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Perioperative airway events in pediatric patients with obesity undergoing bariatric surgery: A retrospective cohort

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ABSTRACT

Objective: Obesity presents challenges in airway management due to physiological and anatomical changes, increasing the risk of difficult mask ventilation and tracheal intubation. This study aimed to determine the frequency and types of airway complications and identify risk factors for difficult intubation and extubation in pediatric patients undergoing bariatric surgery.

Material and Methods: This retrospective cohort included 269 patients aged 12-17 years with body mass index ≥30 undergoing bariatric surgery under general anesthesia in Hamad Medical Corporation operating rooms between January 1, 2014, and January 1, 2024. We collected demographic data, preoperative airway assessment values; postoperative airway complications, and vital parameters. Multivariable logistic regressions were performed to assess variables associated with difficult intubation or extubation.

Results: Of the 269 patients, one developed cardiovascular instability post-operatively and one experienced bronchospasm after intubation. None of the patients experienced laryngospasm, vomiting, or airway edema. Desaturation occurred in 10 (3.6%) patients during intubation and 14 (5.1%) during extubation. Male sex was associated with a higher odd of difficult intubation [odds ratio (OR) 2.28, 95% confidence interval (CI): 0.95-5.49, p=0.065] and extubation (OR 3.83, 95% CI: 0.85-17.35, p=0.082). More than one intubation attempt increased the odds of difficult extubation 15.52- fold (95% CI: 1.83-131.37, p=0.012).

Conclusion: Male pediatric patients with obesity, especially with a history of snoring, are at higher risk for difficult intubation. Multiple intubations attempts strongly predict difficult extubation.

Keywords: Obesity, airway management, difficult intubation, difficult extubation, pediatric surgery, bariatric surgery

INTRODUCTION

Bariatric surgery in the pediatric population has become an increasingly utilized intervention for the management of severe obesity and its associated comorbidities, particularly when lifestyle modifications and medical therapy prove insufficient. This approach is especially pertinent for individuals with a body mass index (BMI) of 40 or higher, categorized as Class 3 or severe obesity, who face an increased risk of serious complications including type 2 diabetes, hypertension, obstructive sleep apnea (OSA), and diminished quality of life (1). Recent guidelines, including those from the Swedish National Board for Health and Welfare and the American Academy of Pediatrics, now recommend bariatric surgery for patients aged ≥15 years and ≥13 years, respectively, with severe obesity (1). While numerous studies have documented reductions in BMI, weight loss, adverse surgical outcomes, and the overall efficacy and safety of bariatric surgery in children and adolescents, the perioperative management of these patients—particularly regarding airway management and anesthesia—remains an underexplored area (2).

Airway management poses significant challenges in the perioperative care of pediatric bariatric patients due to anatomical and physiological factors, including reduced airway patency, increased neck circumference, and comorbid conditions

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such as OSA (3). Moreover, the challenges extend beyond the intraoperative period to include complications during extubation, such as hypoxia, laryngospasm, and airway trauma, which may result in prolonged recovery times and increased morbidity (4).

Despite the recognized risks, there is a paucity of comprehensive studies exploring the incidence and predictors of difficult airway management in pediatric populations undergoing bariatric surgery. Existing research on airway management in bariatric pediatric patients is often extrapolated from adult data or limited pediatric cohorts, which may not fully capture the unique considerations in this subgroup (5). This study aims to fill this gap by analyzing the frequency and types of complications related to tracheal intubation and extubation in pediatric patients undergoing bariatric surgery. Additionally, this study seeks to identify risk factors associated with the development of difficult intubation and extubation.

MATERIAL and METHODS

Ethical Considerations

The Institutional Review Board approval for this study (MRC-01-24-445) was provided by the Medical Research Center at Hamad Medical Corporation (HMC) Doha, Qatar (Chairperson Prof. Jassim Mohd. Al Suwaidi) on 17th September, 2024. Written informed consent was obtained for the surgery from parents of the pediatric patients. This study has been conducted in accordance with the principles set forth in the Helsinki Declaration.

Study Design, Population, and Eligibility Criteria

This study was designed as a retrospective cohort study and was conducted at HMC in Qatar. The study population consisted of pediatric patients with obesity aged 12 to 17 years, with a BMI of 30 or higher, who underwent bariatric surgery under general anesthesia in HMC operating rooms between January 1, 2014, and January 1, 2024. Patients were excluded if they were over 18 years of age, had a BMI below 30, underwent surgeries other than bariatric procedures, or received only sedation, local, or regional anesthesia.

Data Collection and Variables

Data was collected from the electronic medical records after approval from the institutional review board. Key variables included, 1) Demographic information (age, gender, nationality, BMI, and type of surgery); 2) Preoperative assessment parameters such as American Society of Anesthesiologists (ASA) score, Mallampati score, neck movement, neck circumference, mouth opening, thyromental distance, and comorbidities (e.g., OSA, asthma, and diabetes mellitus); 3) Intraoperative data captured Cormack-Lehane score, anesthetic agents used, laryngoscope type and size, endotracheal tube type and size, cuff pressure, laryngeal mask airway size, number of intubation attempts, any intubation or ventilation difficulties, and the use of stylet or bougie. Additionally, any need for airway rescue techniques such as supraglottic airway device, videolaryngoscope, or cricothyroidotomy was noted. Postoperative complications such as desaturation, airway trauma or edema, laryngospasm, bronchospasm, cardiovascular instability and technical complications were documented. Postoperative vital signs, as well as duration of post-anesthesia care unit (PACU) stay, intensive care unit (ICU) stay, and hospital stay, were also recorded.

Outcomes of Interest

The primary outcome of interest was the frequency and types of complications during tracheal intubation and extubation in pediatric patients undergoing bariatric surgery. Preoperative difficult airways were defined by the 1) Occurrence of desaturation (SpO_2 ≤94% for ≥10 seconds) during intubation, 2) Use of assisted intubation devices, and 3) The need for rescue airway techniques. Postoperative difficult extubation was identified by desaturation (SpO_2 ≤94% for ≥10 seconds) during extubation; as other potential complications, such as airway trauma, airway edema, laryngospasm, did not occur in this population. The secondary outcome was to assess preoperative factors associated with difficult intubation, as well as preoperative and intraoperative variables associated with difficult extubation.

Statistical Analysis

All statistical analyses were conducted using Stata 17 (College Station, TX, USA). Continuous variables were assessed for normality using histograms; normally distributed variables were reported as means and standard deviations (SD), while non-normally distributed variables were presented as medians and interquartile ranges (IQR). For comparisons between difficult intubation or extubation groups, t-tests were used for normally distributed continuous variables, and the Wilcoxon rank-sum test was applied for non-normally distributed variables. Categorical data were compared using the chi-squared test, or Fisher's exact test when appropriate. To evaluate factors associated with difficult intubation and extubation, logistic regression analyses were conducted. Association models were used and was adjusted for age and gender. Exact p-values were reported and were interpreted as evidence against the null hypothesis. For the logistic regression, odds ratios (OR) with 95% confidence intervals (95% CI) were reported to two decimal places.

RESULTS

Baseline Characteristics

Table 1 reports the baseline characteristics of 269 participants who were included in the study, of whom 64.3% (n=173) were males. The median age was 16 years (IQR 15.0 to 17.0). The median BMI in the cohort was 47.7 kgm^{-2}, and the majority of the patients included had Class III obesity (63.2%, n=170). In terms of comorbidities, 45.7% (n=123) of participants had at least one comorbidity, with the most common being asthma (22.7%, n=61), followed by OSA (11.2%, n=30), hypothyroidism (7.1%, n=19), diabetes mellitus (4.8%, n=13), glucose-6-phosphate dehydrogenase (G6PD) deficiency (4.5%, n=12), and hypertension (3.7%, n=10). The remaining 54.3% (n=146) had no documented comorbid conditions. Majority of participants underwent laparoscopic sleeve gastrectomy, accounting for 89.6% (n=241) of the cohort. The median length of hospital stay was 2.0 days (IQR 2.0 to 3.0), and the median ICU stay was 2.0 days (IQR 1.0 to 2.0).

Preoperative Assessment

Preoperative assessments are outlined in Table 2, which demonstrates that 63.6% (n=171) of participants were classified as ASA 2, while 36.4% (n=98) were classified as ASA 3. For the Mallampati score, 63.9% (n=172) of patients were in Class II, 11.5% (n=31) in Class I, 16.0% (n=43) in Class III, and 3.0% (n=8) in Class IV. Cormack-Lehane scores were distributed as follows: 27.9% (n=75) in Class I, 28.3% (n=76) in Class II, 21.9% (n=59) in Class IIa, 9.3% (n=25) in Class IIb, and 0.4% (n=1) in Class III. A short neck was noted in 4.1% (n=11) of participants. The mean thyromental distance was 5.7 cm (SD=0.9), with 28.3% (n=76) measuring less than 6 cm, 45.7% (n=123) between 6 and 6.5 cm, and 8.6% (n=23) over 6.5 cm. Tracheal tube sizes of 7.0 and 7.5

Table 1. Baseline characteristics of the patients

Variable	Level	Value
N		269
Age (years), median (IQR)		16.0 (15.0, 17.0)
Sex	Female	96 (35.7%)
	Male	173 (64.3%)
BMI (kgm^{-2}), median (IQR)		47.7 (44.4, 52.5)
BMI categories	Class 3 obesity	170 (63.2%)
	Class 4 obesity	85 (31.6%)
	Class 5 obesity	14 (5.2%)
Comorbidities	No	146 (54.3%)
	Yes	123 (45.7%)
Type of comorbidities		
	Hypertension	10 (3.7%)
	Diabetes mellitus	13 (4.8%)
	G6PD deficiency	12 (4.5%)
	Hypothyroidism	19 (7.1%)
	Asthma	61 (22.7%)
	Obstructive sleep apnea	30 (11.2%)
Type of procedure	Robotic single gastric anastomosis	1 (0.4%)
	Endoscopic intragastric balloon insertion	5 (1.9%)
	Endoscopic intragastric balloon removal	13 (4.8%)
	LRYGB	4 (1.5%)
	LSG	241 (89.6%)
	Lap perigastric LN biopsy (spindle cell)	1 (0.4%)
	MGB	3 (1.1%)
	RRGB	1 (0.4%)
Duration of anesthesia (mins), mean (SD)		66.5 (22.5)
Duration of surgery (hrs), median (IQR)		1.0 (1.0, 1.0)
PACU stay (days), median (IQR)		70.0 (45.0, 100.0)
Hospital stay (days), median (IQR)		2.0 (2.0, 3.0)
ICU stay (days), median (IQR)		2.0 (1.0, 2.0)

BMI: Body mass index, SD: Standard deviation, G6PD: Glucose-6-phosphate dehydrogenase, PACU: Post-anesthesia care unit, ICU: Intensive care unit, IQR: Interquartile range, LRYGB: Laparoscopic roux-en-Y gastric bypass, LSG: Laparoscopic sleeve gastrectomy, LN: Lymph node, MGB: Mini gastric bypass, RRGB: Roux-en Y gastric bypass.

Table 2. Preoperative assessment and intubation data		
Variable	Level	Value
N		269
ASA physical status classification	2	171 (63.6%)
	3	98 (36.4%)
Mallampati score	Not reported	15 (5.6%)
	I	31 (11.5%)
	II	172 (63.9%)
	III	43 (16.0%)
	IV	8 (3.0%)
Cormack-Lehane score	Not reported	33 (12.3%)
	I	75 (27.9%)
	II	76 (28.3%)
	IIa	59 (21.9%)
	IIb	25 (9.3%)
	III	1 (0.4%)
Short neck	No	258 (95.9%)
	Yes	11 (4.1%)
Thyromental distance (cm), mean (SD)		5.7 (0.9)
Thyromental distance categories (cm)	<6	76 (28.3%)
	6 to 6.5	123 (45.7%)
	>6.5	23 (8.6%)
	Not reported	47 (17.5%)
Tracheal tube size	6	1 (0.4%)
	6.5	9 (3.3%)
	7	157 (58.4%)
	7.5	86 (32.0%)
	8	8 (3.0%)
	Not reported	8 (3.0%)
Laryngoscope blade number	3	44 (16.4%)
	3.5	6 (2.2%)
	4	193 (71.7%)
	Not reported	26 (9.7%)

ASA: American Society of Anesthesiologists, SD: Standard deviation.

were most commonly used, at 58.4% (n=157) and 32.0% (n=86), respectively. Lastly, a laryngoscope blade size of 4 was used in 71.7% (n=193) of cases, followed by size 3 in 16.4% (n=44) and size 3.5 in 2.2% (n=6).

Characteristics of Difficult Intubation or Extubation

Table 3 summarizes the difficult airway management and outcomes during intubation and extubation. Amongst the 269 patients, 1 patient developed cardiovascular instability post-operatively in the PACU and 1 patient developed bronchospasm after intubation. None of the patients experienced laryngospasm, vomiting, airway edema, or airway injury. Fifteen patients required the use of a videolaryngoscope, while the majority (94.4%, n=254) did not. Intubation through a supraglottic airway was used in two patients (0.7%). A stylet or bougie was required for intubation in 3.4% (n=9) of cases, with 3.0% (n=8) using a stylet and 0.4% (n=1) using a bougie. Desaturation events (SpO_2 <94% for ≥10 seconds) were observed in 10 participants during intubation and 14 participants during extubation. Most intubations (96.3%, n=259) were successful on the first attempt, with more than one attempt required in 1.5% (n=4) of cases.

Table 3. Difficult intubation and extubation data		
Variable	Level	Value
N		269
Use of video laryngoscope	No	254 (94.4%)
	Yes	15 (5.6%)
Intubation through supraglottic airway device	No	267 (99.3%)
	Yes	2 (0.7%)
Requirement of stylet/bougie	Bougie	1 (0.4%)
	Stylet	8 (3.0%)
	None	260 (96.7%)
Cardiovascular instability	No	268 (99.6%)
	Yes	1 (0.37%)
Bronchospasm	No	268 (99.6%)
	Yes	1 (0.37%)
Desaturation during intubation <94%	No	259 (96.3%)
	Yes	10 (3.7%)
Desaturation during extubation <94%	No	255 (94.8%)
	Yes	14 (5.2%)
Number of intubation attempts	1	259 (96.3%)
	>1	4 (1.5%)
	Not reported	6 (2.2%)

Logistic Regression Analysis for Difficult Intubation

Table 4 presents the logistic regression analysis for factors associated with difficult intubation. Male sex was associated with increased odds of difficult intubation, with an adjusted OR of 2.28 (95% CI: 0.95-5.49; p=0.065), compared to females. Patients aged 16 years and older had decreased odds of difficult intubation (OR=0.68, 95% CI: 0.32-1.45; p=0.322) compared to those under 16, though this was with limited evidence against the null hypothesis. Notably, history of snoring was associated with difficult intubation, with an OR of 2.66 (95% CI: 1.20-5.90; p=0.016) with strong evidence against the null hypothesis at this sample size. For ASA score, patients classified as ASA 3 had slightly higher odds of difficult intubation (OR=1.38, 95% CI: 0.65-2.92; p=0.404) compared to those with an ASA score of 2, again with weak evidence against the model hypothesis. BMI was also analyzed, with patients in BMI Class 4 obesity demonstrating higher odds of difficult intubation (OR=1.20, 95% CI: 0.55-2.62; p=0.645) compared to Class 3 obesity. OSA was associated with an increased odds of difficult intubation (OR=1.73, 95% CI: 0.63-4.71; p=0.286), though this result had weak evidence against the null hypothesis.

Logistic Regression Analysis for Difficult Extubation

Table 5 presents the logistic regression analysis for factors associated with difficult extubation. Male patients showed an increased likelihood of difficult extubation, with an OR of 3.83 (95% CI: 0.85-17.35; p=0.082) compared to females. Additionally, those in BMI Class 4 obesity had increased odds of difficult extubation (OR=1.33, 95% CI: 0.45-3.90; p=0.605) relative to BMI Class 3 obesity, however with weak evidence against the null hypothesis. Among the variables, a notable association was observed with the number of intubation attempts; whereby patients requiring more than one intubation attempt had significantly higher odds of desaturation during extubation (OR=15.52, 95% CI: 1.83-131.37; p=0.012). OSA was associated with an increased odds of difficult extubation (OR=1.92, 95% CI: 0.49-7.47; p=0.384), though this result also had weak evidence against the null hypothesis. Duration of anesthesia for ≥60 minutes was associated with higher odds of desaturation during extubation (OR=2.53, 95% CI: 0.69-9.27; p=0.161) compared to a duration of <60 minutes.

DISCUSSION

Obesity presents a significant challenge in perioperative airway management, particularly in pediatric patients undergoing bariatric surgery. This study aimed to identify the frequency and types of complications related to tracheal intubation and extubation, as well as to investigate factors associated with difficult intubation and extubation in pediatric patients with severe obesity.

Our findings show that male sex, age below 16 years, elevated BMI, and higher ASA scores were all associated with an increased likelihood of difficult intubation. Furthermore, a history of snoring and OSA further elevated these odds. The unique anatomical and physiological characteristics associated with obesity in this population—such as increased neck circumference, excess soft tissue mass around the airway, and OSA—contribute to a higher likelihood of both difficult intubation and extubation, in line with findings from prior studies in adult and limited pediatric cohorts.

Table 4. Multivariable logistic regression for difficult intubation

Variable	Level	Adjusted OR	Adjusted 95% CI	p-value	Reference
Sex	Male	2.28	0.95-5.49	0.065	Female
Age	≥16	0.68	0.32-1.45	0.322	<16
ASA score	3	1.38	0.65-2.92	0.404	2
Body mass index	Class 4	1.20	0.55-2.62	0.645	Class 3
	Class 5	0.51	0.06-4.16	0.530	Class 3
Comorbidity	Yes	1.41	0.67-2.95	0.362	No
Asthma	Yes	1.53	0.67-3.45	0.311	No
Hypertension	Yes	0.71	0.09-5.85	0.747	No
Hypothyroidism	Yes	0.43	0.05-3.39	0.423	No
Obstructive sleep apnea	Yes	1.73	0.63-4.71	0.286	No
G6PD deficiency	Yes	2.20	0.55-8.73	0.262	No
Mallampati score	II	1.10	0.34-3.56	0.870	I
	III	0.98	0.23-4.06	0.974	I
	IV	2.43	0.35-17.11	0.372	I
Cormack-Lehane score	II	0.71	0.26-1.93	0.505	I
	IIa	0.89	0.31-2.55	0.832	I
	IIb	0.91	0.23-3.70	0.900	I
Snoring	Yes	2.66	1.20-5.90	0.016	No
Thyromental distance	6 cm to 6.5 cm	0.78	0.32-1.88	0.577	<6
	>6.5 cm	1.09	0.30-4.01	0.898	<6
Tracheal tube type	Straight	1.14	0.53-2.45	0.730	Regular
Tracheal tube size	7.5	1.41	0.63-3.18	0.406	7
Laryngoscope blade number	4	1.28	0.27-6.14	0.762	3

ASA: American Society of Anesthesiologists, OR: Odds ratio, CI: Confidence interval, G6PD: Glucose-6-phosphate dehydrogenase.

Table 5. Multivariable logistic regression for difficult extubation					
Variable	**Level**	**Adjusted OR**	**Adjusted 95% CI**	**p-value**	**Reference**
Sex	Male	3.83	0.85-17.35	0.082	Female
Age	≥16 years	0.92	0.30-2.80	0.884	<16
ASA score	3	0.51	0.16-1.67	0.264	2
Body mass index	Class 4 obesity	1.33	0.45-3.90	0.605	Class 3
Comorbidity	Yes	1.28	0.45-3.68	0.643	No
Asthma	Yes	1.62	0.53-5.00	0.401	No
Hypothyroidism	Yes	1.23	0.15-10.28	0.850	No
Obstructive sleep apnea	Yes	1.92	0.49-7.47	0.348	No
Mallampati score	II	2.07	0.25-17.44	0.503	I
	III	1.62	0.14-19.25	0.700	I
Cormack-Lehane	II	0.74	0.21-2.58	0.641	I
	IIa	0.39	0.08-2.07	0.272	I
Short neck	Yes	1.75	0.20-15.14	0.609	No
Snoring	Yes	1.41	0.43-4.66	0.576	No
Thyromental distance	6 cm to 6.5 cm	0.65	0.16-2.57	0.537	<6
	>6.5	1.37	0.22-8.45	0.734	<6
Number of intubation attempts	>1	15.52	1.83-131.37	0.012	1
Tracheal tube type	Straight	1.60	0.52-4.87	0.412	Regular
Tracheal tube size	7.5	0.89	0.29-2.70	0.838	7
Laryngoscope blade number	4	2.51	0.31-20.12	0.387	3
Duration of anesthesia	≥60 minutes	2.53	0.69-9.27	0.161	<60 minutes
Difficult intubation	Yes	0.93	0.20-4.40	0.929	No

ASA: American Society of Anesthesiologists, OR: Odds ratio, CI: Confidence interval.

Obesity also induces physiological changes in the respiratory system, leading to a shortened time to desaturation during anesthesia induction and airway management (6). The Pediatric Difficult Intubation Collaborative has highlighted that multiple intubation attempts and continued use of direct laryngoscopy are significant risk factors for complications in children with difficult airways (7). In response, they launched initiatives to minimize repeated attempts and reliance on direct laryngoscopy. Our study found that patients requiring multiple intubation attempts had statistically significant greater odds of desaturation during extubation, likely due to airway trauma or edema incurred during these repeated attempts, though this finding was limited by the small sample size (n=4). More than one intubation attempt was related with 15.5 fold higher odds of desaturation at extubation. Desaturation during Extubation occurred in 5.2% of patients overall. Using this as a baseline to illustrate the magnitude of effect, a 15.5 fold increase in odds translated into an estimated 46% risk of desaturation if a patient has required more than one intubation attempt. Clinically, this means that failure to achieve first-pass success was not only an intraoperative challenge but also carried forward into extubation and recovery, underscoring the critical importance of a first-pass success strategy in pediatric bariatric cases.

Male sex was associated with higher risks of both extubation desaturation and difficult intubation. Snoring increased the odds of difficult intubation by 2.66-fold. These markers identify children who warrant automatic escalation in airway planning including the involvement of a senior operator, VL as first-line, apneic oxygenation, and a formalized extubation plan. In addition, anesthesia lasting longer than 60 minutes was associated with a 2.53 fold higher odds of desaturation during extubation. This emphasizes the importance of planning for an earlier, controlled, "no-drift" emergence in longer cases. We recommend to minimize residual anesthetic or opioid load, use PEEP or CPAP support, and extubate fully awake with two-person jaw support.

Moreover, in our study, video laryngoscopy was only used in 15 patients while majority did not require it. Nonetheless, it is vital to minimize intubation attempts through advanced techniques, such as videolaryngoscopy, and pre-emptively addressing difficult airway predictors. Simulation-based training offers a structured approach to improve performance in this domain. High-fidelity scenarios allow anesthesia teams to practice advanced techniques of video laryngoscopy, bougie-first intubation, ramped positioning or apneic oxygenation in a safe environment, while reinforcing crisis resource management skills. By repeatedly rehearsing anticipated difficult airway cases including extubation failure and re-intubation drills, trainees internalize decision algorithms and develop muscle memory for rarely used but life-saving maneuvers (8). We are of the opinion that, if implemented systematically, such simulation curricula can reduce the incidence of multiple intubation attempts, thereby attenuating the increased risk of extubation desaturation identified in our analysis. In this way, simulation training directly addresses the mechanism underlying the ORs we report, translating statistical risk into modifiable practice change.

Additionally, many children with obesity present with comorbidities such as bronchial asthma (8). In our study, the odds of difficult intubation were increased in patients with bronchial asthma and G6PD deficiency. Difficulties with extubation were primarily linked to factors such as previous intubation attempts. The higher incidence of desaturation during extubation emphasizes the need for meticulous planning and monitoring during the transition from mechanical ventilation, particularly in patients with anatomical or functional airway compromise (9).

This study emphasizes the critical need for tailored preoperative assessment, including the use of predictive scoring systems. Routine screening for OSA and snoring history, alongside careful evaluation of neck circumference and thyromental distance, should guide the choice of airway management strategies. Our findings also support the routine availability of advanced airway devices and personnel trained in pediatric airway management in bariatric centers (10).

Study Limitations

While this study provides valuable insights, its retrospective design is prone to incomplete data therefore limiting the ability to control all relevant variables. The single center design and relatively sample size, though substantial for a pediatric cohort, may restrict the diversity of patient demographics and institutional practices, thereby limiting the external validity and generalizability of findings. Moreover, potential confounders, such as anesthesiologist experience and variation in institutional airway management protocols, which could have affected the choice of airway technique and the occurrence of complications were not accounted for. Future research should include prospective multicenter studies to validate these findings and explore interventions to mitigate airway management risks in this population.

CONCLUSION

The perioperative airway management of pediatric patients with obesity undergoing bariatric surgery is challenging but manageable with appropriate preparation and vigilance. Male patients, those with a history of snoring, and requiring multiple intubation attempts are at higher risk for complications. Early identification of these risk factors and the strategic use of advanced airway devices are crucial for improving outcomes.

Ethics

Ethics Committee Approval: The Institutional Review Board approval for this study (MRC-01-24-445) was provided by the Medical Research Center at Hamad Medical Corporation (HMC) Doha, Qatar (Chairperson Prof. Jassim Mohd. Al Suwaidi) on 17th September, 2024.

Informed Consent: Written informed consent was obtained for the surgery from parents of the pediatric patients.

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Footnotes

Author Contributions

Surgical and Medical Practices - A.S., A.R.R.V., M.K., M.R., M.M.B., Y.O.O.M.E., M.W.J., K.T.S.; Concept - A.S., A.R.R.V., B.M.A., A.M.E., M.A., A.M.O.A.I., M.K., M.R., M.M.B., Y.O.O.M.E., M.W.J., K.T.S.; Design - A.S., B.M.A., A.M.E., A.M.O.A.I., M.K., M.R., M.M.B., Y.O.O.M.E.; Data Collection or Processing - B.M.A., A.M.E., A.M.O.A.I., M.K., M.R., M.M.B., Y.O.O.M.E.; Analysis or Interpretation - A.S., A.R.R.V., B.M.A., A.M.E., M.A., K.T.S.; Literature Search - A.S., A.R.R.V., B.M.A., A.M.E., M.A., A.M.O.A.I., M.K., M.R., M.M.B., Y.O.O.M.E., M.W.J., K.T.S.; Writing - A.S., A.R.R.V., B.M.A., A.M.E., M.A., A.M.O.A.I., M.K., M.R., M.M.B., Y.O.O.M.E., M.W.J., K.T.S.

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REFERENCES

1. *Järvholm K, Janson A, Henfridsson P, Neovius M, Sjögren L, Olbers T. Metabolic and bariatric surgery for adolescents with severe obesity: benefits, risks, and specific considerations. Scand J Surg. 2025;114:95-106.*
2. *Armitage JA, Poston L, Taylor PD. Developmental origins of obesity and the metabolic syndrome: the role of maternal obesity. Front Horm Res. 2008;36:73-84.*
3. *Saracoglu A, Saracoglu KT, Sorbello M, Kurdi R, Greif R; European Airway Management Society. A view on pediatric airway management: a cross sectional survey study. Minerva Anestesiol. 2022;88:982-993.*
4. *Alvarez A, Goudra BG, Singh PM. Enhanced recovery after bariatric surgery. Curr Opin Anaesthesiol. 2017;30:133-139.*
5. *Torbahn G, Brauchmann J, Axon E, Clare K, Metzendorf MI, Wiegand S, et al. Surgery for the treatment of obesity in children and adolescents. Cochrane Database Syst Rev. 2022;9:CD011740.*
6. *Saraçoğlu KT, Arslan G, Saraçoğlu A, Sezen Ö, Ratajczyk P, Gaszynski T. Oxygen reserve index vs. peripheral oxygen saturation for the prediction of hypoxemia in morbidly obese patients: a prospective observational study. BMC Anesthesiol. 2024;24:367.*

7. Stein ML, Sarmiento Argüello LA, Staffa SJ, Heunis J, Egbuta C, Flynn SG, et al. Airway management in the paediatric difficult intubation registry: a propensity score matched analysis of outcomes over time. EClinicalMedicine. 2024;69:102461.

8. Samuels PJ, Sjoblom MD. Anesthetic considerations for pediatric obesity and adolescent bariatric surgery. Curr Opin Anaesthesiol. 2016;29:327-336.

9. Cooper RM, Khan S. Extubation and reintubation of the difficult airway. Benumof and Hagberg's Airway Management. 2013:1018-1046.e7.

10. Saracoglu KT, Yilmaz M, Duzyol IY, Turan AZ, Okuyucu KA, Yurt E. Advanced techniques in extubation: bailey maneuver, tube exchange catheter and staged extubation set. J Clin Anesth. 2018;48:28-29.