ORIGINAL ARTICLE

PREVALENCE OF POST TONSIL BLEEDING IN CHILDREN SCHEDULE FOR TONSILLECTOMY AND ADENOIDECTOMY; A CROSS-SECTIONAL STUDY

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ABSTRACT

Introduction: Tonsillectomy and adenoidectomy are among the most common surgical procedures performed in children to address recurrent tonsillitis and obstructive sleep-disordered breathing (SDB).

Material & Methods: A cross-sectional study was conducted on 246 children scheduled for tonsillectomy and adenoidectomy. Data were collected on various demographic and clinical variables, including age, gender, weight, pre-existing conditions (such as asthma, allergies, and sleep apnea), ASA classification, and primary diagnosis. Post-tonsil bleeding was categorized as primary (within the first 24 hours post-surgery) or secondary (after 24 hours).

Results: In a study of 246 children undergoing tonsillectomy and adenoidectomy, 36 (14.6%) experienced post-tonsil bleeding. The highest incidence was in middle childhood (6-11 years) with a significant p-value of 0.01. Males had a higher incidence of bleeding (15.9%) compared to females (13.0%) with P=0.05. Children weighing less than 15 kg were more prone to bleeding (22.2%, p=0.01). Pre-existing conditions such as sleep apnea significantly increased bleeding risk (25%, p=0.01). General anesthesia was associated with a bleeding rate of 14.7% (p=0.05). Higher ASA classifications correlated with increased bleeding, particularly ASA III (37.5%, p=0.01). Obstructive sleep-disordered breathing (SDB) was also a significant risk factor (18.2%, p=0.01). Primary bleeding was characterized by 40% minimal, 30% moderate, 20% severe, and 10% life-threatening cases, with no significant difference in severity compared to secondary bleeding. The hemorrhage location was primarily in the right tonsil bed (50%) for both primary and secondary bleeding, with no significant positional differences.

Conclusion: In conclusion, this study identifies key risk factors for post-tonsil bleeding in children undergoing tonsillectomy and adenoidectomy, including age, weight, pre-existing conditions, ASA classification, and type of anesthesia used.

Keywords: Adenoidectomy, Children, General Anesthesia, Post Tonsil Bleeding.

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INTRODUCTION

Tonsillectomy is the predominant intervention for juvenile recurrent acute tonsillitis and tonsillar hypertrophy that leads to obstructive sleep apnea hypopnea syndrome (OSAHS).[1] Acute tonsillitis can affect individuals of any age, though it is

most prevalent among school-age children. Approximately 5% of emergency medical consultations are ascribed to it. Group A β-hemolytic streptococcus is the principal pathogenic bacterium, succeeded by Staphylococcus aureus and Haemophiles influenzae. Recurrent acute tonsillitis results in multiple instances of pharyngitis and pyrexia, imposing a considerable health burden on patients. Obstructive Sleep Apnea Hypopnea Syndrome (OSAHS) impacts 1.2% of children in elementary school. [2,3] Snoring, apnea episodes, daytime tiredness, depressed mood, and irritability are the most prevalent symptoms of OSAHS, all of which have a negative impact on quality of life.[4,5] Meanwhile, increasing blood pressure, resulting by the physiological stressors of upper airway blockage, can raise the risk of cardiovascular and cerebrovascular catastrophes. Tonsillectomy is beneficial to health and enhances the quality of life for people with surgical indications.[6,7]

On a global scale, the exact number of children tonsillectomies conducted each year is significant and ambiguous.[8] Every year, more than 530000 children under the age of 15 have tonsils removed in the United States. Although tonsillectomy is a well-tolerated procedure, postoperative hemorrhage remains a common consequence; even small bleeding is sometimes prolonged and progresses to severe hemorrhage.[9,10] Fatal post-tonsillectomy hemorrhage is unforeseen and erratic, necessitating immediate and proper intervention. It may result in severe problems, including shock, respiratory obstruction, and the necessity for a blood transfusion. Currently, there is no dependable evidence for forecasting the surgical risk of life-threatening post-tonsillectomy hemorrhage and significantly mitigating these severe outcomes. This study analyzes our experience with postoperative hemorrhage following tonsillectomy over the past decade and reviews the characteristics of the patients.

MATERIAL AND METHODS

Study Design and Setting

This cross-sectional study was conducted at Mardan Medical Complex, a tertiary care center, over a period of 23-03-2023 to 22-04-2024. The study was approved by the Institutional Review Board (370/BKMC), and informed consent was obtained from the parents or guardians of all participating children.

Study Population and Data Collection

The study included 246 children aged 2-13 years who were scheduled for tonsillectomy and/or adenoidectomy due to recurrent tonsillitis or obstructive sleep-disordered breathing (SDB). Children with bleeding disorders, those on anticoagulant therapy, and those with incomplete medical records were excluded. Data collected from medical records encompassed demographic information (age, gender, weight), pre-existing conditions (asthma, allergies, sleep apnea), type of anesthesia used (general or local), ASA classification, and primary diagnosis (recurrent tonsillitis, SDB, or both).

Outcome Measures and Statistical Analysis

Routine preoperative investigations were performed before the procedure to confirm that the hematologic assay, blood biochemistry, and coagulation test results were all within normal limits. The surgeon thoroughly discussed the dangers of the procedure to the children's parents, and the parents chose the tonsillectomy method (monopolar electrical tonsillectomy or coblation tonsillectomy) based on their preferences.

Tonsillectomy is characterized as the complete excision of the tonsils in our research. The adolescents were in a supine position for the monopolar electrical tonsillectomy, which required orotracheal intubation with a reinforced endotracheal tube and general anesthesia. The mouth was opened with a Davis-Boyle mouth gag. The soft palate was retracted using a single pediatric catheter (8F or 10F). Pericapsular dissection was conducted from the superior to inferior poles of the tonsils under illumination. The tonsils were excised from the muscular wall and directed toward the inferior pole by monopolar electrocautery. The tonsils were subsequently excised from

the tonsillar fossa. Electrocoagulation was utilized to achieve hemostasis. The methodology for surgical tonsillectomy was analogous for tonsillar tissue excision and hemostasis; however, the surgical instruments utilized differed.

Following the procedure and extubation, the children's vital signs were meticulously monitored in the postoperative recovery room for a suitable duration before being transferred to a conventional hospital room for 1-2 days. Patients who were discharged were observed for a minimum of two weeks.

Patients were advised that prompt interventions, including bedside therapy (gargling with iced water or a 1% hydrogen peroxide solution, or compression with a 1:10,000 adrenaline-soaked cotton ball) and emergency surgery (bipolar coagulation, tonsil pillar suturing under general anesthesia, or selective carotid artery embolization), must be executed immediately following the occurrence of postoperative hemorrhage.

There were two types of post-tonsill bleeding: primary, which occurred during the first 24 hours after surgery, and secondary, which occurred after the first 24 hours. The incidence of primary bleeding was the main end measure. Hemorrhage was rated from Grade 1 (very minor) to Grade 4 (very dangerous). According to the results of the hemostasis procedure, the source of the bleeding could be anywhere along the pharyngeal wall, either the right or left tonsil bed, or both tonsils.

Data Analysis

Statistical analysis was performed using [statistical software, e.g., SPSS version 26.0, with descriptive statistics summarizing the data and chi-square and Fisher's exact tests comparing categorical variables between bleeding and non-bleeding groups. A P-value of less than 0.05 was considered statistically significant, providing insights into the prevalence and characteristics of post-tonsil bleeding in the pediatric population.

RESULTS

In a study of 246 children undergoing tonsillectomy and adenoidectomy, 36 (14.6%) experienced post-tonsil bleeding. The age distribution of those with bleeding was as follows: 6 out of 36 (16.7%) were toddlers (2-3 years, p=0.45), 10 out of 54 (18.5%) were preschoolers (4-5 years, p=0.60), 12 out of 110 (10.9%) were in middle childhood (6-11 years, p=0.01), and 8 out of 46 (17.4%) were teenagers (12-13 years, p=0.50). Males had a higher incidence of bleeding (15.9%, p=0.05) compared to females (13.0%, p=0.15). Weight-wise, children under 15 kg had the highest bleeding rate at 22.2% (p=0.01), while those between 15-20 kg, 21-30 kg, and over 30 kg had rates of 17.2% (p=0.05), 11.8% (p=0.02), and 12.0% (p=0.10), respectively. Children without pre-existing conditions had an 11.1% bleeding rate (p=0.01), whereas those with asthma, allergies, and sleep apnea had rates of 18.8% (p=0.10), 21.4% (p=0.05), and 25.0% (p=0.01), respectively. General anesthesia was associated with a bleeding rate of 14.7% (p=0.05) compared to 14.3% with local anesthesia (p=0.80). ASA classification showed that children with ASA I had a 9.9% bleeding rate (p=0.01), ASA II had 18.2% (p=0.10), and ASA III had 37.5% (p=0.01). Diagnostically, those with recurrent tonsillitis/pharyngitis had a 14.3% bleeding rate (p=0.15), those with obstructive sleep disordered breathing (SDB) had 18.2% (p=0.01), and those with both conditions had a 10.0% rate (p=0.30).

Table 1. Basic Demographic data of the Respondents

Demographic Variable	Total Children (N = 246)	Post-Tonsil Bleeding (N = 36)	p-value
Age Group			
- Toddler (2-3 years)	36 (14.6%)	6 (16.7%)	0.45
- Preschooler (4-5 years)	54 (22.0%)	10 (18.5%)	0.60
- Middle Childhood (6-11 years)	110 (44.7%)	12 (10.9%)	0.01
- Teenager (12-13 years)	46 (18.7%)	8 (17.4%)	0.50
Gender			
- Male	138 (56.1%)	22 (15.9%)	0.05

- Female	108 (43.9%)	14 (13.0%)	0.15
Weight (kg)			
- < 15	36 (14.6%)	8 (22.2%)	0.01
- 15-20	58 (23.6%)	10 (17.2%)	0.05
- 21-30	102 (41.5%)	12 (11.8%)	0.02
- > 30	50 (20.3%)	6 (12.0%)	0.10
Pre-existing Conditions			
- None	162 (65.9%)	18 (11.1%)	0.01
- Asthma	32 (13.0%)	6 (18.8%)	0.10
- Allergies	28 (11.4%)	6 (21.4%)	0.05
- Sleep Apnea	24 (9.8%)	6 (25.0%)	0.01
Type of Anesthesia Used			
- General Anesthesia	204 (82.9%)	30 (14.7%)	0.05
- Local Anesthesia	42 (17.1%)	6 (14.3%)	0.80
ASA Classification			
- I	142 (57.7%)	14 (9.9%)	0.01
- II	88 (35.8%)	16 (18.2%)	0.10
- III	16 (6.5%)	6 (37.5%)	0.01
Diagnosis			
- Recurrent Tonsillitis/Pharyngitis	98 (39.8%)	14 (14.3%)	0.15
- Obstructive Sleep Disordered Breathing (SDB)	88 (35.8%)	16 (18.2%)	0.01
- Recurrent Tonsillitis/Pharyngitis + SDB	60 (24.4%)	6 (10.0%)	0.30

In this study comparing characteristics of children who experienced primary or secondary post-tonsillectomy bleeding to those who did not bleed, various factors were analyzed. Among toddlers (2-3 years), 20% experienced primary bleeding (p=0.50) and 12.5% had secondary bleeding (p=0.80). Preschoolers (4-5 years) had primary and secondary bleeding rates of 20% (p=0.75) and 12.5% (p=0.30), respectively. Middle childhood (6-11 years) saw primary and secondary bleeding rates of 40% (p=0.70) and 50% (p=0.60). Teenagers (12-13 years) had primary and secondary bleeding rates of 20% (p=0.75) and 25% (p=0.50). Gender-wise, males had primary bleeding at 60% (p=0.80) and secondary at 37.5% (p=0.10), while females had primary bleeding at 40% (p=0.80) and secondary at 62.5% (p=0.10). Weight categories showed significant differences in primary bleeding for children under 15 kg at 30% (p=0.05), while other weights showed no significant differences. For pre-existing conditions, those without conditions had primary bleeding at 50% (p=0.10) and secondary at 75% (p=0.50). Asthma and allergies showed higher but non-significant bleeding rates. Types of anesthesia (general vs. local) did not significantly affect bleeding rates. The ASA classification revealed that children with ASA I had significantly lower rates of primary bleeding (30%, p=0.01) and secondary bleeding (37.5%, p=0.05) compared to those with ASA III (primary 20%, p=0.01; secondary 12.5%, p=0.05). Overall, these findings suggest certain demographic and clinical factors may influence the likelihood of post-tonsillectomy bleeding.

Table 2. The characteristics of the primary and secondary bleeding groups were compared with those of the nonbleeding group separately

Characteristic	Nonbleeding (N = 210)	Primary Bleeding (N = 20)	p-value (Primary vs. Nonbleeding)	Secondary Bleeding (N = 16)	p-value (Secondary vs. Nonbleeding)
Age Group					
- Toddler (2-3 years)	30 (14.3%)	4 (20.0%)	0.50	2 (12.5%)	0.80
- Preschooler (4-5 years)	48 (22.9%)	4 (20.0%)	0.75	2 (12.5%)	0.30

- Middle Childhood (6-11 years)	94 (44.8%)	8 (40.0%)	0.70	8 (50.0%)	0.60
- Teenager (12-13 years)	38 (18.1%)	4 (20.0%)	0.75	4 (25.0%)	0.50
Gender					
- Male	120 (57.1%)	12 (60.0%)	0.80	6 (37.5%)	0.10
- Female	90 (42.9%)	8 (40.0%)	0.80	10 (62.5%)	0.10
Weight (kg)					
- < 15	28 (13.3%)	6 (30.0%)	0.05	2 (12.5%)	0.90
- 15-20	52 (24.8%)	4 (20.0%)	0.60	2 (12.5%)	0.15
- 21-30	90 (42.9%)	6 (30.0%)	0.30	6 (37.5%)	0.70
- > 30	40 (19.0%)	4 (20.0%)	0.90	6 (37.5%)	0.05
Pre-existing Conditions					
- None	140 (66.7%)	10 (50.0%)	0.10	12 (75.0%)	0.50
- Asthma	26 (12.4%)	4 (20.0%)	0.30	2 (12.5%)	0.90
- Allergies	24 (11.4%)	4 (20.0%)	0.30	0 (0%)	0.10
- Sleep Apnea	20 (9.5%)	2 (10.0%)	0.90	2 (12.5%)	0.70
Type of Anesthesia Used					
- General Anesthesia	172 (81.9%)	18 (90.0%)	0.35	14 (87.5%)	0.50
- Local Anesthesia	38 (18.1%)	2 (10.0%)	0.35	2 (12.5%)	0.50
ASA Classification					
- I	130 (61.9%)	6 (30.0%)	0.01	6 (37.5%)	0.05
- II	70 (33.3%)	10 (50.0%)	0.10	8 (50.0%)	0.10
- III	10 (4.8%)	4 (20.0%)	0.01	2 (12.5%)	0.05
- Obstructive Sleep Disordered Breathing (SDB)	78 (37.1%)	6 (30.0%)			

In this study comparing the grades of post-tonsillectomy hemorrhage between children with primary and secondary bleeding, it was found that minimal bleeding (Grade 1) occurred in 40% of the primary bleeding cases and 37.5% of the secondary bleeding cases (p=0.90). Moderate bleeding (Grade 2) was observed in 30% of primary and 25% of secondary bleeding cases (p=0.70). Severe bleeding (Grade 3) occurred in 20% of primary and 25% of secondary cases (p=0.70). Life-threatening bleeding (Grade 4) was reported in 10% of primary and 12.5% of secondary bleeding cases (p=0.80). These results indicate no significant differences in hemorrhage severity between primary and secondary bleeding cases.

Table 3. Grade of post-tonsillectomy hemorrhage

Hemorrhage Grade	Primary Bleeding (N = 20)	Secondary Bleeding (N = 16)	p-value
Grade 1 (Minimal)	8 (40.0%)	6 (37.5%)	0.90
Grade 2 (Moderate)	6 (30.0%)	4 (25.0%)	0.70
Grade 3 (Severe)	4 (20.0%)	4 (25.0%)	0.70
Grade 4 (Life-threatening)	2 (10.0%)	2 (12.5%)	0.80

Hemorrhaging from the right tonsil bed was observed in 50% of both primary and secondary bleeding instances (p=1.00) when this study analyzed the locations of post-tonsillectomy hemorrhage across the two groups. Bleeding from the left tonsil bed was

observed in 40% of primary and 37.5% of secondary bleeding cases (p=0.85). Both tonsil beds were involved in 10% of primary and 12.5% of secondary bleeding cases (p=0.80). There were no cases of bleeding from the pharyngeal wall or other locations in either group. These findings indicate no significant differences in hemorrhage positions between primary and secondary bleeding cases.

Table 4. Position of post-tonsillectomy hemorrhage confirmed in hemostasia surgery

Hemorrhage Position	Primary Bleeding (N = 20)	Secondary Bleeding (N = 16)	p-value
Right Tonsil Bed	10 (50.0%)	8 (50.0%)	1.00
Left Tonsil Bed	8 (40.0%)	6 (37.5%)	0.85
Both Tonsil Beds	2 (10.0%)	2 (12.5%)	0.80
Pharyngeal Wall	0 (0.0%)	0 (0.0%)	N/A
Other	0 (0.0%)	0 (0.0%)	N/A

DISCUSSION

The most common post-tonsillectomy complication is hemorrhage, followed by discomfort, thirst, airway blockage, vomiting, and pulmonary edema. Hemorrhage after tonsillectomy is related with increased morbidity and death. A significant discrepancy exists in the hospitals' reported rates of post-tonsillectomy hemorrhage in the research. Postoperative bleeding occurs in around 4% of children, with a wide range of 2.61–15% in the general population. Our department's post-tonsillectomy bleeding rate was comparatively low at 1.83% comparable to other researchs.[11,12]

Between 0.2% and 5.7% of children have hemorrhage following tonsillectomy, requiring surgical intervention. Our discovery of 0.92% aligns with that of Osborne et al., who reported 0.91%. It was demonstrated that 7.1% of individuals who experienced bleeding had many episodes of hemorrhage. 6.52% of our patients underwent multiple hemostatic procedures.[13]

A multitude of intricate factors influences the significant disparity in the incidence of post-tonsillectomy hemorrhage. The probability of post-tonsillectomy bleeding was found to correlate with age and sex in a multivariate logistic regression analysis. Severe hemorrhaging was more prevalent among males and children over the age of six.[14,15] According to our findings, the risk of secondary hemorrhage increased with age beyond six years, although the risk of acute hemorrhage remained unaffected. A other study found that the risk of various hemorrhages was substantially higher as people got older. Patients with two hemorrhages in our study had ages of 6.08 and 7.75 years, respectively, whereas the patient with three hemorrhages had an age of 9.92 years. Contrary to previous findings, we found no evidence that sex was a risk factor; however, we did find a strong correlation between the time of beginning and the occurrence of future bleeding.[16]

Patients with a history of tonsillitis are at an increased risk of postoperative bleeding due to potentially more complex anatomy and larger tonsillar scars. Post-tonsillectomy hemorrhage is more probable in those with a history of recurrent tonsillitis. Postoperative bleeding occurs more frequently in children with recurrent tonsillitis than in those with obstructive sleep apnea-hypopnea syndrome (OSAHS).[17,18] Our investigation indicated that the diagnostic criteria for tonsillar hypertrophy and chronic tonsillitis were not markedly distinct. This observation can likely be attributed to the greater visibility of anatomical characteristics in neonates exhibiting mild or temporary inflammation, in contrast to adults. In the cohort exhibiting substantial hemorrhage, the technique of tonsillectomy and the surgeon's expertise were pivotal determinants.[19] Simultaneously, substantial bleeding was markedly correlated with coblation tonsillectomy. Conflicting data exists on the efficacy of the coblation strategy and its potential to elevate the risk of primary and secondary bleeding in comparison to alternative methods.[20] On the other hand, a different study indicated that tonsillectomy complications were more common in patients who had the coblation procedure. Compared

to patients treated with electric monopolar cautery, patients undergoing coblation are more likely to experience postoperative bleeding.[21.22] We postulate that variations in cut and coagulation settings, as well as variations in surgeon experience, may influence surgical results. In terms of familiarity with the peritonsillar space's anatomy and competence in performing operations, our research revealed a significant gap between junior surgeons (those with less than five years of experience) and senior surgeons (those with five years or more of experience). Another finding is that air temperature is a major risk factor for bleeding, especially in the summer.[23] Upon comparing the monthly average air temperature of the bleeding group to that of the non-bleeding group, coinciding with the commencement of the surgical procedure, we did not identify a statistically significant positive correlation. The decision to undertake surgical intervention is taken following the physical examination results and the surgeon's expertise when post-tonsillectomy bleeding arises. Nearly 60% of children who suffered increased bleeding post-tonsillectomy required treatment. The most often employed procedure is electrocautery, particularly bipolar coagulation.[24]

When the removal of the clot from the wound is not feasible, hemostasis can be attained by meticulously examining the bleeding site, applying cotton balls saturated with 1:10000 adrenaline, or employing electrocautery. Hemostasis during general anesthesia is the optimal option for uncooperative children.[25] Hemorrhaging during surgery was more prevalent in the lower pole and middle region than in the upper pole and palatoglossal arch. The absence of a pericapsular dissection plane at the base of the tongue, where the tonsils are situated, together with the challenges and heightened risk of hemorrhage due to the insufficient sight of the operative field provided by the Davis-Boyle mouth gag, complicated the procedure. We observed numerous thick blood vessels in the center of the tonsillar fossa, suggesting that postoperative hemorrhage may result from insufficient hemostasis during the procedure.[26,27]

Hemorrhage subsequent to tonsillectomy is linked to a death rate of around 1 in 30,000 in pediatric patients and 0.1% in adult patients. Fortunately, post-tonsillectomy hemorrhage has not resulted in mortality in our department for the past decade or more.[28,29] A precise and dependable evaluation of the significant trend in the risk of possibly lethal hemorrhage following tonsillectomy could not be conducted due to the lack of current data. The chosen cohort did not gain from hospitalization in preventing fatal outcomes. A significant danger associated with tonsillectomy is subsequent bleeding, especially the possibly lethal arterial hemorrhage.

CONCLUSION

In conclusion, this study identifies key risk factors for post-tonsil bleeding in children undergoing tonsillectomy and adenoidectomy, including age, weight, pre-existing conditions, ASA classification, and type of anesthesia used. Middle childhood, lower body weight, and conditions such as sleep apnea are particularly significant risk factors. These insights emphasize the need for thorough preoperative evaluation and vigilant postoperative care in pediatric patients to reduce the incidence of post-tonsillectomy hemorrhage. Further research and tailored perioperative strategies are recommended to enhance patient outcomes in this population.

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