Journal of Chemical Health Risks

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JCHR (2025) 15(5), 811-817 | ISSN:2251-6727

Prevalence of Emergence Delirium in Paediatric Patients Undergoing Elective Surgery in Tertiary Care Centre in Chengalpet District: A Cross-Sectional Study

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Received Date: 20/06/2025 ***Revised Date: 22/07/2025*** ***Accepted Date: 25/08/2025***

KEYWORDS

Emergence Delirium (ED), Pediatric Anesthesia, Tonsillectomy and Adenoidectomy (T&A), PAED Score

ABSTRACT:

Background: Emergence delirium (ED) is a transient, post-anesthetic behavioral disturbance predominantly observed in pediatric patients, particularly following procedures under general anesthesia. Despite its short duration, ED can be distressing and may complicate postoperative recovery.

Aim: To determine the prevalence of ED in children undergoing tonsillectomy and adenoidectomy (T&A) and evaluate associated risk factors, recovery profiles, and the impact of intraoperative variables such as fentanyl use.

Methods: A cross-sectional observational study was conducted over 18 months at a tertiary care center in Chengalpattu District, South India. A total of 114 pediatric patients aged 2–18 years scheduled for elective T&A under general anesthesia were enrolled. The Pediatric Anesthesia Emergence Delirium (PAED) score was used to assess ED postoperatively. Demographic details, ASA status, OSA severity, anesthetic duration, and recovery times were recorded and analyzed.

Results: The overall prevalence of ED was 1.3%. Male patients and those in the toddler and preschooler age groups were more susceptible to ED. ED incidence was higher in children receiving intraoperative fentanyl, who also demonstrated prolonged anesthesia and recovery durations. ASA status and surgical indication did not significantly influence ED rates.

Conclusion: The incidence of ED in this cohort was lower than globally reported rates. Male gender, younger age, and fentanyl use were notable risk factors. These findings highlight the importance of perioperative planning and tailored anesthetic approaches to minimize ED, especially in high-risk pediatric populations. Further prospective studies are needed to standardize ED assessment and prevention.

INTRODUCTION

Emergence delirium (ED) is a common postoperative complication in pediatric patients undergoing general anesthesia, with incidence rates ranging from 10% to 80%. It is marked by transient behavioral disturbances and psychomotor agitation during the emergence phase, typically lasting 30–45 minutes and resolving without intervention.[1,2] Contributing factors include younger age, high preoperative anxiety, baseline behavioral issues, use of volatile anesthetics, and certain surgeries—particularly otolaryngologic procedures like adenotonsillectomy, which show a higher ED prevalence.[5] Poor pain control can both precipitate and result from ED, complicating recovery. Clinically, ED presents as a dissociative state with agitation, crying, thrashing, or incoherent speech, where the child is

Journal of Chemical Health Risks

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JCHR (2025) 15(5), 811-817 | ISSN:2251-6727

inconsolable and uncooperative during the early postoperative period.[7,8]

MATERIAL AND METHODS

This cross-sectional study was conducted over a period of 18 months at a tertiary care hospital in Ammapettai, Chengalpattu district, South India. The study included pediatric patients aged 2 to 18 years posted for elective surgery under general anesthesia (GA), classified as ASA I or II. Exclusion criteria included ASA III, lower respiratory tract infections, mental retardation, CNS abnormalities, and congenital anomalies.[9] The anesthesia protocol included preoperative midazolam (oral/IV), sevoflurane induction, propofol and fentanyl administration, and possible use of neuromuscular blockers. Maintenance was achieved using sevoflurane with oxygen and air or nitrous oxide. All patients received acetaminophen, dexamethasone, and ondansetron; reversal of neuromuscular blockade was done using neostigmine or sugammadex. Postoperatively, pain was assessed using FLACC or FACES scales, and managed with ibuprofen ± opioids. The PAED score was calculated in the PACU before analgesic administration; a score ≥10 indicated emergence delirium (ED). Data collected included age, gender, ASA status, anesthesia duration, PACU recovery times, comorbidities, and PAED scores. Age groups were categorized as toddlers (1–3 years), preschoolers (3–5 years), and middle childhood (6–18 years). The prevalence of ED and its association with demographic and clinical variables was evaluated.[14,15]Sample size was calculated as 114, based on a 29.8% prevalence rate and 9% precision. Data were entered in MS Excel and analyzed using SPSS v17. Statistical tests included chi-square, Fisher's exact, t-tests, and Mann-Whitney U-tests, with a significance level of $p<0.05$. Ethical approval was obtained, informed consent collected, and confidentiality maintained in adherence with the Declaration of Helsinki.

RESULTS

In a cross-sectional study of 114 pediatric patients undergoing elective surgery under general anesthesia, the overall prevalence of emergence delirium (ED) was low at 1.3%. Gender-based analysis revealed a higher prevalence among males (1.6%) than females (0.9%), with a statistically significant difference ($p = 0.03$). Age-wise, toddlers exhibited the highest ED incidence (2.9%), followed by preschoolers (1.5%), while middle childhood and teenagers had notably lower rates (0.7% and 0.8%, respectively), indicating younger children are more susceptible. ED prevalence varied slightly across clinical diagnoses—highest in recurrent tonsillitis (1.8%) and lowest in combined diagnoses (0.9%)—though not statistically significant ($p = 0.6$). ASA status also showed no meaningful impact on ED incidence. Recovery data revealed that males and fentanyl users had significantly longer anesthesia times, with fentanyl users also showing higher PAED scores and delayed recovery, suggesting a link between fentanyl and more pronounced ED. Patients with combined tonsillitis and SDB or mild OSA also had significantly longer anesthesia durations ($p = 0.03$). No ED was observed in patients with ASA I, isolated tonsillitis, or severe OSA. These results highlight age, gender, use of fentanyl, and airway comorbidities as potential influencers of ED and recovery in pediatric surgical patients.[17]

Table 1: Demographic and Clinical Characteristics of Study Participants

Parameter	Subgroups	ED Prevalence (%)	p-value
Total Participants (n = 114)	—	1.3%	—
Gender	Male (n=61) / Female (n=53)	1.6% / 0.9%	0.03
Age Group	Toddler / Preschooler / Middle Childhood / Teenager	2.9 / 1.5 / 0.7 / 0.8	—
Diagnosis	Recurrent Tonsillitis / SDB / Both	1.8 / 1.3 / 0.9	0.6

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JCHR (2025) 15(5), 811-817 | ISSN:2251-6727

ASA Status	ASA I / ASA II	1.4 / 1.2	0.9
OSA Severity	Mild / Moderate / Severe	1.3 / 1.2 / —	—

Table 2: Recovery Parameters by Subgroups

Group	PAED Score (Mean ± SD)	Anesthesia Time (min)	Phase I Recovery (min)	Phase II Recovery (min)
Gender	Male: 15 ± 3 / Female: 14 ± 3	40 ± 15 / 32 ± 15	100 ± 48 / 92 ± 68	115 ± 55 / 119 ± 29
Fentanyl Use	Yes: 15 ± 3 / No: 14 ± 3	70 ± 14 / 32 ± 15	94 ± 14 / 92 ± 68	127 ± 54 / 119 ± 29
Diagnosis	SDB: 14 ± 3 / Tonsillitis + SDB: 15 ± 3	32 ± 15 / 40 ± 15	92 ± 68 / 100 ± 48	119 ± 29 / 115 ± 55
OSA Severity	Mild: 15 ± 3 / Moderate: 14 ± 3	40 ± 15 / 32 ± 15	100 ± 48 / 92 ± 68	115 ± 55 / 119 ± 29

Table:3 Prevalance of ED by ASA status

Patient Group	Number of Subjects	Prevalence of Emergence Delirium	p-Value
ASA Status			
ASA I	69	1.4%	p = 0.9
ASA II	45	1.2%	

Table:4 Prevalance of ED by diagnosis

Patient Group	Number of Subjects	Prevalence of Emergence Delirium	p-Value
Diagnosis			
Recurrent tonsillitis/pharyngitis	25	1.8%	p = 0.6
Obstructive sleep-disordered breathing (SDB)	45	1.3%	
Recurrent tonsillitis/pharyngitis + SDB	44	0.9%	

Table 5: Prevalance of ED by Gender

Patient Group	Number of Subjects	Prevalence of Emergence Delirium	Approximate Number with ED	p-Value

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JCHR (2025) 15(5), 811-817 | ISSN:2251-6727

Entire cohort	114	1.3%	1–2	—
Gender				
Male	61	1.6%	1	p = 0.03
Female	53	0.9%	0–1	—

Table:6 Prevalence of ED by Age group

Age Group	Prevalence of Emergence Delirium (ED) (%)
Toddler	2.9%
Preschooler	1.5%
Middle Childhood	0.7%
Teenager	0.8%

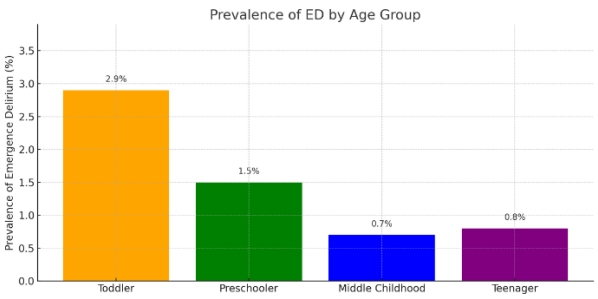
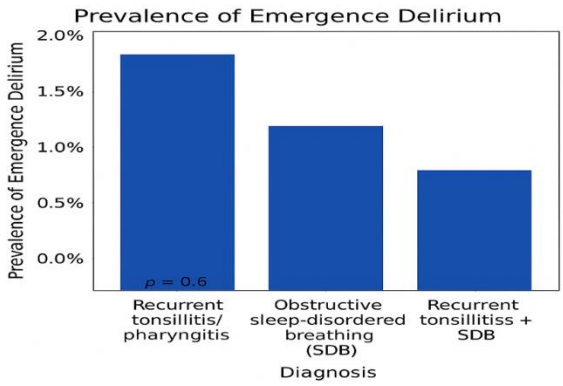


Figure:1



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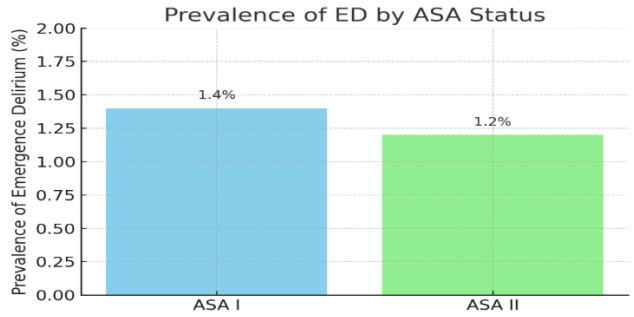

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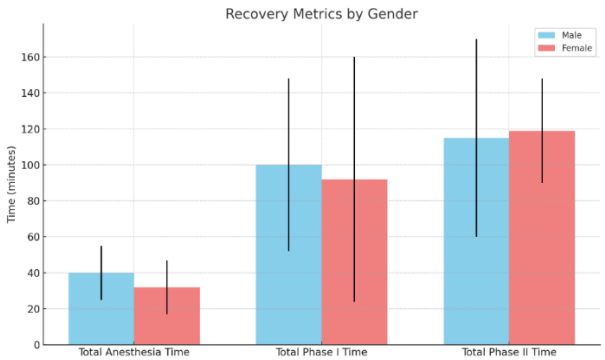

Figure 4: Recovery time difference in each Gender

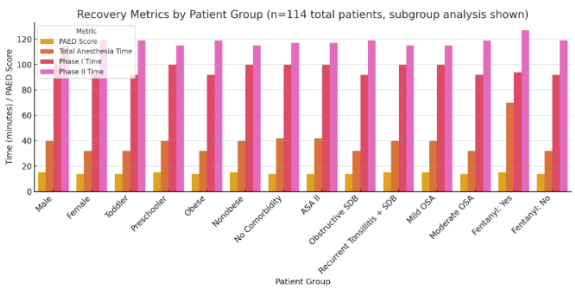

Figure:5

DISCUSSION

In this study, the prevalence of emergence delirium (ED) was 1.3% among children undergoing tonsillectomy and

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JCHR (2025) 15(5), 811-817 | ISSN:2251-6727

adenoidectomy much lower than the 10%–80% range typically reported in pediatric anesthesia. This reduced incidence may be attributed to variations in patient profiles, anesthesia protocols, and potential underreporting by recovery staff. Younger children, especially toddlers and preschoolers, were more prone to ED, supporting existing literature linking age with increased susceptibility.[20] Male gender also showed a higher association with ED and longer anesthesia durations. However, ASA status and surgical indication did not significantly affect ED rates. Despite the low incidence, these findings highlight the importance of age- and gender-specific perioperative strategies. Study limitations include lack of data on preoperative anxiety, behavioral history, and variability in anesthetic agents used. The subjective nature of PAED scoring further limits generalizability. Standardized ED assessment and future prospective studies are needed to better predict, prevent, and manage ED in pediatric surgical populations.[22,23]

STRENGTHS

This study's strengths include its focused assessment of emergence delirium (ED) in a defined pediatric surgical group using a structured cross-sectional design at a tertiary care center. Standardized anesthetic protocols and consistent intraoperative and postoperative monitoring improved data reliability. The inclusion of demographic details, ASA status, and anaesthesia and recovery durations offered a well-rounded analysis of ED-related factors. Moreover, it provides valuable regional data on ED prevalence, addressing a gap in existing literature within Indian paediatric surgical settings.

LIMITATIONS

This study had several limitations. Its retrospective nature relied on existing documentation, risking underreporting of emergence delirium (ED). Key variables such as preoperative anxiety, behavioral traits, and provider-patient interaction quality were not assessed. Variability in anesthetic agents and subjective PAED score interpretation further affected consistency. Additionally, small sample sizes in certain subgroups, such as severe OSA or ASA I patients, limited the generalizability and statistical strength of subgroup analyses, reducing the robustness of the study's overall conclusions.[14]

CONCLUSION

The study reported a 1.3% incidence of emergence delirium (ED) in children undergoing tonsillectomy and adenoidectomy. ED was more common in male toddlers and preschoolers, with longer anesthesia durations. ASA I status correlated with prolonged Phase I recovery. Future studies are needed to refine prevention and management strategies.

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JCHR (2025) 15(5), 811-817 | ISSN:2251-6727

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