries, or anaesthetic techniques.

CONCLUSION

The present randomized controlled study demonstrated that intravenous dexmedetomidine at a dose of 0.5 µg/kg significantly reduced the incidence and severity of emergence delirium in paediatric patients undergoing elective surgery under sevoflurane anaesthesia. Children in Group A exhibited significantly lower PAED scores and a markedly lower incidence of emergence delirium (12.5%) compared with Group B (75%). In addition, dexmedetomidine provided superior postoperative analgesia, as evidenced by significantly lower FLACC scores, and facilitated a smoother recovery by maintaining optimal sedation levels during the immediate postoperative period.

Although dexmedetomidine was associated with transient reductions in heart rate and blood pressure, these haemodynamic changes remained within clinically acceptable limits and did not require intervention. Furthermore, the duration of PACU stay was comparable between the two groups, indicating that dexmedetomidine did not delay postoperative recovery. Therefore, intravenous dexmedetomidine 0.5 µg/kg can be considered a safe and effective adjunct for the prevention of emergence delirium in children undergoing surgery under sevoflurane-based general anaesthesia and may be incorporated into routine paediatric anaesthetic practice to improve perioperative outcomes.

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