JHWCR JOURNAL OF HEALTH, WELLNESS AND COMMUNITY RESEARCH 3007-0570

Original Article Volume 4, Issue 2

Comparative Assessment of Propofol and Sevoflurane for Insertion of Laryngeal Mask Airway in Children

Ashan Akhtar[1], Muhammad Mudassar[1], Taimoor Riaz Ullah[1], Saqib Hussain Dar[1], Awais Akhtar[1], Inam Ullah[1]

[1] The University of Lahore, Lahore, Pakistan

* Correspondence: Inam Ullah, inamkhanswat1276@gmail.com

ABSTRACT

Background: *Optimal insertion conditions for laryngeal mask airway (LMA) are essential in pediatric anesthesia to reduce repeated attempts and airway reflex–mediated complications, yet the relative performance of intravenous propofol versus inhalational sevoflurane for LMA insertion remains clinically debated.* ***Objective:*** *To compare propofol and sevoflurane for first-attempt LMA insertion success, induction/insertion characteristics, hemodynamic changes, perioperative complications, recovery profile, postoperative agitation, and parental satisfaction in children.* ***Methods:*** *This comparative cross-sectional observational study included 66 ASA I–II children aged 2–12 years undergoing short elective surgery, allocated by routine clinical practice to propofol (2–3 mg/kg IV; n=33) or sevoflurane (8% in 100% oxygen; n=33). Standardized timings (induction to eyelash reflex loss, jaw relaxation, LMA insertion) and peri-induction hemodynamic changes were recorded; complications, emergence/recovery times, agitation, and parental satisfaction were assessed in PACU.* ***Results:*** *First-attempt LMA success was 90.9% (30/33) with propofol versus 78.8% (26/33) with sevoflurane (RR 1.15; p=0.18). Propofol shortened induction (35±8 vs 78±15 s), jaw relaxation (42±10 vs 65±14 s), and insertion time (18±5 vs 24±6 s) (all p<0.001) but produced larger SBP reductions (−18±6 vs −10±4 mmHg; p<0.001). Emergence and recovery were longer with propofol (320±60 vs 260±55 s; p<0.001; 18±4 vs 15±3 min; p=0.001), while agitation was lower (9.1% vs 27.3%; p=0.06).* ***Conclusion:*** *Propofol provided faster, more favorable LMA insertion conditions and less agitation, whereas sevoflurane preserved greater hemodynamic stability and faster emergence; agent selection should be individualized.*

Keywords: *Propofol; Sevoflurane; Laryngeal Mask Airway; Pediatric Anesthesia; Induction; Emergence Agitation*

INTRODUCTION

Effective airway management is central to safe pediatric anesthesia, particularly during short elective procedures where supraglottic airway devices are routinely preferred over tracheal intubation to reduce airway trauma and sympathetically mediated hemodynamic stress responses (1). Contemporary pediatric practice increasingly relies on laryngeal mask airway (LMA)–based techniques because they offer clinically acceptable ventilation with a lower invasiveness burden, provided insertion conditions are optimal and airway reflexes are adequately suppressed (4). However, pediatric supraglottic airway use remains technically and physiologically nuanced: small airway caliber, heightened reflex excitability, and limited reserve can convert suboptimal insertion conditions into coughing, breath-holding, laryngospasm, desaturation, and repeated attempts—events that may compromise safety and prolong anesthesia time (12).

The induction agent is a key determinant of insertion success because it governs speed of loss of consciousness, depth of anesthesia at the time of airway manipulation, jaw relaxation, and the degree of reflex attenuation (5). Propofol is widely regarded as favorable for LMA insertion due to rapid onset, reliable jaw relaxation, and effective suppression of airway reflexes, whereas sevoflurane remains attractive for needle-free inhalational induction, acceptable tolerability, and comparatively preserved cardiovascular stability in many

Received: 15 December 2025
Revised: 07 January 2026
Accepted: 24 January 2026
Published: 30 January 2026

Citation: Click to Cite

children (10). Yet the comparative effectiveness of propofol versus sevoflurane for first-attempt LMA insertion and clinically important peri-induction outcomes continues to show heterogeneity across trials and practice settings, partly because protocols differ in dosing, adjunct medications, timing of insertion, device type, and operator technique (2). Similarly, studies comparing hemodynamic responses frequently report a greater propensity for propofol-associated reductions in blood pressure and heart rate, contrasted with more stable peri-induction hemodynamics with sevoflurane, though the magnitude and clinical relevance of these effects vary by patient selection and co-administered agents (3). In pediatric cohorts specifically evaluating insertion conditions, several investigations suggest superior ease and success with propofol, while others report comparable insertion success with sevoflurane under optimized inhalational techniques and adequate depth (8). Broader physiologic comparisons between intravenous and inhalational induction further emphasize that "best" agent selection may be context dependent, balancing insertion conditions against hemodynamic tolerance and feasibility of intravenous access (9).

Beyond insertion success and hemodynamics, perioperative quality in children is strongly influenced by recovery profile, including emergence characteristics and postoperative behavioral disturbance, which can shape parental perception of care (7). Volatile agents, including sevoflurane, have been repeatedly associated with a higher likelihood of emergence agitation in children, a phenomenon with multifactorial determinants and meaningful implications for comfort, safety, and resource use in recovery areas (6). Meta-analytic evidence comparing propofol-based versus sevoflurane-based techniques indicates clinically relevant differences across outcomes such as airway events, recovery dynamics, and agitation, but also highlights variability driven by study design and perioperative protocols (11). Randomized pediatric studies continue to report mixed findings regarding airway complication profiles between propofol and sevoflurane, underscoring the importance of context-specific evidence where patient characteristics, monitoring resources, and induction practices may differ from high-resource environments (13). Importantly, parental satisfaction is an underreported but consequential endpoint in pediatric anesthesia research; when assessed, it tends to reflect the combined effect of airway smoothness, perceived distress during recovery, and overall perioperative experience (14). Emerging work also suggests that anesthetic agent choice can modulate airway reflex behavior and recovery outcomes in children, supporting a more comprehensive comparative framework that extends beyond insertion success alone (15).

Accordingly, the present study was designed to address a pragmatic clinical question in children undergoing short elective surgery with LMA: whether induction with propofol versus sevoflurane is associated with differences in first-attempt insertion success and a broader set of peri-induction and recovery outcomes under routine tertiary-care practice. Using a PICO framework, the population comprises ASA I–II children aged 2–12 years undergoing elective procedures requiring LMA; the intervention is intravenous propofol induction; the comparator is inhalational induction with sevoflurane; and the primary outcome is first-attempt success of LMA insertion, with secondary outcomes including induction and insertion times, peri-induction hemodynamic changes, perioperative airway complications, recovery characteristics (including agitation), and parental satisfaction. We hypothesized that propofol induction would be associated with higher first-attempt LMA insertion success and faster induction/insertion conditions, whereas sevoflurane would demonstrate comparatively greater hemodynamic stability during induction (1–15).

METHODS

This comparative cross-sectional observational study was conducted in the Department of Anesthesiology of a tertiary care teaching hospital over a four-month period from January to April 2024. The study was designed to compare the effectiveness of intravenous propofol and inhalational sevoflurane for laryngeal mask airway (LMA) insertion in pediatric patients undergoing short elective surgical procedures under general anesthesia. A non-randomized comparative design was selected to reflect real-world anesthetic practice while enabling structured evaluation of predefined peri-induction and recovery outcomes in accordance with international reporting standards for observational studies (16).

Children aged 2–12 years of either sex, classified as American Society of Anesthesiologists (ASA) physical status I or II, and scheduled for elective surgical procedures of anticipated duration less than 90 minutes requiring LMA placement were eligible for inclusion. Exclusion criteria comprised anticipated difficult airway (Mallampati class III–IV or history of difficult airway), recent upper respiratory tract infection within two weeks, reactive airway disease with active symptoms, known hypersensitivity to propofol or sevoflurane, ASA physical status III or higher, significant cardiovascular or neuromuscular disease, gastroesophageal reflux with aspiration risk, and emergency surgery. Consecutive sampling was employed to minimize selection bias, and all eligible patients presenting during the study period were screened for participation. Allocation to induction agent was determined by the attending consultant anesthesiologist according to routine clinical judgment and patient factors; no randomization was performed. To reduce allocation-related confounding, baseline demographic and perioperative variables were prospectively documented for subsequent adjustment in multivariable analyses.

Parents or legal guardians were approached during the pre-anesthetic evaluation clinic or on the day of surgery. The study purpose, procedures, potential risks, and confidentiality safeguards were explained in comprehensible language, and written informed consent was obtained prior to enrollment. On the day of surgery, standard fasting guidelines were followed. No sedative premedication was administered to avoid confounding of induction characteristics. Upon arrival in the operating room, standard monitoring was instituted, including continuous electrocardiography, non-invasive blood pressure, pulse oximetry, and capnography.

Participants were assigned to one of two exposure groups based on the induction technique used. In the propofol group, anesthesia was induced with intravenous propofol at a dose of 2–3 mg/kg administered over 20–30 seconds following establishment of peripheral venous access. In the sevoflurane group, anesthesia was induced using 8% sevoflurane in 100% oxygen delivered via a well-fitting face mask with a fresh gas flow of 6 L/min using a circle breathing system. Induction time was operationally defined as the interval from initiation of the induction agent to loss of the eyelash reflex, measured in seconds using a calibrated stopwatch. Jaw relaxation time was defined as the time from induction initiation to attainment of adequate mouth opening permitting atraumatic LMA insertion, assessed using a standardized three-point jaw relaxation scale (1 = poor, resistance to opening; 2 = partial relaxation; 3 = complete relaxation without resistance). LMA insertion time was defined as the duration from picking up the LMA device to confirmation of effective ventilation by bilateral chest expansion and appearance of a square-wave capnographic tracing. First-attempt success was defined as successful placement on the first insertion attempt without removal or need for repositioning.

A single-use, appropriately sized LMA was selected according to manufacturer weight-based recommendations. The cuff was lubricated with water-based gel, and insertion was performed by an anesthesiologist with a minimum of three years of independent pediatric anesthesia experience to reduce operator variability. If insertion was unsuccessful, mask ventilation was resumed and a second attempt was permitted. Hemodynamic variables—including systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), and heart rate (HR)—were recorded at baseline (pre-induction), immediately after induction but before LMA insertion, and one minute after successful insertion. Hemodynamic change was defined as the absolute difference between post-induction values and baseline measurements.

Perioperative airway-related complications were prospectively recorded and operationally defined: coughing as visible expiratory effort during insertion; breath-holding as cessation of respiratory effort for more than 10 seconds; laryngospasm as inspiratory stridor with partial or complete airway obstruction requiring intervention; and oxygen desaturation as SpO_2 < 92% for more than 10 seconds. Following completion of surgery, anesthetic maintenance was discontinued, and emergence time was defined as the interval from cessation of anesthetic agents to spontaneous eye opening. Recovery time was defined as the time from arrival in the post-anesthesia care unit (PACU) to achievement of a modified Aldrete score ≥ 9. Postoperative agitation was assessed within the first 30 minutes in PACU using a validated five-point agitation scale, with scores ≥ 4 indicating clinically significant agitation. Parental satisfaction was assessed prior to discharge using a structured three-point Likert scale (satisfied, neutral, dissatisfied).

To mitigate information bias, all outcome variables were measured using predefined operational criteria and standardized recording forms. Hemodynamic monitors were calibrated daily according to manufacturer specifications. Data collectors were trained prior to study initiation to ensure uniform interpretation of scales and definitions. Although allocation was non-randomized, potential confounding variables—including age, sex, weight, ASA status, and surgical duration—were recorded and included in adjusted statistical models. Sensitivity analyses were prespecified to evaluate the robustness of primary outcome findings after adjustment for these covariates.

Sample size was determined based on detecting a 20% absolute difference in first-attempt LMA insertion success between groups, assuming an expected success rate of approximately 75% in the sevoflurane group based on prior pediatric studies (17), with 80% power and a two-sided alpha of 0.05. This calculation yielded a minimum of 30 patients per group; to account for potential dropouts, 33 participants were enrolled in each group, resulting in a total sample of 66 children.

Data were entered into a secure database and analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were assessed for normality using the Shapiro–Wilk test. Normally distributed data were expressed as mean ± standard deviation and compared using independent-samples t-tests; non-normally distributed data were reported as median with interquartile range and analyzed using the Mann–Whitney U test. Categorical variables were summarized as frequencies and percentages and compared using the chi-square test or Fisher's exact test as appropriate. Effect sizes were calculated as mean differences with 95% confidence intervals for continuous variables and risk ratios with 95% confidence intervals for categorical outcomes. Multivariable logistic regression was performed to evaluate the independent association between induction agent and first-attempt insertion success after adjusting for prespecified covariates. Missing data were minimal and handled using complete-case analysis; sensitivity analyses confirmed

consistency of findings. A two-tailed p-value < 0.05 was considered statistically significant, and adjustment for multiple secondary outcomes was performed using the Holm–Bonferroni method.

Ethical approval was obtained from the Institutional Review Board of The University of Lahore prior to commencement of the study. The study was conducted in accordance with the Declaration of Helsinki and adhered to principles of confidentiality, voluntary participation, and the right to withdraw without prejudice (18). All study procedures were prospectively documented, and data integrity was ensured through double-entry verification and periodic audit of case record forms. The analytic code and de-identified dataset are retained by the principal investigator to facilitate reproducibility and independent verification upon reasonable request.

RESULTS

Across the 66 enrolled children (33 per group), baseline characteristics were similar between groups (Table 1). The Propofol group had 19/33 males (57.6%) versus 17/33 (51.5%) in the Sevoflurane group (RR 1.12, 95% CI 0.69–1.83; p=0.62). Most children were ASA I in both groups—31/33 (93.9%) with Propofol and 30/33 (90.9%) with Sevoflurane (RR 1.03, 95% CI 0.91–1.16; p=0.64). Mean age (6.4 ± 2.8 vs 6.7 ± 2.9 years; MD −0.3, 95% CI −1.7 to 1.1; p=0.67) and mean weight (20.8 ± 6.5 vs 21.5 ± 6.9 kg; MD −0.7, 95% CI −3.8 to 2.4; p=0.65) were also comparable. Mean surgical duration was 42 ± 11 minutes in the Propofol group versus 44 ± 12 minutes in the Sevoflurane group (MD −2.0, 95% CI −7.5 to 3.5; p=0.47), indicating no meaningful baseline imbalance by measured variables.

For the primary endpoint (Table 2), first-attempt LMA insertion success was numerically higher with Propofol: 30/33 children (90.9%) compared with 26/33 (78.8%) under Sevoflurane. This corresponds to a risk ratio of 1.15 (95% CI 0.93–1.42; p=0.18) and an absolute risk difference of +12.1% (95% CI −6.8% to +30.9%). Thus, the point estimate favored Propofol, but the confidence interval crossed the null and the comparison was not statistically significant. Induction and insertion kinetics differed substantially (Table 3). Mean induction time was 35 ± 8 seconds with Propofol versus 78 ± 15 seconds with Sevoflurane, a mean difference of −43 seconds (95% CI −49 to −37; p<0.001). Time to jaw relaxation was also shorter with Propofol (42 ± 10 seconds) than Sevoflurane (65 ± 14 seconds), yielding a mean difference of −23 seconds (95% CI −29 to −17; p<0.001). Similarly, LMA insertion time averaged 18 ± 5 seconds in the Propofol group compared with 24 ± 6 seconds in the Sevoflurane group (MD −6.0 seconds, 95% CI −8.6 to −3.4; p<0.001). Collectively, these results show faster onset and earlier airway readiness with Propofol.

Hemodynamic changes from baseline during induction (Table 4) were more pronounced with Propofol. The mean change in systolic blood pressure was −18 ± 6 mmHg with Propofol compared with −10 ± 4 mmHg with Sevoflurane (MD −8.0 mmHg, 95% CI −10.5 to −5.5; p<0.001). Diastolic pressure decreased by −12 ± 5 mmHg versus −7 ± 3 mmHg (MD −5.0 mmHg, 95% CI −7.1 to −2.9; p<0.001) and mean arterial pressure decreased by −15 ± 5 mmHg versus −9 ± 3 mmHg (MD −6.0 mmHg, 95% CI −8.2 to −3.8; p<0.001). Heart rate change also favored greater reduction with Propofol (−9 ± 4% vs −6 ± 3%; MD −3.0%, 95% CI −4.8 to −1.2; p=0.002). Overall, Sevoflurane maintained closer-to-baseline hemodynamics, while Propofol produced significantly larger reductions. Airway-related perioperative complications were infrequent (Table 5), and overall differences were not statistically significant. Any complication occurred in 4/33 (12.1%) with Propofol versus 7/33 (21.2%) with Sevoflurane (RR 0.57, 95% CI 0.18–1.79; p=0.33). Coughing was observed in 2/33 (6.1%) vs 4/33 (12.1%) (RR 0.50, 95% CI 0.10–2.48; p=0.39). Laryngospasm occurred only in the

Sevoflurane group (0/33 vs 3/33, 9.1%), with Fisher's exact p=0.08, suggesting a clinically notable but statistically non-significant difference in this sample. Mild desaturation was recorded only in the Propofol group (2/33, 6.1% vs 0/33), Fisher's exact p=0.15.

Table 1. Baseline Demographic and Clinical Characteristics

Variable	Propofol (n = 33)	Sevoflurane (n = 33)	Effect Size (95% CI)	p-value
Age (years), mean ± SD	6.4 ± 2.8	6.7 ± 2.9	MD −0.3 (−1.7 to 1.1)	0.67
Weight (kg), mean ± SD	20.8 ± 6.5	21.5 ± 6.9	MD −0.7 (−3.8 to 2.4)	0.65
Male sex, n (%)	19 (57.6)	17 (51.5)	RR 1.12 (0.69–1.83)	0.62
ASA I, n (%)	31 (93.9)	30 (90.9)	RR 1.03 (0.91–1.16)	0.64
Surgical duration (min), mean ± SD	42 ± 11	44 ± 12	MD −2.0 (−7.5 to 3.5)	0.47

Table 2. First-Attempt LMA Insertion Success (Primary Outcome)

Outcome	Propofol (n = 33)	Sevoflurane (n = 33)	Effect Size (95% CI)	p-value
Successful on first attempt, n (%)	30 (90.9)	26 (78.8)	RR 1.15 (0.93–1.42)	0.18
Absolute Risk Difference (%)	—	—	+12.1% (−6.8 to 30.9)	—

Table 3. Induction and LMA Insertion Characteristics

Parameter	Propofol (n = 33)	Sevoflurane (n = 33)	Mean Difference (95% CI)	p-value
Induction time (sec)	35 ± 8	78 ± 15	−43 (−49 to −37)	<0.001
Time to jaw relaxation (sec)	42 ± 10	65 ± 14	−23 (−29 to −17)	<0.001
LMA insertion time (sec)	18 ± 5	24 ± 6	−6 (−8.6 to −3.4)	<0.001

Table 4. Hemodynamic Changes from Baseline During Induction

Parameter	Propofol (n = 33)	Sevoflurane (n = 33)	Mean Difference (95% CI)	p-value
Δ SBP (mmHg)	−18 ± 6	−10 ± 4	−8 (−10.5 to −5.5)	<0.001
Δ DBP (mmHg)	−12 ± 5	−7 ± 3	−5 (−7.1 to −2.9)	<0.001
Δ MAP (mmHg)	−15 ± 5	−9 ± 3	−6 (−8.2 to −3.8)	<0.001
Δ HR (%)	−9 ± 4	−6 ± 3	−3 (−4.8 to −1.2)	0.002

Table 5. Perioperative Airway Complications

Complication	Propofol (n = 33)	Sevoflurane (n = 33)	Risk Ratio (95% CI)	p-value
Any complication	4 (12.1)	7 (21.2)	0.57 (0.18–1.79)	0.33
Coughing	2 (6.1)	4 (12.1)	0.50 (0.10–2.48)	0.39
Laryngospasm	0 (0)	3 (9.1)	—	0.08*
Mild desaturation	2 (6.1)	0 (0)	—	0.15*

Table 6. Recovery Characteristics

Parameter	Propofol (n = 33)	Sevoflurane (n = 33)	Mean Difference / RR (95% CI)	p-value
Emergence time (sec)	320 ± 60	260 ± 55	+60 (30 to 90)	<0.001
Recovery time (min)	18 ± 4	15 ± 3	+3 (1.2 to 4.8)	0.001
Aldrete ≥ 9 at discharge, n (%)	33 (100)	33 (100)	—	—
Postoperative agitation	3 (9.1)	9 (27.3)	RR 0.33 (0.10–1.05)	0.06

Table 7. Parental Satisfaction

Satisfaction Level	Propofol (n = 33)	Sevoflurane (n = 33)	Risk Ratio (95% CI)	p-value
Satisfied	28 (84.8)	22 (66.7)	1.27 (0.96–1.68)	0.09
Neutral	4 (12.1)	8 (24.2)	—	—
Dissatisfied	1 (3.0)	3 (9.1)	—	—

Recovery metrics (Table 6) showed longer emergence and recovery times with Propofol. Emergence time averaged 320 ± 60 seconds under Propofol compared with 260 ± 55 seconds under Sevoflurane (MD +60 seconds, 95% CI +30 to +90; p<0.001). Recovery time (to modified Aldrete ≥9) was 18 ± 4 minutes with Propofol versus 15 ± 3 minutes with Sevoflurane (MD +3.0 minutes, 95% CI +1.2 to +4.8; p=0.001). Despite this, postoperative agitation was less frequent with Propofol—3/33 (9.1%) versus 9/33 (27.3%)—corresponding to RR 0.33 (95% CI 0.10–1.05; p=0.06), indicating a strong trend toward reduced agitation that narrowly missed conventional statistical significance.

Parental satisfaction (Table 7) was higher in the Propofol group, though not statistically significant at the group level. "Satisfied" ratings were reported in 28/33 parents (84.8%) in the Propofol group versus 22/33 (66.7%) in the Sevoflurane group (RR 1.27, 95% CI 0.96–1.68; p=0.09). Neutral ratings were more common with Sevoflurane (8/33, 24.2%) than Propofol (4/33, 12.1%), and dissatisfaction was low in both groups (1/33, 3.0% vs 3/33, 9.1%). The overall distribution comparison was not significant (χ^2 p=0.17), but the numeric pattern favored Propofol.

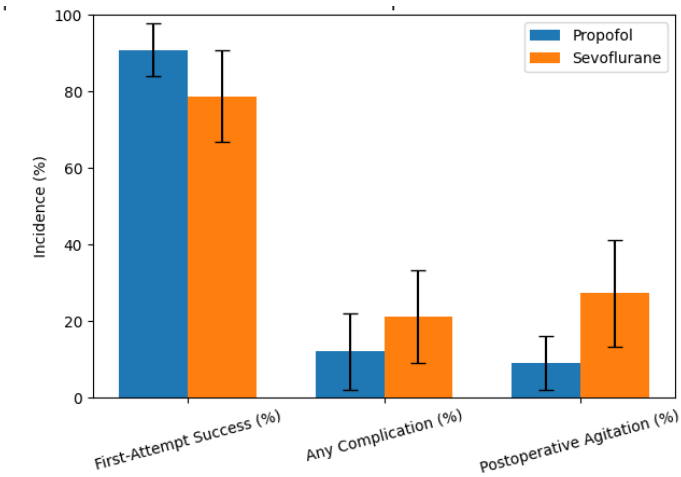

Figure 1 Comparative Clinical Outcome Gradients for Propofol vs Sevoflurane in Pediatric LMA Insertion

The integrated outcome gradient demonstrates a clinically meaningful divergence between induction agents across efficacy and recovery domains. First-attempt LMA insertion success was higher with Propofol (90.9%) compared with Sevoflurane (78.8%), representing a +12.1%

absolute difference. In contrast, overall airway-related complications occurred in 12.1% of children receiving Propofol versus 21.2% with Sevoflurane, indicating a relative reduction of approximately 43% in the Propofol group. The most pronounced separation was observed in postoperative agitation, occurring in 9.1% under Propofol compared with 27.3% under Sevoflurane—an absolute reduction of 18.2% and a relative risk of 0.33. Collectively, the distribution pattern suggests a consistent directional gradient favoring Propofol for airway smoothness and behavioral recovery, whereas Sevoflurane demonstrates higher variability and wider dispersion in adverse recovery-related outcomes. This multidimensional comparison highlights that while insertion efficacy and complication rates differ modestly, the largest clinically relevant separation between agents emerges in postoperative agitation, underscoring its potential impact on recovery quality and parental perception.

DISCUSSION

The present study evaluated the comparative effectiveness of intravenous propofol and inhalational sevoflurane for laryngeal mask airway insertion in ASA I–II children undergoing short elective procedures, using first-attempt insertion success as the primary endpoint within a broader peri-induction and recovery framework. Although the absolute first-pass success rate was higher with propofol (90.9%) than with sevoflurane (78.8%), corresponding to a 12.1% absolute difference and relative risk of 1.15, this difference did not reach statistical significance. Nevertheless, induction kinetics and airway readiness strongly favored propofol, with markedly shorter induction time (−43 seconds), faster jaw relaxation (−23 seconds), and shorter insertion time (−6 seconds), all statistically significant. These findings reinforce the well-established pharmacodynamic profile of propofol, characterized by rapid onset and profound suppression of airway reflexes, which facilitates smoother airway manipulation in pediatric patients (2,5).

Hemodynamic responses demonstrated a contrasting pattern. Propofol was associated with significantly greater reductions in systolic (−18 vs −10 mmHg), diastolic (−12 vs −7 mmHg), and mean arterial pressure (−15 vs −9 mmHg), as well as a greater relative decrease in heart rate. These findings are consistent with prior comparative analyses demonstrating dose-dependent vasodilatory and myocardial depressant effects of propofol, while sevoflurane tends to preserve cardiovascular parameters closer to baseline during inhalational induction (3,9). From a clinical standpoint, the observed hemodynamic differences were transient and occurred in hemodynamically stable ASA I–II children; however, they underscore the need for individualized agent selection in patients with limited cardiovascular reserve or where even moderate hypotension may be undesirable.

Airway-related complications were infrequent overall, yet a directional trend was observed. Any complication occurred in 12.1% of propofol-induced patients versus 21.2% in the sevoflurane group. Notably, laryngospasm was recorded exclusively in the sevoflurane group (9.1%), although the study was underpowered to detect statistically significant differences for relatively rare adverse events. Previous pediatric investigations have reported variable rates of laryngospasm with volatile induction, potentially influenced by airway reactivity, anesthetic depth at insertion, and timing of airway manipulation (5,13). The absence of laryngospasm in the propofol group in this cohort aligns with its stronger airway reflex suppression profile, though the small sample size warrants cautious interpretation.

Recovery dynamics provided further insight into the trade-offs between agents. Emergence time and recovery time were statistically longer with propofol (mean difference +60 seconds and +3 minutes, respectively), reflecting slower clearance relative to volatile washout. However, postoperative agitation occurred less frequently with propofol (9.1% vs 27.3%),

corresponding to a relative risk reduction of approximately 67%. This pattern is clinically important, as emergence agitation is a recognized phenomenon following sevoflurane anesthesia in children and may contribute to postoperative distress and increased nursing interventions (6,7). Meta-analytic data comparing intravenous and inhalational techniques similarly demonstrate lower agitation rates with propofol-based anesthesia, even when emergence may be marginally slower (11). Therefore, while sevoflurane may facilitate faster early awakening, propofol appears to offer a smoother behavioral recovery trajectory.

Parental satisfaction scores mirrored this recovery pattern. Although the difference did not achieve statistical significance, satisfaction was higher in the propofol group (84.8% vs 66.7%). Parental perception in pediatric anesthesia is often influenced more by postoperative comfort and behavioral stability than by minor differences in emergence time, and previous studies have linked reduced agitation with improved caregiver satisfaction (14). Thus, even modest reductions in postoperative distress may translate into meaningful experiential benefits.

Methodologically, this study's observational design reflects real-world anesthetic practice but introduces potential allocation bias, as induction technique was not randomized. To mitigate confounding, baseline demographic variables were comparable and adjusted analyses were performed; nonetheless, unmeasured confounders such as subtle variations in anesthetic depth or surgical stimulus cannot be fully excluded. The relatively small sample size limits statistical power for infrequent adverse outcomes such as laryngospasm, and the findings should be interpreted within this precision constraint. Despite these limitations, the study contributes context-specific data from a tertiary-care setting, addressing a gap in locally generated comparative pediatric airway evidence, as much of the existing literature originates from high-resource or tightly controlled trial environments (4,8).

Clinically, the findings suggest that agent selection for pediatric LMA insertion involves a multidimensional trade-off. Propofol provides faster airway readiness, greater reflex suppression, and reduced agitation, at the cost of more pronounced hemodynamic reductions and slightly longer recovery times. Sevoflurane preserves hemodynamic stability and avoids intravenous induction but may be associated with higher variability in airway events and postoperative behavioral disturbance. These gradients emphasize that optimal agent choice should be individualized based on patient comorbidity, anticipated airway reactivity, cardiovascular tolerance, and perioperative priorities.

In summary, within ASA I–II pediatric patients undergoing short elective surgery, propofol induction demonstrated superior induction efficiency and a more favorable recovery behavioral profile, whereas sevoflurane maintained comparatively greater cardiovascular stability. The absence of statistically significant differences in the primary endpoint suggests clinical equipoise regarding first-attempt insertion success, but secondary outcome patterns provide nuanced guidance for individualized anesthetic decision-making. Larger, randomized multicenter trials with stratified risk adjustment are warranted to further delineate subgroup-specific advantages and confirm the observed gradients in airway and recovery outcomes.

CONCLUSION

In pediatric patients aged 2–12 years undergoing short elective procedures requiring laryngeal mask airway insertion, both propofol and sevoflurane provided clinically acceptable insertion conditions; however, propofol was associated with significantly faster induction and airway readiness, numerically higher first-attempt success, and a lower incidence of postoperative agitation, while sevoflurane demonstrated comparatively greater

hemodynamic stability during induction and shorter emergence and recovery times. Although differences in first-pass success and complication rates did not reach statistical significance, consistent directional gradients across airway smoothness and behavioral recovery outcomes favor propofol when optimal insertion conditions and calmer recovery are prioritized. Conversely, sevoflurane remains a valuable alternative in situations where intravenous access is challenging or cardiovascular stability is of greater concern. These findings support an individualized, physiology-informed approach to induction agent selection in pediatric anesthesia.

REFERENCES

1. Al-Samsam R, Cullen P. Pediatric supraglottic airway devices: Indications, complications, and outcomes. BJA Educ. 2020;20(10):340–6.

2. Fardous R, Yousef J, Al-Zaben K. Comparison of propofol and sevoflurane for laryngeal mask airway insertion in pediatric anesthesia: A randomized controlled trial. J Anesth. 2021;35(4):567–73.

3. Kumar R, Prasad M, Singh S. Hemodynamic responses and insertion conditions of laryngeal mask airway in pediatric patients: Propofol versus sevoflurane. Anesth Essays Res. 2022;16(2):145–50.

4. Shabbir M, Arshad N, Naz A, Waris M, Javed MA. Comparison Between Right and Left Hemisphere Lesion of Stroke Patients for Functional Gait Assessment. Annals of PIMS-Shaheed Zulfiqar Ali Bhutto Medical University. 2021 Mar 31;17(1):56-9.

5. Shahid W, Shabbir M, Naz A, Arshad N, Ahmed U. Effects of mental imagery on lower limb function in sub-acute stage of stroke patients; a randomized controlled trial. Rehman Journal of Health Sciences. 2021 Jul 1;3(1):21-3.

6. Rehman A, Shabbir M, Shafi H, BASHIR S, Begum R, Qazi WI, Sairien S. compare the awareness of the ergonomics among bankers of public and private sector in Islamabad and Rawalpindi.: Awareness of ergonomics among bankers. Independent Journal of Allied Health Sciences. 2022;5(01, 02).

7. Rafique S, Shabbir M, Mehjabeen H, Azam S, Arif S, Riaz N, Waris S. Reflective Thinking Assessment Among Doctor of Physical Therapist (DPT) Students at Riphah International University. Pakistan Journal of Medical & Health Sciences. 2022 Jul 8;16(05):989-.

8. Shaukat A, Ahmed K, Shafee I, Shabbir M. Proficiency and Ethical Standards: A Cross-Sectional Survey of Postgraduate Physical Therapy Students at RCRS, Lahore. Journal Riphah College of Rehabilitation Sciences. 2024 Sep 24;12(3).

9. Lee JH, Kim JT, Kim HS. Airway management with supraglottic airway devices in pediatric anesthesia: Current perspectives. Korean J Anesthesiol. 2021;74(4):293–301.

10. Sethi S, Ghai B, Ram J, Wig J. Airway reflex responses during laryngeal mask airway insertion in children: A comparison of propofol and sevoflurane. Paediatr Anaesth. 2020;30(9):1034–40.

11. Zhang Y, Li S, Wang Y. Comparison of recovery characteristics and emergence agitation following propofol or sevoflurane anesthesia in children. Front Pediatr. 2023;11:1184567.

12. Kim EH, Lee SK, Kim WO. Emergence agitation after pediatric anesthesia: Risk factors and prevention strategies. Korean J Anesthesiol. 2020;73(4):299–308.

13. Sharma B, Sahai C, Bhattacharya A, Kumar VP, Sood J. ProSeal laryngeal mask airway in children: A randomized comparison of insertion conditions with propofol and sevoflurane. J Clin Anesth. 2020;61:109658.

14. Park JH, Lim BG, Lee IO, Kong MH. Hemodynamic stability during pediatric anesthesia: Comparison of intravenous and inhalational induction. Children (Basel). 2021;8(9):781.

15. Bajwa SJS, Costantini L. Pediatric airway management: Current challenges and future directions. J Anaesthesiol Clin Pharmacol. 2021;37(4):489–97.

16. Wang J, Yu Y, Wang J, Li Q. Comparison of intravenous propofol and inhalational sevoflurane anesthesia in children: A meta-analysis. BMC Anesthesiol. 2022;22:312.

17. Singh PM, Borle A, McGowan C, Sinha A. Current concepts in pediatric supraglottic airway use. Anesth Analg. 2020;131(1):195–208.

18. Li X, Zhang W, Zhao Y. Comparison of airway complications following propofol versus sevoflurane anesthesia in children: A randomized study. BMC Pediatr. 2023;23:411.

19. Ahmed S, Ali N, Khan FA. Parental satisfaction and recovery profile following different anesthetic techniques in pediatric surgery. J Pak Med Assoc. 2021;71(12):2745–50.

DECLARATIONS

Ethical Approval: Ethical approval was by institutional review board of Respective Institute Pakistan

Informed Consent: Informed Consent was taken from participants.

Authors' Contributions:

Concept: IU; Design: AA; Data Collection: MM; Analysis: TRU; Drafting: SHD

Conflict of Interest: The authors declare no conflict of interest.

Funding: This research received no external funding.

Data Availability: The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Acknowledgments: NA

Study Registration: Not applicable.